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Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

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3 **Development of a patient decision aid for children and adolescents following anterior**
4 **cruciate ligament rupture: an international mixed-methods study**
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ABSTRACT

Aim: To develop and user test an evidence-based patient decision aid for children and adolescents who are considering anterior cruciate ligament (ACL) reconstruction.

Design: Mixed-methods study describing the development of a patient decision aid.

Setting: A draft decision aid was developed by a multidisciplinary steering group informed by the best available evidence and existing patient decision aids.

Participants: People who ruptured their ACL when they were under 18 years old (i.e. adolescents), their parents, and health professionals who manage these patients. Participants were recruited through social media and the network outreach of the steering group.

Primary and secondary outcomes: Semi-structured interviews and questionnaires were used to gather feedback on the decision aid. The feedback was used to refine the decision aid and assess acceptability. An iterative cycle of interviews, refining the aid according to feedback and further interviews, was used. Interviews were analysed using reflexive thematic analysis. Questionnaire data were analysed descriptively.

Results: We conducted 32 interviews; 16 health professionals (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who had ruptured their ACL when aged under 18 years (7 were adolescents and 9 were now adults). Parents were present for 8 of these interviews with patients. Most health professionals, patients, and parents rated the aid's acceptability as good or excellent. Health professionals and patients agreed on most aspects of the decision aid, but some health professionals had differing views on non-surgical management (rehabilitation only) in children and adolescents, the risk of harms, treatment protocols and evidence on benefits and harms.

Conclusion: Our patient decision aid is an acceptable tool to assist children and adolescents in choosing an appropriate management option following ACL rupture with their parents and health professionals. A randomised controlled trial evaluating the potential benefit of this tool for children and adolescents considering ACL reconstruction is warranted.

Keywords: ACL; children and adolescents: decision aids; orthopedics; shared decision making;

Strengths and limitations of this study:

- We developed a decision aid that satisfies the International Patient Decision Aid Standards criteria.
- We interviewed a diverse range of participants using one-on-one interviews which allowed for rich feedback to be gathered on the decision aid and used mixed methods to evaluate acceptability of the decision aid.
- We were able to interview health professionals who manage children who have ruptured their anterior cruciate ligament but were unable to recruit children-participants to interview with their parents.
- Our patient decision aid was limited by the lack of high-quality evidence comparing rehabilitation only to ACL reconstruction followed by rehabilitation in children and adolescents.
- The systematic review used to inform estimates of benefits and harms included older studies that did not always report details of rehabilitation and may not reflect advances in treatment.

Conflicts of interest statement:

TCH, KM and RT are unpaid members of the International Patient Decision Aid Standards (IPDAS) Collaboration Steering Committee.

Patient and Public involvement:

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

1. Introduction

The incidence of anterior cruciate ligament (ACL) ruptures continues to increase¹, especially in those 6-18 years old^{2,3}. This increase has been linked to more children and adolescents participating in organised sport, increased intensity of training, and a focus on single-sport specialisation at an earlier age⁴⁻⁶. The number of ACL reconstruction surgeries in children and adolescents is also increasing globally^{1,6-8} despite non-surgical treatment (rehabilitation only) being an option⁹.

Recommended management options following ACL rupture include rehabilitation only, rehabilitation with the choice to undergo ACL reconstruction at a later time or early ACL reconstruction^{10,11}. Research comparing these two options is scarce, particularly in children and adolescents⁹. Two randomised control trials (RCT) (n=167¹¹; n=121,¹⁰) have shown that early ACL reconstruction in adults does not result in superior knee function, sports participation and quality of life compared to rehabilitation only with the option for delayed ACL reconstruction. However, there are no RCT's directly comparing these treatment options in children or adolescents¹².

All treatment options following ACL rupture have risks, with recent guidelines and systematic reviews highlighting uncertainty regarding which approach is superior for children and adolescents. International consensus guidelines state rehabilitation only is a viable and safe option following ACL rupture in skeletally immature children without associated injuries or major instability problems^{9,13}. However, some guidelines also state 'repairable' injuries (e.g. bucket-handle meniscal tear) associated with an ACL rupture should be considered an indication for early ACL reconstruction and meniscal repair^{9,14}. Two recent systematic reviews^{12,15} present conflicting evidence on the certainty of meniscus injury risk when choosing rehabilitation alone or considering the timing of a potential ACL reconstruction. Given this uncertainty and potential impact of poor management choices, there is a need for better evidence-based resources.

Patient decision aids are resources that present balanced information on the benefits and harms of different treatment options. They aim to improve the likelihood of informed choices and active participation of patients in healthcare decisions without negative patient outcomes¹⁶. Supporting shared decision making in children and adolescents following ACL rupture is necessary given the possible consequences of poorly individualised treatment^{9,17,18}. Currently there is no patient decision aid for children and adolescents who have ruptured their ACL. A patient decision aid could help align expectations with evidence and improve patient satisfaction.

Our aim was to develop and user-test a patient decision aid for children and adolescents following ACL rupture to be used with parent and health professionals that presents evidence-based information on treatment options.

2. Methods

Initial design of the decision aid

We developed a patient decision aid informed by the International Patient Decision Aid Standards (IPDAS) checklist and Collaboration Evidence Update 2.0¹⁹. A multidisciplinary

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3 steering group was assembled (study authors), including topic experts on ACL injury and
4 physiotherapists with experience managing ACL ruptures (AG, JZ, MM, DA, EP, CM, SF,
5 SM), an orthopaedic surgeon (IH) and patient decision aid and shared decision-making
6 experts (KM, TH and RT). The first draft of the decision aid was informed by a template used
7 for previous decision aids (for Achilles rupture²⁰, shoulder pain²¹, antibiotics²² and knee
8 arthroscopy²³) developed by some authors in the steering group (JZ, MM, KM, TH, RT, CM,
9 and IH). Key features adopted from these decision aids included questions to consider when
10 talking to health professionals, icon arrays to present statistics, and a table comparing the
11 potential benefits and harms of each management option. Decision science evidence suggests
12 these features improve patient decision making²⁴⁻²⁷. We also included statements of the
13 quality of evidence, study participants demographic information and a reference list to give
14 further context to statistics used in the decision aid.
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18 We used evidence from a systematic review and meta-analysis on rehabilitation only and
19 early or delayed ACL reconstruction in children and adolescents to inform the numeric
20 estimates of benefits and harms¹². We decided not to present benefits and harms data from
21 two RCTs comparing rehabilitation only or delayed ACL reconstruction followed by
22 rehabilitation to early ACL reconstruction followed by rehabilitation in adults^{10,11,18}. The
23 decision to exclude adult data was to avoid overloading children and adolescents with
24 statistics that may not be relevant to them. Expert opinion and consensus from the
25 multidisciplinary steering group was used to inform all information presented in the decision
26 aid (e.g., the benefits, harms, and practical issues of each management option). The steering
27 group provided feedback on the first draft of the decision aid before we began semi-
28 structured interviews.
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31 **Participants**

32 We interviewed people who ruptured their ACL when they were under 18 years old, their
33 parents, and health professionals who manage patients following an ACL rupture. Some
34 participants who ruptured their ACL when they were under 18 years old were adolescents at
35 the time of interview (adolescent-participants) and some were adults (adult-participants).
36 Participants were required to have had their ACL rupture verified previously by an MRI.
37 Participants who were under 18 years old at the time of interview were accompanied by a
38 parent (who we also interviewed). Health professionals needed to review ≥ 5 patients (any
39 age) with ACL rupture per year and there was no restriction on type (e.g., orthopaedic
40 surgeon, physiotherapist, general practitioner), work setting, country of practice, or years of
41 experience. All participants needed to be able to understand written and verbal English. There
42 was no restriction on participant country of birth.
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46 **Recruitment**

47 All participant groups were recruited through social media, snowballing and using the
48 steering group's collaboration network. Health professionals who participated in the study
49 also assisted with recruitment of adolescent-, adult- and parent-participants through referrals.
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52 Using a pre-interview questionnaire, we purposively sampled participants to achieve diversity
53 in age, gender, and ethnicity. For health professionals, we also purposively sampled to
54 achieve diversity in profession, years of experience and country of practice. We adjusted our
55 purposive sampling to recruit people with different characteristics to those already recruited.
56 Before proceeding to the pre-interview questionnaire, all participants provided consent by
57 checking a box that confirmed they had read the participant information sheet and consent
58 form, and agreed to participate in the study.
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Data collection

The data collection process involved a pre-interview questionnaire (supplementary files 3, 4, 5 and 6), semi-structured interview (supplementary file 7, 8 and 9), and acceptability questionnaire (supplementary file 10 and 11).

Pre interview questionnaires

For adolescent-, adult- and parent-participants, we gathered data on demographics (e.g., gender, age), country of birth, schooling/employment details, time since first ACL rupture, details about any other structures that were damaged, use of ACL reconstruction, re-rupture, previous and current sports participation level, and factors related to treatment decision making (supplementary file 3, 4 and 5).

For health professionals, we gathered data on demographics, profession and country of training/qualification, type of health professional, years of experience, clinical setting, average number of patients they manage with an ACL rupture per year, and the percentage of patients they advise to have ACL reconstruction (supplementary file 6).

Semi structured interviews

In accordance with IPDAS guidance,^{28,29} semi structured interviews were used to gather feedback on participant's views of the decision aid and establish the best way to present different aspects such as treatment options, numeric estimates of benefits and harms, questions to ask health professionals, practical issues, and visual layout. Interview guides were created to provide structure and group-specific prompts (supplementary files 7, 8 and 9). A trial interview was conducted as a test prior to beginning formal interviews. Interviews were conducted online via video conference (Zoom) by male researchers with experience in conducting qualitative interviews (AG, IC), and lasted between 30-50 min. Four interviews were conducted by physiotherapy students who were under the supervision of the lead author.

Participants were informed of the reason for the study and provided a draft decision aid to view prior to the interview. However, not all participants viewed the decision aid before the interview. Changes to the decision aid were made throughout the interview process and participants were shown modifications against previous versions so they could provide input on whether changes were useful (supplementary file 1). All interviews were recorded (with verbal consent obtained from participants). Participants were asked to 'think out loud' and encouraged to provide feedback as they viewed each page of the decision aid (e.g., if they thought aspects of the decision aid could be improved or could be presented in a different way). During participant interviews, the interviewer took notes to highlight key concepts emerging from the interview and direct further questioning as needed. At the end of each interview, participants were given the opportunity to provide any additional feedback or comments. Following each interview, participants were sent an email thanking them for their time to participate; there was no incentive offered to participate in the study. All interviews were audio recorded and transcribed verbatim for analysis and participants had the opportunity to review the transcript of their interview prior to data analysis if they wished.

Acceptability questionnaires

Following each interview, an acceptability questionnaire was completed by participants, either during the interview or via a questionnaire link sent via email following the interview. A separate acceptability questionnaire, adapted from The Ottawa Hospital Research

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3 Institute³⁰, was created for adolescent-, adult- and parent-participants (supplementary file 10)
4 and health professional-participants (supplementary file 11).
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7 **Data analysis**

8 We reported the qualitative aspects of this study according to the 32-item Consolidated
9 Criteria for Reporting Qualitative Research (COREQ) checklist (supplementary file 2)³¹. The
10 COREQ is a 32-item checklist that allows for reporting of important aspects of the research
11 team, study methods, context of the study, findings, analysis, and interpretation.
12

13 Pre-interview and acceptability questionnaire responses were summarised using descriptive
14 statistics (means and SDs, counts and percentages). Adolescent-, adult-, and parent-
15 participant acceptability questionnaires (supplemental file 10) involved rating sections of the
16 decision aid as 'poor', 'fair', 'good' or 'excellent', the length of the decision aid, balance of
17 information presented and its potential usefulness. The health professional-participant
18 acceptability questionnaire (supplemental file 11) used a five-point Likert scale (strongly
19 agree=5; strongly disagree=1) to assess agreement with various statements. We presented
20 Likert scores as the percentage of responses for each category and as means (SD).
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23 All interview data were analysed using thematic analysis; a method for identifying, analysing
24 and reporting patterns within data³². Grounded theory using an inductive approach
25 underpinned how data were collected and analysed. Two researchers (AG and SM)
26 independently familiarised themselves with the interviews (via audio recordings or
27 transcripts), recorded initial observations and identified concepts relevant to the questions
28 asked. The two researchers developed a framework to organise concepts into broader themes
29 and subthemes in Excel. Any disagreements in categorising concepts into themes and
30 subthemes were discussed and resolved with a third author (JZ). The mapping of themes and
31 subthemes (figure 1) was iterative as new data emerged so that the decision aid was
32 continually updated before new interviews were conducted. Multiple iterative cycles of
33 revisions were performed. However, in some cases revisions were very minor changes (e.g.,
34 correcting typos, rewording a sentence). No further interviews were conducted once no new
35 feedback emerged (data saturation) and participants had an overall positive impression of the
36 decision aid.
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42 Figure 1: Formation of subthemes and themes.
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45 **Results:**

46 ***Adherence to the IPDAS criteria and user-centredness***

47 The decision aid (supplementary file 17) met all 6 of the criteria to be considered a decision
48 aid, all 6 of the criteria to reduce the risk of harmful bias, and 20 of the 23 quality criteria
49 according to the IPDASi checklist (V.4.0)³³ (supplementary file 13). The three IPDASi
50 criteria that were not met involved reporting readability levels and evaluating the decision
51 aid. Our decision aid also met 10 of the 11 criteria for user-centredness (supplementary file
52 14) as assessed by the User-Centred Design 11-item measure³⁴. The one User-Centred Design
53 criteria that was not met involved reporting on changes completed between iterative cycles.
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Participant characteristics and decision aid acceptability

A total of 32 initial interviews were completed; 16 health professionals who manage ACL ruptures (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who had ruptured their ACL (7 adolescents and 9 who were now adults), 8 of these interviews were with a parent (one parent was interviewed with two adolescents, one with an adult, and one alone).

Additional interviews were conducted with 3 health professionals who wanted to give further feedback but ran out of time in their initial interview. No participants withdrew from the study once their interview had commenced. One parent and adolescent did not participate in an arranged interview as they had not been offered rehabilitation only treatment and the parent did not want to potentially upset them. Participant characteristics are presented in tables 1 and 2. All participants completed the acceptability questionnaire except one adolescent participant (figure 2 and table 3).

Table 1: Characteristics of participants who sustained an ACL rupture and their parents/guardians.

Participant groups pre interview questionnaire responses	Adolescents (n=7) Mean (SD) or N (%) (unless specified otherwise)	Adults (n=9) Mean (SD) or N (%) (unless specified otherwise)	Parents/guardians (n=8) Mean (SD) or N (%) (unless specified otherwise)
Age (years) range	16 (1) 15-17	26 (5.1) 18-33	46 (3.8) 41-51
Female	5 (71%)	3 (33%)	8 (100%)
Country of Birth			
Australia	3 (43%)	7 (78%)	3 (38%)
Philippines	-	-	1 (13%)*
United States of America (USA)	2 (29%)	1 (11%)	2 (25%)
South Africa	2 (29%)	-	1 (13%)
Sri Lanka	-	1 (11%)*	-
Sweden	-	-	1 (13%)
Current grade at school			
Grade 10	4 (57%)	-	-
Grade 11	1 (14%)	-	-
Grade 12 or completed Grade 12	2 (28%)	-	-
Highest level of education			
University graduate or postgraduate degree/s	-	6 (66%)	7 (88%)
TAFE/Trade	-	1 (11%)	1 (13%)
High school (completed)	-	2 (22%)	-
Employment status			
Employed full-time	-	5 (56%)	3 (38%)
Employed part-time or casual	-	3 (33%)	3 (38%)
Student	-	1 (11%)	-
Other (e.g., self-employed)	-	-	2 (25%)
Private health insurance	7 (100%)	7 (78%)	7 (88%)
Age at the time of ACL rupture (years) range	14.7 (1) 13-16	15.7 (1) 14-17	14.4 (1) 13-16

Concomitant injury at the time of ACL rupture**	4 (57%)	6 (67%)	6 (75%)
Lateral Meniscus	2 (29%)	1 (11%)	2 (25%)
Medial Meniscus	3 (43%)	4 (44%)	3 (38%)
MCL	-	1 (11%)	2 (25%)
PCL	1 (14%)	-	-
Cartilage damage	-	2 (22%)	-
Unsure of additional damaged structures	-	1 (11%)	-
Had ACL reconstruction	3 (43%)	9 (100%)	4 (50%)
Had a subsequent ACL rupture (ipsilateral or contralateral) at the time of the interview***	0 (0%)	4 (44%)	0 (0%)
Had another ACL reconstruction***	0 (0%)	3 (33%)	0 (0%)
Time since ACL reconstruction***			
6-12 months	2 (66%)	-	1 (25%)
12-24 months		2 (22%)	3 (75%)
>24 months	1 (33%)	7 (78%)	-
Highest level of activity participation prior to ACL rupture#	9 (1)	7 (2)	9 (1.75)
Median score (IQR)			
Highest current level of activity participation#	6 (6)	4 (3.5)	2 (7.5)
Median score (IQR)			
Which one factor most influenced the decision to have (or not have) an ACL reconstruction			
Recommendation from a health professional (e.g., an orthopaedic surgeon or physiotherapist)	2 (29%)	3 (33%)	4 (50%)
Someone you know (e.g., a friend)	2 (29%)	-	-
Choice due to age (e.g., being young)	1 (14%)	-	-
Wanting to return to sport	2 (29%)	4 (44%)	2 (25%)
Prevent further damage	-	2 (22%)	-
Other (e.g., research and beliefs)	-	-	2 (25%)

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Happiness with treatment choice

Extremely happy	5 (71%)	6 (66%)	2 (25%)
Somewhat happy	-	1 (11%)	2 (25%)
Neither happy nor unhappy	1 (14%)	1 (11%)	1 (13%)
Somewhat unhappy	1 (14%)	-	1 (13%)
Extremely unhappy		1 (11%)	2 (25%)

N, number of adolescents, adults who ruptured their ACL and health professionals who manage ACL ruptures. TAFE, Technical and Further Education. One parent was interviewed without their adolescent; one parent was interviewed with an adult and one parent was interviewed with two adolescents. *Management of ACL rupture were in Australia and not the country of birth. **Some people had more than one concomitant injury to their ACL rupture. ***Percentage of those who had ACL reconstruction. #Scores are based on the Tegner Activity Scale (0-10), higher scores equal higher levels of patient reported activity.

Table 2: Characteristics of health professionals that manage patients with ACL ruptures.

Health Professionals (n=16)	Mean (SD) or N (%) (unless specified otherwise)
Age (years) range	39 (8.6) 23-54
Female	3 (19%)
Country of health professional training /qualification	
Australia	11 (69%)
Germany	1 (6%)
Switzerland	1 (6%)
United Kingdom	1 (6%)
United States of America (USA)	2 (13%)
Role	
Physiotherapist	12 (75%)
Orthopaedic surgeon	4 (25%)
Years of experience	11.5 (7.3)
Work setting	
Private practice	11 (63%)
Private hospital	1 (6%)
Public hospital	4 (25%)
Other	1 (6%)
Average number of patients with ACL rupture managed per year	
5	1 (6%)
5-10	5 (31%)
10-20	2 (13%)
20-30	3 (19%)
>50	5 (31%)
The percentage of patients recommended to have ACL reconstruction following ACL rupture	
	67 (20.3)

N, number of health professionals that manage patients with ACL ruptures.

Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

Table 3: Acceptability questionnaire for people who sustained an ACL rupture (n=16) (adolescents (n=7), adults (n=9)) and their parents/guardians (n = 8).

Acceptability items	N (%) reporting excellent or good	
Who should read this decision aid?	23 (100)	
Diagram of management options following ACL rupture	23 (100)	
The treatment options covered in this decision aid	23 (100)	
Comparing benefits and harms of each management option for those aged under 18 years old	22 (96)	
Summary of benefits and harms of each management option for those aged under 18 years old	23 (100)	
The length of the decision aid was		
	Just right	23 (100)
The amount of information was		
	Just right	21 (91)
	Too little	1 (4)
	Too much	1 (4)
I found the decision aid		
	Balanced	18 (78)
	Slanted towards rehab only (or delayed ACL surgery)	2 (9)
	Slanted towards ACL reconstruction surgery (early ACL surgery)	3 (13)
Agreed they would have found this decision aid 'extremely useful' or 'very useful' when making the decision about ACL reconstruction surgery		18 (78)
Agreed this decision aid would have made their decision easier		20 (87)

N, number of adolescents and adults who have sustained an ACL rupture and their parents.

Feedback for each section of the decision aid

Although most suggestions were implemented, some conflicted with others or were not possible to implement. Online supplementary file 12 outlines feedback we did not incorporate in the decision aid and our justification for this.

Thematic analysis of interviews

Summary of interview themes and subthemes:

Theme 1 and 2: Positive and negative feedback

Most participants gave positive feedback about the design and usability of the decision aid but health professionals expressed a range of views on the content.

“I wish I had something like this for either of my ACLs. Just to have it all in one place, is good” (M, 21-30 years old, adult).

“It would be wonderful to have this handed out” (F, 41-50 years old, parent).

“It's well thought out, nice and balanced. It's good.” (M, 31-40 years old, orthopaedic surgeon).

“I really would suggest that you reconsider what you're doing” (M, 51-60 years old, orthopaedic surgeon).

“I found the whole thing very wordy” (M, 41-50 years old, orthopaedic surgeon).

Theme 3: How to use the decision aid in practice

Some health professionals suggested clarifying the influence of additional injuries (e.g., meniscus tear) or instability on management decisions. Most participants suggested the decision aid shouldn't replace professional advice and it should promote individual management.

“I also feel you have to have a health professional to guide you” (F, 41-50 years old, parent).

“I think a lot of it just comes down to the individual's context, and their goals, and then also their present functional limitation” (F, 21-30 years old, physiotherapist).

Theme 4: More information about specific considerations following ACL rupture

Adolescents frequently suggested including social and psychological support and whole-body health. Adolescents also suggested including information on planning for additional support and show fear of further injury or difficulties maintaining motivation is normal. Some health professionals suggested including ACL guidelines (e.g., Professionally endorsed ACL guidelines) and revising management options to include ACL healing, bracing and 'prehabilitation'. Some participants suggested including practical information on time needed to book ACL reconstruction, graft options, size of scars and loss of muscle strength and control. Modifying questions to ask health professionals were frequently suggested and some parents were particularly concerned about costs and pain relief.

“They don't talk about the psychological effects that it has on someone” (F, 15-17 years old, adolescent).

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“As far as this child is going to really need high care and nurturing, what have you got in place to ensure this person’s needs are going to be met?” (F, 41-50 years old, parent).
“The potential for the ACL to heal, I think parents and kids would be very interested in that” (M, 31-40 years old, physiotherapist).

Theme 5: Change or add information on rehabilitation, exercise and return to sport

Some health professionals suggested return to sport following ACL rupture isn’t guaranteed but most participants agreed rehabilitation timeframes gave realistic expectations. All participant groups mentioned rehabilitation testing should be included (e.g., strength and hop tests) and to differentiate between restricted/unrestricted training and competition sport. Most participants also suggested including consideration for long-term goals and continuing to exercise beyond 12 months.

“It’s easy to get ahead of yourself and many times parents want to rush as well” (F, 41-50 years old, parent).

“Some people may think once I finished my nine months of therapy, I’m done. But it’s like, it’s a lifelong journey” (F, 41-50 years old, parent).

“You need a certain level of dedication” (F, 15-17 years old, adolescent).

Theme 6: Modify language and formatting used

Simple language, being concise and removing unnecessary text were frequently suggested. All participant groups suggested modifications to formatting such as layout, graphs, colour, pictures, or icons and statistics (e.g., most preferred icon array images to bar graphs or ‘x in 100 people’ to percentages).

Positive presentation of information, harms, and return to sport was frequently suggested by all participant groups. Mixed views were expressed about risk of additional injury (e.g., “the relationship between meniscus damage and osteoarthritis), general surgery, paediatric specific risks and return to sport.

“I feel like the language is too academic. To me, I think it could be dumbed down more” (M, 31-40 years old, physiotherapist).

“You want them to be finding the success stories and, yeah, have a positive outlook as well, rather than focusing on who didn’t get back” (F, 41-50 years old, parent).

“You could say potential harms and precautions” (F, 41-50 years old, parent).

Theme 7: Understanding the translation of research

Some health professionals suggested the decision aid should be seen before an appointment with a health professional (e.g., before seeing an orthopaedic surgeon). Participants frequently suggested difficulty navigating the uncertainty of returning to sport with both treatment options. Participants more frequently had views to remove adult data, but some suggested providing context to adult statistics.

“When patients are overwhelmed, they, tend to just kind of they grasp for certainty” (M, 31-40 years old, physiotherapist).

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3 “You’re using adult data in a decision aid for children, and you can’t do that” (M, 51-60
4 years old, orthopaedic surgeon).

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6 “I would rather they have information that is relevant to their population and their category
7 only, even if it is lower quality” (M, 31-40 years old orthopaedic surgeon).

8 9 10 **Discussion:**

11 ***Summary of findings***

12 Most adolescents, parents, and adults rated all aspects of the decision aid as good-excellent
13 (e.g., presentation, comprehensibility, length, graphics, formatting, and amount of
14 information). Following interviews, we identified seven main themes with subthemes
15 (supplementary file 15). The interviews highlighted agreement with most of the decision aid
16 content (e.g., management options, questions to ask health professionals, summary of benefits
17 and harms). Most health professionals selected ‘strongly agree’ or ‘agree’ when asked to rate
18 statements about the decision aid but some health professionals had opposing views on
19 components of the decision aid (e.g., using statistics from studies including participants over
20 18 years old, potential risks and return to sport).

21 ***Meaning of the study***

22 Analysis of the interviews revealed that most aspects of the decision aid were agreed upon by
23 participants despite suggestions for refinement. However, some health professionals had
24 divided opinions on the evidence used to inform content and rehabilitation timeframes.
25 Feedback from all participant groups consistently highlighted the importance of positive
26 messaging, social and psychological support and considering long-term goals. Most
27 participant groups also gave positive feedback on ‘questions to consider asking health
28 professionals’.

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30 Most participants agreed the decision aid clearly outlines its intended users and treatment
31 options but there were mixed views on deciding optimal management. Some participants
32 suggested bringing more attention to the impact of additional injury (e.g., meniscus damage)
33 to decision making or adding other treatment options (e.g., bracing, ACL healing and
34 ‘prehabilitation’). We decided to present only two management options side by side for ease
35 of comparison, which is similar to other decision aids for musculoskeletal conditions^{21,35}.
36 Opinions of the optimal management for children and adolescents who have additional
37 injuries to their ACL rupture were mixed, and evidence remains uncertain^{12,15}. The decision
38 aid prompts patients to confirm their diagnosis with a team of health professionals to gain a
39 balanced opinion on their individual circumstance and discuss multiple factors that may
40 influence their choice (e.g., presence of ‘repairable’ injuries, if their knee gives way and
41 activity levels⁹).

42
43 Some physiotherapists and orthopaedic surgeons had conflicting views on using evidence
44 from research that had included participants over 18 years old. We decided not to present data
45 from studies in people over 18 years to avoid children and adolescents having to consider
46 multiple data sources and potentially becoming confused³⁶. Although adolescents develop
47 and mature at different rates, we included a recommended age limit for using the decision
48 aid. The decision aid also encourages individualised management beyond decisions based on
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3 age (e.g., including questions to consider when talking to a health professional and key
4 points).
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7 Most parents thought the decision aid would be helpful, but some parents had concerns.
8 Children and adolescents should be encouraged to take an active role in the decision-making
9 process. Some parents suggested the decision aid would save them time (e.g., “would have
10 saved me hours of googling”) but one parent withdrew their adolescent from an interview due
11 to concerns (e.g., “seeing potential harms could disrupt focus on rehabilitation”). Parents and
12 health professionals should consider encouraging children and adolescents to be involved in
13 shared decision-making^{9,37,38} and informing them of potential risks.
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17 The decision aid can facilitate parents discussing their child’s treatment preference, sport
18 choice and potential harms of participation. Parents and health professionals should
19 acknowledge their supporting role in treatment decisions (e.g., “it’s important that we listen
20 to the kids and what they have a say, it’s their body”). Discussions of sporting choice may
21 solidify a decision or lead to diversifying sporting participation that has been shown to
22 encourage the development of resilient self-identities³⁶. Parental anxiety or pain
23 catastrophising has been shown to negatively influence children’s anxiety, postoperative pain
24 and ability to perform rehabilitation³⁹. While potential harms and uncertainty of returning to
25 sport can be a sensitive topic, their acknowledgment could also provide reassurance (e.g., “as
26 a parent you’re trying to make sure they understand the decision they’re making”).
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31 Avoiding unrealistic expectations and including children and adolescents in decision making
32 was frequently mentioned by all participant groups. Using the decision aid could prevent
33 decisions being made based on unrealistic expectations and help improve treatment
34 satisfaction. It is accepted that patient satisfaction has been closely linked to expectations,⁴⁰
35 the decision aid may help improve the mismatch between expectations and evidence. Many
36 young athletes (86%) expect to return to sport following ACL reconstruction by 6 months
37 which is much sooner than is recommended in accepted professional guidelines^{41,42}. While
38 return to sport rates may be higher in children who have ACL reconstruction followed by
39 rehabilitation compared to rehabilitation only¹², subsequent ipsilateral or contralateral ACL
40 rupture following ACL reconstruction followed by rehabilitation can be as high as 32% in
41 paediatric athletes³⁹. The reality is that despite anatomical surgical success or well-designed
42 rehabilitation programs, many athletes may never return to their pre-injury athletic
43 performance level or their primary sport⁴³.
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48 Interviews frequently highlighted that information regarding psychological and social support
49 should be included in the decision aid. Sudden changes to sport participation can affect self-
50 identity in children and adolescents who particularly mentioned the mental struggle of
51 recovering post ACL rupture (e.g., “the psychological support often can get missed, you
52 know, everyone's trying to describe the, you know, the structural side of things of the knee.
53 And then forget how tough it is to go through it all”). Children and adolescent self-identities
54 can be fragile and absence from participating in a sport they depend on can be
55 psychologically traumatising³⁹. Therefore, we decided to include messages to encourage the
56 discussion and planning for psychological support. Health professionals should give early
57 recognition to psychosocial factors that have been shown to affect mental wellbeing and
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3 ability to recover from injury⁴³. The decision aid incorporates reassurance, encourages
4 monitoring physical and psychological recovery.
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7 ***Strengths and Limitations***

8 Our development process (Supplementary file 16) had several strengths. The author's
9 professional and personal background are included in the manuscript for transparency. We
10 were guided by the IPDAS criteria, interviewed a diverse range of participants, and used
11 mixed methods to evaluate acceptability of the decision aid. We include justification of the
12 evidence used to inform numeric estimates of benefits and harms in the decision aid and used
13 the highest quality evidence comparing rehabilitation only and ACL reconstruction followed
14 by rehabilitation for children and adolescents¹².
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18 Our patient decision aid was limited by the lack of high-quality evidence comparing
19 rehabilitation only to ACL reconstruction followed by rehabilitation in children and
20 adolescents. Emergence of future studies related to this topic will likely warrant an update of
21 the evidence used in the decision aid. Another limitation is that evidence from older studies
22 did not always report details of rehabilitation or consider advances in treatment. We were
23 unable to interview any children-participants and recruitment of all types of health
24 professional-participants (e.g., Sports medicine doctors) was difficult without incentives for
25 participants to give their time. However, we were able to interview health professionals who
26 manage children, and our aim was to interview participants until we achieved data saturation,
27 so a larger sample size was not needed to achieve this. Although interviews were conducted
28 with participants from several countries, another limitation is that the decision aid is only
29 presented in English. Future work could look at adapting this decision aid for culturally and
30 linguistically diverse populations.
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35 **Conclusion**

36 Our patient decision aid appears to be a valuable tool to help children and adolescents
37 following ACL rupture choose between surgical and non-surgical management, with support
38 from their parents and health professionals. Feedback from adolescents frequently suggested
39 the importance of planning to include psychological and social support during rehabilitation.
40 Feedback also suggested that health professionals should use positive messaging despite
41 uncertainty of outcomes, while avoiding the creation of unrealistic expectations. Our patient
42 decision aid is a user-friendly tool that could improve decision making in children and
43 adolescents following ACL rupture. A randomised controlled trial evaluating its impact is the
44 next important step.
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49 **Supplementary files:**

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51 Supplementary file 1: Decision aid version from PowerPoint

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53 Supplementary file 2: 32-item Consolidated Criteria for Reporting Qualitative Research
54 (COREQ) checklist

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56 Supplementary file 3: Children and adolescent pre-interview questionnaire

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58 Supplementary file 4: Adult pre-interview questionnaire

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60 Supplementary file 5: Parent/guardian pre-interview questionnaire

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5 Supplementary file 7: Children and adolescent and parent/guardian interview guide
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7 Supplementary file 8: Adult interview guide
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9 Supplementary file 9: Health professional interview guide
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11 Supplementary file 10: Acceptability questionnaire for children, adolescents, parents, and
12 adults
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14 Supplementary file 11: Acceptability questionnaire for health professional
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16 Supplementary file 12: Reasons for not implementing feedback for each section of the
17 decision aid
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19 Supplementary file 13: International Patient Decision Aid Standards Checklist (IPDASi v4.0)
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21 Supplementary file 14: User-Centred Design 11-item measure (UCD-11)
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23 Supplementary file 15: Interview themes and subthemes, and example quotes
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25 Supplementary file 16: Flow chart of the development process
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27 Supplementary file 17: Final decision aid
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Contributors:

All authors critically revised the manuscript for important intellectual content and approved the final manuscript. Please find below a detailed description of the role of each author. ARG: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data, drafted, and revised the manuscript and approved the final version to be published. MJM: Developed and designed data collection tools, interpreted data and approved the final version to be published. DBA: Developed and designed data collection tools, interpreted data and approved the final version to be published. EP: Developed and designed data collection tools, interpreted data and approved the final version to be published. IC: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data and approved the final version to be published. SM: Developed and designed data collection tools, analysed and interpreted data and approved the final version to be published. IAH: Developed and designed data collection tools, interpreted data and approved the final version to be published. SRF: Developed and designed data collection tools, interpreted data and approved the final version to be published. KM: Developed and designed data collection tools, interpreted data and approved the final version to be published. TCH: Developed and designed data collection tools, interpreted data and approved the final version to be published. RT: Developed and designed data collection tools, interpreted data and approved the final version to be published. CGM: Developed and designed data collection tools, interpreted data and approved the final version to be published. JRZ: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data, drafted, and revised the manuscript and approved the final version to be published. The corresponding author (ARG) attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. As the guarantor, the corresponding author (ARG) accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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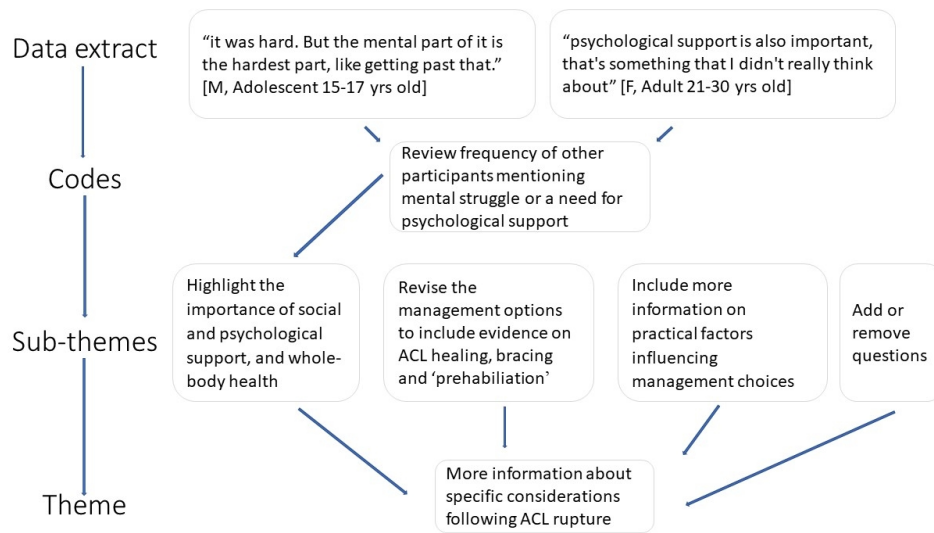


Figure 1: Formation of subthemes and themes.

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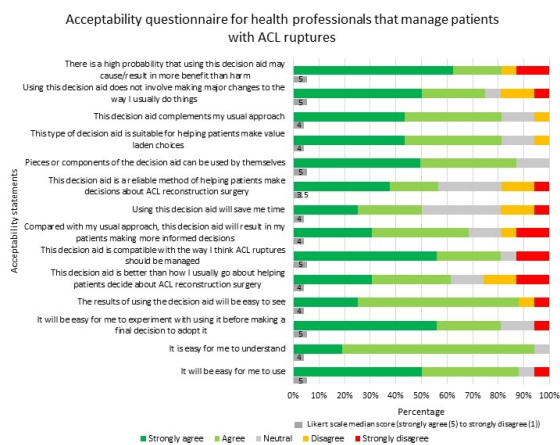
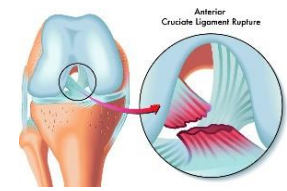


Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

338x190mm (96 x 96 DPI)

Who should read this decision aid?



This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL). ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different. This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.

Management options after ACL rupture

Option #1
Rehab only*
(or delayed ACL surgery)



Health professionals will prescribe your exercises and perform testing to guide progression and return to activity, training or sport.

Option #2
ACL surgery
(early ACL reconstruction)



6-9 months

Potential return to sport

9-12 months

After 9 months

Continue exercises + injury prevention

After 12 months

*Talk to a health professional if your knee keeps 'giving way' despite following advice. No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option. Remember to consider long-term goals and see people who can support you (e.g., friends).

What is covered in the decision aid?

- What are the treatment options covered in this decision aid?
- Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old
- Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

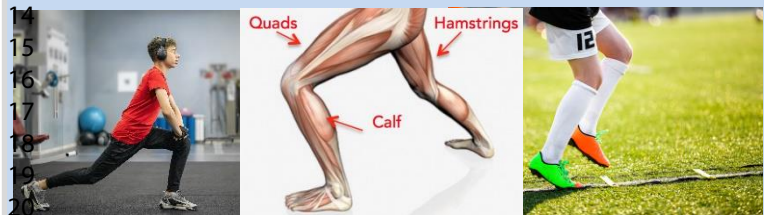
Important: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. **Last reviewed:** Updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.




1. Rehab only (or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.



After an ACL rupture occurs

See a health professional. 

0-1 month post injury

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.



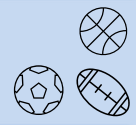
1-3 months post injury

You may begin activities like running, swimming or outdoor cycling.



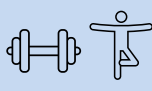
6-9 months post injury

You may return to sports like soccer, basketball, volleyball or rugby.



After 9 months post injury

Continue exercises to help your functional recovery and keep the knee strong.

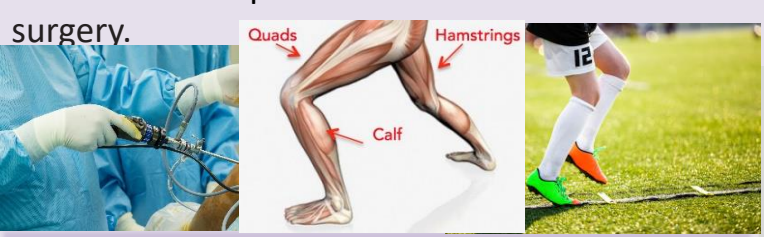


If you decide to have **delayed ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.


Caution: If your knee 'gives way' after 3 months, talk to your health professional. You may be at risk of further injury.

2. ACL surgery (early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.



After an ACL rupture occurs

See a health professional. 

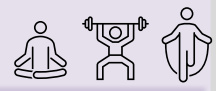
0-1 month post surgery

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.



1-3 months post surgery

With the help of a health professional, gradually start harder exercises at home or in a gym.



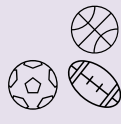
3 months post surgery

You may begin activities like running, swimming or outdoor cycling.



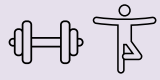
9-12 months post surgery

You may return to sports like soccer, basketball, volleyball or rugby.



After 12 months post surgery

Continue exercises to help your functional recovery and keep the knee strong.



Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹

Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

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This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).² High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

1. Rehab only (or delayed ACL surgery)

Delayed ACL surgery = 3 months or later

2. ACL surgery (early ACL reconstruction)

Early ACL surgery = before 3 months

+ Return to pre-injury sport

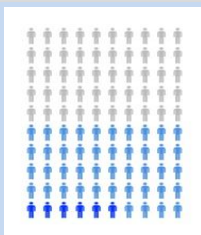
Not everyone will return to their pre-injury level of sport with either option.

Rehab only:

Between

6 and 50 people per 100

return to their pre-injury sport around 20 months after injury.²



Early ACL surgery:

Between

57 and 100 people per 100

return to their pre-injury sport around 24 months after injury.²

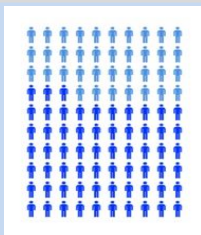


Delayed ACL surgery:

Between

63 and 100 people per 100

return to their pre-injury sport around 22 months after injury.²



- Precautions and potential harms

Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²

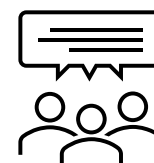
Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.²

meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

Questions to consider when talking to a health professional...

- Will my choice affect what sport I play?
- If I am still growing, will this affect my management?
- What type of graft is best for me if I have ACL surgery?
- Is there any psychological support available?



- What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?

Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

1. Rehab only (or delayed ACL surgery)

2. ACL surgery (early ACL reconstruction)

+ Positives and potential benefits

- Between 41 – 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

- Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience ‘giving way’ of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

+ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

- Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Key points

- Choose what is best for your situation
- If you chose rehab only, you could still decide to have delayed ACL surgery later
- See family, friends and health professionals for support
- Listen and care for your whole-body
- Care for your mental and physical health
- Plan to try new activities
- Don't rush – expect challenges
- Stay positive!

References:

1) Grindem H, et al. Br J Sports Med. 2016;50(13):804–8
 2) James EW, et al. Am J Sports Med. 2021; 49(14):4008-4017
 3) Frobell RB, et al. NEJM 2010;363(4):331-342
 4) Reijman M, et al. BMJ 2021;372-375
 5) Wiggins AJ, et al. Am J Sports Med. 2016;44(7):1861–76
 6) Frosch KH, Arthroscopy, 2010; 26:1539–50.
 7) Ardern CL, et al. KSST. 2018;26(4):898-1010
 8) Webster, K et al. CJSM. 2022;32(2):145-152
 9) Pitsillides, A et al. J Bodyw Mov Ther. 2021;28:246-254

COREQ (CONsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the interview or focus group?	
Duration	21	What was the duration of the interviews or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Children and Adolescent Participant information statement before starting the survey.
2. CHILDREN AND ADOLESCENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

By saying yes to being in this study, I am saying that:

Tick/initial boxes

- I know what I will be asked to do and have been given a Study Information Sheet to keep.
 - I know that this study is about what information is important for children before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - Someone has talked to me about the study and what it means for me.
 - I know that I will be asked to answer a questionnaire (5-minutes) before I attend an interview to provide feedback on educational information of treatment options following ACL injury (online, via telephone or in person if the COVID-19 situation allows) that will last 30 minutes.
 - I know that I don't have to be in the study if I don't want to.
 - I know that I can choose not to talk about something if I don't want to.
 - I have been asked if it is ok or not ok to record what I say.
 - I have been told that I can change my mind at any time if I don't want to take part anymore.
 - I have been told that if I say yes or no it won't change how the study team feel about me.
 - I know that what I say or do in this study is private and when the study team write about what they learn they won't use my name or anything that could tell other people who I am.
 - I understand that after I sign and return this consent form it will be kept by the researcher, and that I can ask for a copy at any time.
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

- Yes
 No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

- Yes
 No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
 Male
 Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. Are you currently at school?

- Yes
 No

If Yes, What Grade are you in at school? _____

If No, What Grade did you finish/leave school? _____

5. Do you work?

- Yes
 No

If Yes,

- Part-time
 Full-time

What type of work do you do? _____

6. How long ago did you rupture your ACL (weeks, months or years)?

7. When you ruptured your ACL, did you also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?

- Yes
 No (skip to question 8)

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Unsure

Please specify the structures you damaged. Please select all that apply:

- Medial collateral ligament (MCL)
- Lateral collateral ligament (LCL)
- Posterior cruciate ligament (PCL)
- Medial meniscus
- Lateral meniscus
- Cartilage damage
- I am unsure of the structure

8. Did you have an ACL reconstruction surgery?

- Yes
- No > go to question 10

> If 'Yes' did you re-rupture your ACL after surgery?

- Yes
- No

> If 'Yes', did you have another ACL reconstruction?

- Yes
- No

9. How long ago did you have your most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

10. Please indicate in the spaces below the HIGHEST level of activity that you participated in BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.

BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite)
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

11. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

12. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Adult Participant information statement before starting the survey.
2. ADULT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

1
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3 7. How long ago did you rupture your ACL? _____
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7 8. When you ruptured your ACL, did you also damage any other structures in the knee (e.g.,
8 Meniscus or other ligament damage)?

- 9 Yes
10 No (skip to question 9)
11
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13 Please specify the structures you damaged. Please select all that apply:
14

- 15 Medial collateral ligament (MCL)
16 Lateral collateral ligament (LCL)
17 Posterior cruciate ligament (PCL)
18 Medial meniscus
19 Lateral meniscus
20 Cartilage damage
21 I am unsure of the structure
22
23
24

25 9. Did you have an ACL reconstruction surgery?

- 26 Yes
27 No > go to question 11
28
29

30 > If 'Yes' did you re-rupture your ACL after surgery?

- 31 Yes
32 No
33
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35 > If 'Yes', did you have another ACL reconstruction?

- 36 Yes
37 No
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40 10. How long ago did you have your most recent ACL reconstruction surgery?

- 41 <1 month ago
42 1-3 months ago
43 4-6 months ago
44 6-12 months ago
45 12-24 months ago
46 >24 months ago
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51 11. Please indicate in the spaces below the HIGHEST level of activity that you participated in
52 BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.
53

54 BEFORE INJURY: Level _____ CURRENT: Level _____
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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite))
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

12. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Parent Participant information statement before starting the survey.
2. PARENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of any involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I and my child will both be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
- I understand that my participation will involve my interview to be recorded.
- I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to let my child participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
- I understand that we (myself and/or my child) are free to withdraw from this study at any time and can choose to withdraw any information already provided (unless the data has already been de-identified or published).
- I have been informed that the confidentiality of the information provided by myself and/or my child will be protected and will only be used for purposes that has been agreed to. I understand that information will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, and that publications will not contain any identifiable information about myself or my child.
 - Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

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7. How long ago did your child rupture their ACL? _____
8. When your child ruptured their ACL, did they also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?
- Yes
 - No (skip to question 9)
 - Unsure

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Please specify the structures your child damaged. Please select all that apply:

- Medial collateral ligament (MCL)
- Lateral collateral ligament (LCL)
- Posterior cruciate ligament (PCL)
- Medial meniscus
- Lateral meniscus
- Cartilage damage
- I am unsure of the structure

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9. Has your child have an ACL reconstruction surgery?
- Yes
 - No > go to question 11

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> If 'Yes' did your child re-rupture their ACL after surgery?

- Yes
- No

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> If 'Yes', did your child have another ACL reconstruction?

- Yes
- No

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10. How long ago did your child have their most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

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11. Please indicate in the spaces below the HIGHEST level of activity that your child participated in BEFORE THEIR INJURY and the highest level they can participate in CURRENTLY.

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BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite)
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

12. Which one factor most influenced the decision for your child to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy was your child with their treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

We would like to interview you and your child together. Is this okay?

Yes

No

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via email

Consent section

1. Please make sure you have read the Health Professional Participant information statement before starting the survey.
2. HEALTH PROFESSIONAL PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
-
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

- Yes
 No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

- Yes
 No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country did you receive your health professional training/qualification? [free text response]

4. What type of health professional are you?

- Orthopaedic surgeon
- General practitioner
- Sports medicine doctor
- Physiotherapist
- Other (please specify) _____

5. How many years have you been practicing? [free text response]

6. Which clinical setting have you spent the most time practicing in?

- Private practice
- Public hospital
- Private hospital
- Sports teams
- Other (please specify) _____

7. On average, how many patients with an ACL rupture do you manage/review per year? [free text response]

8. On average, what percentage of these patients do you advise to have ACL reconstruction surgery when they first visit you? [free text response]

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Finally, when are the best times to schedule you for an online Zoom interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

Example structure of interviews with parents, children and adolescent participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to parents, children and adolescents (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?
- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Do you expect to return to your pre-injury level of sport?
- How long do you expect recovery to take?
- Would you consider activity modification?

Goals:

- What do you aim to achieve with management and how does this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with adult participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to adult participants (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material taking your experience into account.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?
- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Did you expect to return to your pre-injury level of sport?
- How long did you expect recovery to take?
- Did you consider activity modification?

Goals:

- What did you aim to achieve with management and how did this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with health professional participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What is your understanding of the treatment options following an anterior cruciate ligament (ACL) rupture? What causes it? How can it be treated?
- What do you think of ACL reconstruction surgery as a treatment?

Brief explanation of ACL reconstruction surgery to health professionals (depending on their current level of understanding e.g. do not explain this to an orthopedic surgeon)

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

Core questions

If we were designing an education leaflet to help patients decide whether to have ACL reconstruction surgery or not....

- What information is most important for them to know? (prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure, etc.)
- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure
- How would your response to the above options differ if the information was intended to be used during a consultation with a health professional?

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to health professionals (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have ACL reconstruction surgery or not. We would like for you to help us refine this material – for example, how you find the visual appeal, readability, content, and what are your overall thoughts on patients using this material?

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything confusing, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as health professionals are reading through the material:

- How do you think patients would find this section?
- Did you feel like patients will know where to look, and what to do next?

- 1 • Did you feel like patients knew the relevance of this section in their decision?
- 2 • How do you think patients will find the content of this section?
- 3 • Were the instructions clear/helpful?
- 4 • How easy was it to understand the section? (readability)
- 5 • Was there anything that was unclear or confusing?
- 6 • How were the visual aids?
- 7 • How was the functionality?
- 8 • Is there anything that you would improve in this section?
- 9 • What did you like most about this material?
- 10 • What did you like least about this material?
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16 **General feedback at the end**

- 17 • Are there any topics that you would like to see in future versions of this tool?
- 18 • Do you have any other general feedback, thoughts, or comments?
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Supplementary File 10: Acceptability questionnaire for children, adolescents, parents, and adults

We would like to know what you think about the patient decision aid you have just read.

Which participant group are you?

- Parent/Gaurdian
- Child or Adolescent
- Adult

1. Please rate each section by circling 'poor', 'fair', 'good', or 'excellent' to show what you think about the way the information was presented on:

Who should read this decision aid?	Poor	Fair	Good	Excellent
Diagram of management options following ACL rupture	Poor	Fair	Good	Excellent
The treatment options covered in this decision aid	Poor	Fair	Good	Excellent
Comparing benefits and harms of each management option for those aged < 18 years old	Poor	Fair	Good	Excellent
Summary of benefits and harms of each option	Poor	Fair	Good	Excellent

2. The length of the decision aid was:
 - a. Too long
 - b. Too short
 - c. Just right
3. The amount of information was:
 - a. Just right
 - b. Too much
 - c. Too little
4. I found the decision aid:
 - a. Balanced
 - b. Slanted towards rehab only (or delayed ACL surgery)
 - c. Slanted towards ACL reconstruction surgery (early ACL surgery)
5. Would you find (or would you have found) this decision aid useful when/if you were making your decision about ACL reconstruction surgery?
 - a. Not at all useful
 - b. Slightly useful
 - c. Moderately useful
 - d. Very useful

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 - 60
- e. Extremely useful
6. Did this decision aid/would this decision aid make your decision to have ACL reconstruction surgery...?
- a. Easier (option to comment)
 - b. More difficult (option to comment)

For peer review only

Supplementary File 11: Acceptability questionnaire for Health Professionals

We would like to know what you think about the patient decision aid you have just read.

Please rate each section by selecting 'strongly agree', 'agree', 'neutral', 'disagree' or 'strongly disagree' to show what you think about the way the information was presented on:

In general:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It will be easy for me to use	1	2	3	4	5
It is easy for me to understand	1	2	3	4	5
It will be easy for me to experiment with using it before making a final decision to adopt it	1	2	3	4	5
The results of using the decision aid will be easy to see	1	2	3	4	5
This decision aid is better than how I usually go about helping patients decide about ACL reconstruction surgery	1	2	3	4	5
This decision aid is compatible with the way I think ACL ruptures should be managed	1	2	3	4	5
Compared with my usual approach, this decision aid will result in my patients making more informed decisions	1	2	3	4	5
Using this decision aid will save me time	1	2	3	4	5
This decision aid is a reliable method of helping patients make decisions about ACL reconstruction surgery	1	2	3	4	5
Pieces or components of the decision aid can be used by themselves	1	2	3	4	5
This type of decision aid is suitable for helping patients make value laden choices	1	2	3	4	5
This decision aid complements my usual approach	1	2	3	4	5
Using this decision aid does not involve making major changes to the way I usually do things	1	2	3	4	5
There is a high probability that using this decision aid may cause/result in more benefit than harm	1	2	3	4	5

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Supplementary file 12: Reasons for not implementing feedback for each section of the decision aid.

Themes	Sub themes	Feedback	Reason for not implementing feedback
Negative feedback on the decision aid	Negative feedback on the content	Health Professionals:	Health Professionals:
		A decision aid cannot be made for adolescents and children due to poor supporting evidence. [OS]	We believe that it is still possible to create a decision aid using the best available evidence.
		It was suggested that pictures were not necessary in the decision aid. [PT]	We had a large amount of opposing feedback that participants liked the inclusion of some pictures.
Outline how the decision aid should be used	Improve clarity on the target population	Health Professionals:	Health Professionals:
		Add who does well with each option. For example, how many episodes of giving way is acceptable. [PT]	We couldn't do this as there is no evidence on who does well with each outcome.
	Clarify that choices should be made based on individual circumstances	Adults:	Adults:
		Provide definitions of what a successful or unsuccessful outcome.	Treatment success is individualised.
		Health Professionals:	Health Professionals:
		Add that decisions should be made based on skeletal maturity rather than age. [OS]	We decided to specify a recommended age limit for use of the decision aid and did not mention skeletal maturity directly due to feedback it was too complex for children and adolescents to understand.
More information about specific considerations following ACL	Highlight the importance of social and psychological support, and whole-body health	Parents:	Parents:
		Some parents suggested including information about alternative medicine.	There is a lack of supporting evidence for alternative medicine in both adults and children.
		Health Professionals:	Health Professionals:

rupture		Add information on methods of pain management. For example, the need for massage. [PT]	There is a lack of supporting evidence for pain management using massage in both adults and children.
	Revise the management options to include evidence on ACL healing, bracing and ‘prehabilitation’	Children and adolescents:	Children and adolescents:
		Include non-operative bracing as another option. Give an estimation of the percentage of people that can have ACL healing.	There is currently no evidence comparing non-operative bracing to rehab only and ACL reconstruction. There is currently no strong link between ACL healing and outcomes so we did not want to overload children and adolescents with more statistics.
		Adults:	Adults:
		Include that it can take time to book ACL reconstruction, depending on if you have surgery privately or publicly.	This information was decided to be unnecessary as both rehabilitation timeframes mention the need to see a health professional.
		Health Professionals:	Health Professionals:
		Include recommendations of prehabilitation and checking if the ACL has healed after three months. [PT]	There is no evidence that prehabilitation is beneficial and there is currently no strong link between ACL healing and outcomes, so we did not want to overload children and adolescents with more statistics.
	Include more information on practical factors influencing management choices	Children and adolescents:	Children and adolescents:
		Include that COVID 19 may have influenced having an ACL rupture.	There is no evidence to support this claim, so we decide to exclude.
		Adults:	Adults:
		Add consider the time it can take to book surgery.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.

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		Parents:	Parents:
		Add the consideration of scar size following ACL reconstruction surgery.	Scars are mentioned in the description of ACL reconstruction, but we do not expand beyond this as there is a lack of high-quality evidence on the importance of scar size following ACL reconstruction.
		Health Professionals:	Health Professionals:
		Add a statement that meniscus is a secondary restraint in pivoting without an ACL. [OS] Include the injury risk related to graft type. [PT]	We did not include this statement as it was beyond the scope of this decision aid. We included a question about graft choices which provides an opportunity to discuss graft choice with a health professional.
	Add or remove questions	Parents:	Parents:
		The decision aid could prompt children and adolescents to ask about other previous injuries not just the ACL.	We included a question about previous injuries, but this was otherwise beyond the scope of this decision aid.
		Health Professionals:	Health Professionals:
		Add 'what factors have been shown to make a bigger difference' in achieving outcomes. [PT] Add 'if I don't have surgery how would my knee function be in the future? [OS]	We did not include this statement directly as there is no evidence on who does well with each outcome. We did not include this question as it could be considered a leading question.
Change or add information on rehabilitation, exercises and return to sport	Include more detail on return to sport following ACL rupture	Health Professionals:	Health Professionals:
		Include a statistic that participation in change of direction sports in children following ACL rupture may mean a higher risk of meniscus damage. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
	Refine rehabilitation for children and adolescents	Children and adolescents:	Children and adolescents:

progression timeframes	Add remember to also focus on the uninjured leg during rehabilitation.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
	Adults:	Adults:
	Add to settle the knee with bed exercises to avoid confusion that you start harder exercise straight away.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
	Health Professionals:	Health Professionals:
	Add patient milestones or goals of each rehabilitation phase. [PT] Include when activities can be done. [OS]	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
Clarify the importance of testing rehabilitation progress and return to training or competition sport	Health Professionals:	Health Professionals:
	Add more detail on the classification of the individual's current level of sport and their desired level of sport. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
Expand on the type of exercises involved in management	Children and adolescents:	Children and adolescents:
	Include the need to get a gym membership.	We did not include this statement as it was beyond the scope of this decision aid.
	Adult:	Adult:
	Include the importance of hard work on quadriceps muscle at the gym.	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.
	Health Professionals:	Health Professionals:
	It was suggested to provide more detail on muscle strengthening programs and how exercise can help to stabilise the knee. [PT]	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.

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	Consider the long-term need for ongoing “hard work” and injury prevention	Health Professionals: Note that if meniscus and cartilage injuries happen, this can have major impact on the future osteoarthritis. [PT]	Health Professionals: We noted the link between meniscus damage and risk of osteoarthritis damage. The risk of cartilage damage can be discussed with a health professional.
Modify language and formatting used	Use simple language	Health Professionals:	Health Professionals:
		Reduce the number of words used in the headings to describe each option. [PT]	We decided to keep ‘or delayed ACL surgery’ and ‘early ACL surgery’ in brackets following the headings of each option throughout to keep consistency.
	Make the section more concise	Health Professionals:	Health Professionals:
		Remove the statement about quality of evidence. [PT] Soften the language around return to sport as people can return sooner and be ok [PT]	We did not remove the statement about the quality of evidence as we believe this is important in showing the uncertainty of evidence and feedback frequently reported this as important to convey. We used evidence-based ranges of times for an expected for return to sport.
	Modify presentation of harms, formatting, graphics, or statistics	Children and adolescents:	Children and adolescents:
Add more pictures to the decision aid.		We received opposing feedback that too many visuals may take away from key information.	
Adult:		Adult:	
Highlight the statistics that were ‘better’.		We did not apply highlighting around statistics to avoid bias.	
Parents:		Parents:	

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		Present statistics as percentages as it is easier to understand.	We received opposing feedback that ‘x amount of people per 100’ was preferable.
		Health Professionals:	Health Professionals:
		Include if there is a clinically significant difference in function scores between groups when presenting statistics. [PT] Use more visuals, pictures and make more like an infographic. [PT] Use a bar graph rather than an icon array. [PT] Suggestion to include definitions of a complication. [PT]	We included a statement about the quality of evidence and presented statistics without significance values to avoid making the decision aid too complex. We received opposing feedback that too many visuals may take away from key information. We received opposing feedback that using icon array was preferable than a bar graph to represent statistics. The decision aid is designed to be used with a health professional who can clarify this information.
	Use positive messaging	Parents:	Parents:
		Include a statement that research is only presenting the average outcomes.	We used evidence-based statistics, but avoided using statements that may give unrealistic expectations.
		Health Professionals:	Health Professionals:
		Add a positive message in the form of a sentence at the end of the decision aid [PT]	It was decided that key points were more appropriate.
Understanding the translation of research	Usability of the decision aid	Health Professionals:	Health Professionals:
		Move the summary page to be the first page of the decision aid. [PT]	We received opposing feedback that it was appropriate to present the summary page on the last page of the decision aid.
	Clarify the uncertainty	Children and Adolescents:	Children and Adolescents:

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of evidence and outcomes of each option	Add statistics that females can be at a higher risk of ACL rupture.	We did not include this statement as it was beyond the scope of this decision aid.
	Health Professionals:	Health Professionals:
	It was suggested to include that the position of the graft in ACL reconstruction can influence outcomes. [OS]	The inclusion of graft position as a variable is beyond the scope of our decision aid.
Keep or remove statistics using adult data	Children and Adolescents:	Children and Adolescents:
	Adult statistics could be included as they may be more relevant for older skeletally mature adolescents.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
	Adults:	Adults:
	Include adult data because if someone was 19 years old and they wanted to look at adult data then it could be relevant for them.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
	Parents:	Parents:
	Include adult data as it was clear enough that it was data using adults.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.

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Supplementary File 13. International Patient Decision Aid Standards checklist
(IPDASi v4.0)

Qualifying criteria	Answer
1. The patient decision aid describes the health condition or problem (treatment, procedure, or investigation) for which the index decision is required.	Yes
2. The patient decision aid explicitly states the decision that needs to be considered (index decision).	Yes
3. The patient decision aid describes the options available for the index decision.	Yes
4. The patient decision aid describes the positive features (benefits or advantages) of each option.	Yes
5. The patient decision aid describes the negative features (harms, side effects, or disadvantages) of each option.	Yes
6. The patient decision aid describes what it is like to experience the consequences of the options (e.g., physical, psychological, social).	Yes
Certification criteria	Answer
1. The patient decision aid shows the negative and positive features of options with equal detail (e.g., using similar fonts, sequence, presentation of statistical information).	Yes
2. The patient decision aid (or associated documentation) provides citations to the evidence selected.	Yes
3. The patient decision aid (or associated documentation) provides a production or publication date.	Yes
4. The patient decision aid (or associated documentation) provides information about the update policy.	Yes
5. The patient decision aid provides information about the levels of uncertainty around event or outcome probabilities (e.g., by giving a range or by using phrases such as “our best estimate is . . .”).	Yes
6. The patient decision aid (or associated documentation) provides information about the funding source used for development.	Yes
7. The patient decision aid describes what the test is designed to measure.	N/A
8. If the test detects the condition or problem, the patient decision aid describes the next steps typically taken.	N/A
9. The patient decision aid describes the next steps if the condition or problem is not detected.	N/A
10. The patient decision aid has information about the consequences of detecting the condition or disease that would never have caused problems if screening had not been done (lead time bias).	N/A
Quality criteria	Answer
1. The patient decision aid describes the natural course of the health condition or problem, if no action is taken (when appropriate).	Yes
2. The patient decision aid makes it possible to compare the positive and negative features of the available options.	Yes
3. The patient decision aid provides information about outcome probabilities associated with the options (i.e., the likely consequences of decisions).	Yes
4. The patient decision aid specifies the defined group (reference class) of patients for whom the outcome probabilities apply.	Yes
5. The patient decision aid specifies the event rates for the outcome probabilities	Yes
6. The patient decision aid allows the user to compare outcome probabilities across options using the same time period (when feasible).	Yes

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3	7. The patient decision aid allows the user to compare outcome probabilities	Yes
4	across options using the same denominator (when feasible).	
5	8. The patient decision aid provides more than 1 way of viewing the	Yes
6	probabilities (e.g., words, numbers, and diagrams).	
7	9. The patient decision aid asks patients to think about which positive and	Yes
8	negative features of the options matter most to them (implicitly or	
9	explicitly).	
10	10. The patient decision aid provides a step-by step way to make a decision.	Yes
11	11. The patient decision aid includes tools like worksheets or lists of	Yes
12	questions to use when discussing options with a practitioner.	
13	12. The development process included a needs assessment with clients or	Yes
14	patients.	
15	13. The development process included a needs assessment with health	Yes
16	professionals.	
17	14. The development process included review by clients/patients not	Yes
18	involved in producing the decision support intervention.	
19	15. The development process included review by professionals not involved	Yes
20	in producing the decision support intervention.	
21	16. The patient decision aid was field tested with patients who were facing	Yes
22	the decision.	
23	17. The patient decision aid was field tested with practitioners who counsel	Yes
24	patients who face the decision.	
25	18. The patient decision aid (or associated documentation) describes how	Yes
26	research evidence was selected or synthesized.	
27	19. The patient decision aid (or associated documentation) describes the	Yes
28	quality of the research evidence used.	
29	20. The patient decision aid includes authors'/developers' credentials or	Yes
30	qualifications.	
31	21. The patient decision aid (or associated documentation) reports	No
32	readability levels (using 1 or more of the available scales).	
33	22. There is evidence that the patient decision aid improves the match	No*
34	between the preferences of the informed patient and the option that is	
35	chosen.	
36	23. There is evidence that the patient decision aid helps patients improve	No*
37	their knowledge about options' features.	
38	24. The patient decision aid includes information about the chances of	N/A
39	having a true-positive test result.	
40	25. The patient decision aid includes information about the chances of	N/A
41	having a true-negative test result.	
42	26. The patient decision aid includes information about the chances of	N/A
43	having a false-positive test result.	
44	27. The patient decision aid includes information about the chances of	N/A
45	having a false-negative test result.	
46	28. The patient decision aid describes the chances the disease is detected	N/A
47	with and without the use of the test.	
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N/A: not applicable.
*we plan to evaluate the decision aid in a randomised controlled trial.

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Supplementary File 11. User-Centered Design 11-item measure (UCD-11)

Items	Explanations and examples	Yes/No
1. Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps to help understand users (eg, who they are, in what context might they use the tool) and their needs?	Such steps could include various forms of user research, including formal or informal needs assessment, focus groups, surveys, contextual inquiry, ethnographic observation of existing practices, literature review in which users were involved in appraising and interpreting existing literature, development of user groups, personas, user profiles, tasks, or scenarios, or other activities	Yes
2. Were potential end users involved in any steps of designing, developing, and/or refining a prototype?	Such steps could include storyboarding, reviewing the draft design or content before starting to develop the tool, and designing, developing, or refining a prototype	Yes
3. Were potential end users involved in any steps intended to evaluate prototypes or a final version of the tool?	Such steps could include feasibility testing, usability testing with iterative prototypes, pilot testing, a randomized controlled trial of a final version of the tool, or other activities	Yes
4. Were potential end users asked their opinions of the tool in any way?	For example, they might be asked to voice their opinions in a focus group, interview, survey, or through other methods	Yes
5. Were potential end users observed using the tool in any way?	For example, they might be observed in a think-aloud study, cognitive interviews, through passive observation, logfiles, or other methods	Yes
6. Did the development process have 3 or more iterative cycles?	The definition of a cycle is that the team developed something and showed it to at least one person outside the team before making changes; each new cycle leads to a version of the tool that has been revised in some small or large way	Yes
7. Were changes between iterative cycles explicitly reported in any way?	For example, the team might have explicitly reported them in a peer-reviewed paper or in a technical report. In the case of rapid prototyping, such reporting could be, for example, a list of design decisions made and the rationale for the decisions	No
8. Were health professionals asked their opinion of the tool at any point?	Health professionals could be any relevant professionals, including physicians, nurses, allied health providers, etc. These professionals are not members of the research team. They provide care to people who are likely users of the tool. Asking for their opinion means simply asking for feedback, in contrast to, for example, observing their interaction with the tool or assessing the impact of the tool on health professionals' behavior	Yes

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3	9. Were health professionals	Consulting before the first prototype means	Yes
4	consulted before the first	consulting prior to developing anything. This	
5	prototype was developed?	may include a variety of consultation methods	
6			
7	10. Were health	Consulting between initial and final prototypes	Yes
8	professionals consulted	means some initial design of the tool was	
9	between initial and final	already created when consulting with health	
10	prototypes?	professionals	
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12	11. Was an expert panel	An expert panel is typically an advisory panel	Yes
13	involved?	composed of experts in areas relevant to the	
14		tool if such experts are not already present on	
15		the research team (eg, plain language experts,	
16		accessibility experts, designers, engineers,	
17		industrial designers, digital security experts,	
18		etc). These experts may be health professionals	
19		but not health professionals who would	
20		provide direct care to end users	
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Supplementary file 15: Themes, sub-themes and example quotes

Themes	Sub themes	Feedback
1. Positive feedback on the decision aid	1.1. Positive feedback on the content	Adolescents:
		Female, 15-17 yrs old - "I like the page and it makes sense to me everything that it's saying."
		Adults:
		Female, 18-20 yrs old - "So I guess informing people that have torn ACL and the benefits and limitations of each graph. And what they do would be good."
		Male, 21-30 yrs old - "I wish I had something like this for either of my ACL ruptures as following the first one I may have tried not having surgery as I was already back running."
		Male, 31-40 yrs old - "Giving them more information on what rehab they could be doing in the meantime, might lead to better outcomes until the surgery, there was for me, there was nothing in between in terms of exercise or rehab or anything. Yeah, and I didn't even know that, you know, that would have been something I should have been doing."
		Male, 21-30 yrs old - "Like it's giving you the clear picture but also showing you the downside simultaneously."
		Male, 21-30 yrs old - "Yeah, I like those, the data points there. That's pretty good. I like it as it shows you how many people out of 100. Nice. I also liked on the other page, you had the little infographic with the people bicolored."
		Parents:
		Female, 41-50 yrs old - "I like all the information, the statistics are really good."
		Female, 41-50 yrs old - "I think that's perfect." and "I think it's really good."
		Health Professionals:
OS, Male, 31-40 yrs old - "Well thought out, nice and balanced."		
PT, Male, 31-40 yrs old - "I like this. I like the summary. I think it's a good, I think is where you get a lot of information, which is really, really nice."		

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	<p>1.2. Positive feedback on design</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "I think it will be really valuable. It doesn't look boring as I get bored really quickly with medical brochures but this is engaging."</p> <p>Female, 15-17 yrs old - "I like reading it and I would go highlight it. I also like the cute little numbers and like percentage size. So I feel like this is like really good. So this is engaging."</p> <p>Female, 15-17 yrs old - "I think it's really good. I like the pictures"</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "I like that flowchart, it's pretty straight forward."</p> <p>Female, 21-30 yrs old - "I think the pictures are good."</p> <p>Female, 21-30 yrs old - "I do like that it kind of has a timeline shows you the differences and similarities and each timeline."</p> <p>Female, 21-30 yrs old - "I do like that they are like side by side. It's easy to look from one to the other."</p> <p>Female, 21-30 yrs old - "I think that I don't think that's too long or too short. I think it gives enough information without necessarily overloading someone with it. It gives you the information you need to know without being overwhelming."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I love the little pictures. Great. Easy to read. Logical. Succinct."</p> <p>Female, 41-50 yrs old - "I like it. I like how the benefits and harms are highlighted. And the numbers really pop out."</p> <p>Female, 41-50 yrs old - "Remember, choose what is best for your situation. Think of whole-body health. See family, friends and health professionals for support and stay positive. Love that."</p> <p>Health professionals:</p> <p>OS, Male, 31-40 yrs old - "That's really good, the pictures there are great and it's really good to compare"</p>
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	1.3. Positive feedback on usability	<p>OS, Male, 31-40 yrs old - "It's really nicely displayed. So it's very easy to understand."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "I think this is probably something that would have been nice to have."</p> <p>Male, 31-40 yrs old - "It's easy to follow."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Easy to follow."</p> <p>Female, 41-50 yrs old - "I like to timeframe because it sort of shows a comparison, especially what I've been reading a lot. So it kind of brings it together. So I can see, I like how it's broken down. Because most of the time when you go to the doctor, they don't discuss anything into this, this much detail"</p> <p>Female, 41-50 yrs old - "I actually had had a study in my hand and he didn't even look at it."</p> <p>Health professionals:</p> <p>PT, Female, 41-50 yrs old - "I really liked the first page, I think it makes it really clear that there are two options, it makes it clear that you know that if you try exercise, you still got the option for surgery, I think that's good. And that if you have successful rehab from either of them, then they return to sport or other activities. So I really liked that first page and I like the questions underneath."</p>
2. Negative feedback on the decision aid	2.1. Negative feedback on the content	<p>Adolescents:</p> <p>Male, 15-17 yrs old - "The pictures. I mean, it might make it look a little nicer, but it's not really giving you information. I think take the pictures away."</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "Formatting could just be a no having pictures on both sides and having the legend somewhere else, but I think that was overkill with pictures."</p> <p>Health Professionals:</p> <p>OS, Male, 31-40 yrs old - "This language is too academic. Provide some more simple options."</p>

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		PT, Male, 31-40 yrs old - "Could have it more infographic style." OS, Male, 51-60 yrs old - "What you're doing is intrinsically incorrect."
3. Outline how the decision aid should be used	3.1. Improve clarity on the target population	Children and adolescents:
		Female, 15-17 yrs old - "It makes sense to me."
		Parents:
		Female, 41-50 yrs old - "Have you thought about doing separate ones of these for boys versus girls being those girls have such a higher reinjury rate?"
		Female, 41-50 yrs old - "Females may be at a greater risk of re injury or something like along those lines."
	Health Professionals:	
	PT, Female, 21-30 yrs old - "Because the well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic." PT, Male, 31-40 yrs old - "So I think, obviously, there are patients that are going to do better with a reconstruction, particularly if they have a knee that for them feels unstable or is objectively unstable, either passively with bedside ligament testing, or in weight bearing their knee gives up or has given way." PT, Male, 41-50 yrs old - "I believe that as a sports physical therapist, there's a certain population of athletes and younger athletes that could be fine without an ACL reconstruction surgery. I don't know exactly in my mind what that percentage is, I do think it's a smaller number. And then those who will need a reconstruction surgery to get back to all functional activity and high level of sport, especially playing catch pivot activities."	
3.2. Highlight that patients need to discuss the decision aid with health	Adolescents:	
	Female, 15-17 yrs old - "So just knowing the fact that they've had some someone go in there, like a professional and fix everything up. I feel like that helps."	

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	<p>professionals</p>	<p>Adults:</p> <p>Male, 21-30 yrs old - "It was for children and adolescents. But should be used with a parent and guardian with health professional. So I thought that was good."</p> <p>Male, 21-30 yrs old - "But if that disclaimers at the top, and it's you know, in bigger writing, you say like, okay, if I'm going to do this option, I should still speak to a professional rather than making this decision on my own."</p> <p>Male, 21-30 yrs old - "Your final step should be going to see a healthcare professional like a physio before you go back."</p> <p>Female, 18-20 yrs old - "Added on to the second one. Like should be used with guardians and health professionals. And then like in brackets, it's not made to replace advice from health question or something."</p> <p>Male, 21-30 yrs old - "I think that when I got mine down, I didn't really know what they were doing. And you wake up and your knees so sore. And you're like, "Why was my knee so swollen? But they've drilled through your tibia to attach this new data graph there?"</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Discharge procedures is that they do the medications, etc. And again, for myself, as a mother, none of it was discussed with myself."</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "And it's also getting parents to understand what that is going to mean through the health professional. In terms of giving way – swelling, locking, hints of an unhappy knee is indicative of chondral damage, or meniscal tears."</p>
	<p>3.3. Clarify that choices should be made based on individual circumstances</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Like the psychological issue, like it depends on like your circumstance, but I feel like it should still be talked about with your professional."</p> <p>Female, 15-17 yrs old - "You gotta listen to your own body, because someone could be telling you something, and you could not feel the same."</p>

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		<p>Male, 15-17 yrs old - "You know you might get clearance from your health professional but you don't feel confident in your knee yet, for example."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "I do like to this says Not everyone will return to pre injury sport. Because lots of things can happen. And all of the recoveries can be different."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Delayed ACL surgery doesn't sound that bad. But also I feel like it is very circumstantial."</p> <p>Female, 41-50 yrs old - "It should be an individual choice. And I think what you're saying there is sort of reflecting that, you know, you make this decision."</p> <p>Female, 41-50 yrs old - "Remembers that everybody's gonna have different results."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "Yeah, I so I like it. And I what I really like about it, is the questions to consider, you know, particularly around, you know, individual factors, age, sporting participation cost, all those kinds of things."</p>
<p>4. More information about specific considerations following ACL rupture</p>	<p>4.1. Highlight the importance of social and psychological support, and whole-body health</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Only thing I think about is how long will I sort of be limited in my sort of getting around and being able to socialise or how long have you crutches for. like you're saying you to how long to kind of walk around and go see your friends that sort of thing. That's important."</p> <p>Female, 15-17 yrs old - "Yeah, I feel like the immobility that you have. I feel like that's really important. Because for like that first month, you're completely reliant on like, whoever you haven't house with you. Yeah, and you just can't do anything. Really."</p> <p>Female, 15-17 yrs old - "I wasn't really offered any psychological help."</p>

		<p>Female, 15-17 yrs old - "I noticed that because I had put most of my weight on my right leg instead of my left like white bear in it. I my hip my like lowered discs in my back have like never really been the same."</p> <p>Female, 15-17 yrs old - "I didn't see any of my friends for like, two months, I barely saw my family. Like, I was literally in my house for like, two months, I didn't see anyone, so it was like, very isolating."</p> <p>Female, 15-17 yrs old - "But I think there should be a lot more psychological support. Yeah. I think mentally, it's just as hard or harder than the actual physical injury. And often, that's missed as well, like, it's not even talked about how hard it is."</p> <p>Female, 15-17 yrs old - "Fear of and it wouldn't be whether you have ACL surgery or not afraid of re injuring and I think that that's a really big psychological step to get over whether you have surgery or not."</p> <p>Female, 15-17 yrs old - "So, with weightlifting, I kind of I don't even back off, but like, I can feel that my legs are a lot weaker that certain time of the month. But then two days later, it'll be completely fine."</p> <p>Male, 15-17 yrs old - "It was hard. But the mental part of it the hardest part, like getting past that."</p> <p>Male, 15-17 yrs old - "Like mental health that you're looking after, as well. Yeah. Because it's such a mental battle for you to get back and feel ready to play and be confident. Or as well, because you're consistent with the rehab."</p>
		<p>Adults:</p>
		<p>Female, 21-30 yrs old - "Psychological support is also important, that's something that I didn't really think about. Yeah, was like, how tough it would be mentally. So that would definitely be a good thing to have."</p> <p>Male, 21-30 yrs old - "For example, my glutes not switching on because of the knee and then like not focusing enough on them, which then puts more pressure on the knee that puts more pressure on my back can lead to complications elsewhere? Like it's not just a knee problem?"</p>

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		<p>Male, 21-30 yrs old - "So definitely highlighting the whole psychological impact of if you're not ready, you don't have to go back."</p> <p>Female, 18-20 yrs old - "Remember when I was disappointed people told me that, like, you're not a full-time athlete. You're not getting paid to rehab. Yeah. And yeah, so it's like, to me, it's, it's like, important that kids know that that like when they say nine to 12 months, like that's what professional athletes are coming back in."</p> <p>Female, 18-20 yrs old - "Um, the psychological health. I think that's good. And really important that it stays there."</p> <p>Male, 31-40 yrs old - "That's a big component as well. I think just anything with any injury, really just a psychological rehab."</p>
		<p>Parents:</p>
		<p>Female, 41-50 yrs old - "Not just about that what sport she can play but about the effect of the slow recovery on their social life. Being able to go and like walk."</p> <p>Female, 41-50 yrs old - "It doesn't incorporate any alternative things."</p> <p>Female, 41-50 yrs old - "Especially the psychological support or something. I figured it would kick in eventually, when finally realising how severe I guess the injury was. But no one ever talks to us about that."</p> <p>Female, 41-50 yrs old - "If you don't feel like doing your exercises, things like that, to know that, you know, that's normal that, that, you know, a lot of people experience the same thing, which is why those groups are good. That you can see what other people are doing as well."</p> <p>Female, 41-50 yrs old - "The big thing with the ACL with them and actually speaking to people who have returned the ACLs, because we do know, quite a few people that have"</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 41-50 yrs old - "I think one of the factors that needs to be considered is your psychological support. That's probably the biggest one of the biggest issues that I think is coming more and more to the forefront."</p>

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		<p>PT, Male, 21-30 yrs old - "Whether a patient needs surgery or not, is highly dependent on the person and what their needs and goals are."</p>
	<p>4.2. Revise the management options to include evidence on ACL healing, bracing and 'prehabilitation'</p>	<p>Adults:</p> <p>Male, 21-30 yrs old - "I feel like besides those three routes, like you either, we could have option four do nothing."</p> <p>Male, 21-30 yrs old - "There's only like exercise and delayed and earlier ACL surgery – had you just thought about doing the other options like the brace protocol? If you've seen that the doctor cross brace one?"</p> <p>Male, 21-30 yrs old - "Like prehab like before you have surgery. It can take a long time to get an ACL surgery appointment. Even like, mine was two weeks. But like, in those two weeks, I was like, rehabbing my knee to the best I could before my surgery."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "So for us option one, we didn't really consider option one we considered our option one was bracing protocol option two surgery, and we decided we'd go first and bracing protocol."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "At the time, [ACL surgery] was what we thought was the only option. We thought that that was important to do. And then honestly, then I had a few people who, like, they weren't actually great surgical candidates, but they still went and had it because we thought that's what you had to do. And it really made me question like the necessity of it."</p> <p>PT, Male, 31-40 yrs old - "Yeah, so obviously, there is a few treatment options that are available in the sense of early reconstruction prehabilitation, or delayed reconstruction with a set date. So you can do prehab and then reconstruction, or rehabilitation exercise therapy/physiotherapy on its own with the option of surgery later if you need it."</p>
	<p>4.3. Include more information on practical factors influencing</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "It would have been good to know what like where the incisions would be, yeah, just so that you could have been prepared."</p>

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	management choices	<p>Adults:</p> <p>Female, 18-20 yrs old - "As someone who did it in high school, you've got school, you've got a job, or at a job, you've got, like, you got to go to the gym, like four or five times a week, and then go for it again, as well, whilst you're going to the gym."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "The length of time on crutches and sort of you know, those length of time using sort of walking aids or with braces those sorts of things? I think that'd be something that a kid wants to know about."</p> <p>Female, 41-50 yrs old - "The options of quad, the quad graft, the patella graft, the hamstring graft, the donor graft. I mean, those are all the things that we've looked at."</p> <p>Female, 41-50 yrs old - "Is there anything about the requirement to have it immobilised? With a teenager, it was very hard to get them to wear a big, ugly, chunky brace."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "I treated someone years ago, who was the donor site for their child. And so I don't know if they're still doing that"</p> <p>PT, Female, 21-30 yrs old - "Add in something around 'Maybe even if I do have surgery quickly, what should I be doing until then?'"</p>
	4.4. Add or remove questions	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "I think they're good questions. I guess the main thing that you want to know is like, how long does it take to get back? If I don't have surgery?"</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "That's pretty good. Like that first one, because that's like, good, roundabout way of saying that you might not get back to pivoting sports, which is good."</p> <p>Female, 21-30 yrs old - "But a lot of people, well, they can be pretty clueless about these things. So I think that's a really good thing to have."</p> <p>Female, 18-20 yrs old - "I think the questions down the bottom are super good."</p>

		<p>Parents:</p> <p>Female, 41-50 yrs old - "Considering the cost Yeah and even a child is gonna be aware of those stresses and a family's, economics. so maybe having a question about the cost as well."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "What happens in the surgery? You know, like, because we've paid, you've obviously got a few graft choices. So I think they should know whether they're going to have it taken from themselves, or whether they're going to have a donor, or whether they're going to get a cadaver for. And then what that entails, like, you know, so they kind of have an explanation of it. And so they need to ask about that would be my something that, I would say, just as a side point"</p> <p>OS, Male, 41-50 yrs old - "Yeah, basically, what happens if I don't have surgery? The benefits of surgery, basically, are the two main things. Well, I need to change if I don't have surgery. Well, I need to change what sport I play but also if I don't have surgery, what will happen in the future? Like, what if my knee function without the ACL? They want to know if there's any long-term problems."</p>
<p>5. Change or add information on rehabilitation, exercises and return to sport</p>	<p>5.1. Include more detail on return to sport following ACL rupture</p>	<p>Adolescents:</p> <p>Female 15-17 yrs old - "I don't have the desire to go into a club anymore. Because I'm so scared that it will happen again, because I know that they still like a huge chance that will happen."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I was all for surgery, because my goal was to get back to sport, and I just didn't think I trusted the process of having gone through rehab without having the surgery."</p> <p>Male, 21- 30 yrs old - "The takeaway you'd get from that page. Like it's possible. But it's, you know, a little bit of a risk. You know, yeah, you get through or not, but I guess you're doing it, knowing that's the case."</p> <p>Male, 21- 30 yrs old - "If you don't feel comfortable going back to sport, once fully recovered, you don't have to go straight back to sport."</p> <p>Female, 18-20 yrs old - "Feel like yeah, you got a lot of false hope from people. Yeah. So I think that, like the tie, like giving a timeline is good. But it can also be like, really dangerous, because</p>

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		<p>then people get to that 12. Like, I mean, I was at 12 months being like, I'm still not playing sport like.”</p>
		<p>Parents:</p>
		<p>Female, 41-50 yrs old - “I read statistics like that. Something very, similar, in my little delving down little rabbit holes, to find out outcomes. And when there was talk about returning to play soccer, I wasn't supportive of that. Yeah, for that very reason.”</p>
		<p>Health Professionals:</p>
		<p>OS, Male, 31-40 yrs old - "I think patients might read that like running, cycling, swimming, and they might go, I can't do anything for three months. Yeah, rather than I can do some of this stuff, but I can't do it in the same fashion."</p>
		<p>OS, Male, 41-50 yrs old - "I would be very hesitant to recommend a return to pivoting sports with no ACL for the younger people, because they are already a little bit lax in their joints."</p>
	<p>5.2. Refine rehabilitation progression timeframes</p>	<p>Adults:</p>
		<p>Male, 21-30 yrs old - “Well, for my second one, where I did conservative I was, I was cycling within a couple of weeks. I'm running after about a month.”</p>
		<p>Male, 31-40 yrs old - “All those timeframes that seem pretty accurate.”</p>
		<p>Female, 18-20 yrs old - “These timelines are a guide. Like, and like aren't certain. Yeah, but yeah, I think the other thing that's hard with it as well is like adolescence.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “Rehabilitation for two to three months is not enough. Like it's just not enough. You know, we need at least three to six months like there's, it's hard because as we've said, it's like the research and guideline evidence is very thin on the ground, particularly for paediatric populations. But the Swedish guidelines for adults would be three to six months.”</p>
		<p>PT, Female, 41-50 yrs old - "Nine months, nine to 12 months with surgery. And without surgery, I don't see a reason why it should be shorter. Without of course, the [duration of] swelling may be shorter, because you don't have an operation. But it isn't always faster. It can be really the same. It depends on if it's only the ACL or there are also other structures which are injured."</p>

		<p>PT, Male, 31-40 yrs old - "It's rare that I see anyone get back to sport at nine months, then maybe that's me holding them back a little bit. It's not almost always 12 plus. I, but I don't know, maybe that's a confidence thing, or not a confidence, but a motivational thing for patients to if you say to them talk, it's gonna be 12 months. Sometimes that can be a bit confronting early on No, nine sounds a little bit better. You know? I think they think, you know, we definitely know it's possible, right? "</p>
	<p>5.3. Clarify the importance of testing rehabilitation progress and return to training or competition sport</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "So because I know this is return to sport. But to me is returning to sport. Unrestricted."</p> <p>Male, 15-17 yrs old - "Physio was really good. So he'd basically tell us every week yeah, okay, you can do this. And then he'd give us a letter to say, okay, she's allowed to do, you know, this part of that in her training, she's not allowed to do directionals she was only allowed to run straight lines or whatever."</p> <p>Male, 15-17 yrs old - "I do think to add in the just for the general person a clearance for return to sport that then must do a proper documented return to play protocol and "when cleared by medical professional."</p> <p>Adults:</p> <p>Male, 31-40 yrs old - "In that middle section here could have like, you know, clearance or passing test or something."</p> <p>Male, 21-30 yrs old - "Like a clearance to return to sport with testing or like something like that."</p> <p>Female, 18-20 yrs old - "I don't know, maybe you could do like a staggered return to sport and other activities or like something."</p> <p>Female, 18-20 yrs old - "Even adding the word gradual into the return to sport."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Like with that clearance with a health professional. It's the what do you call it? like the return to sport criteria? I think that's really important."</p>

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		<p>Female, 41-50 yrs old - "Return to sport, they do a psychological assessment, as well. And it's sort of not just physical, it's a psychological test, as well. And I think that's pretty important."</p> <p>Female, 41-50 yrs old - "You know, they look for, you know, strength testing of at least 90% of your other side. So, you know, on your leg press or knee extensions, or you know, isometric testing."</p> <p>Health Professionals:</p> <p>PT, Male, 21-30 yrs old - "So you have a lot of people who come out of surgery if they're not like physically active in general did struggle or like physically active prior to surgery would find it much harder. Yeah, it would be a good way to like, have that looked at as for so like, objectively measuring whether your injured limb is at least at a certain percentage of your non injured limb prior to surgery."</p> <p>PT, Female, 41-50 yrs old - "I would rather say "If your knee is giving way, please talk to your health professional" because if you write it like that it's kind of already the decision if it's more giving where you need to do the operation and I find it it's more individual and it's makes sense maybe to talk to a health professional to really decide if this is a reason to opt for the surgery or not."</p> <p>PT, Male, 31-40 yrs old - "Mention that the body can or the muscle system can learn to take over the role of an injured ACL to restabilise the knee something like that."</p>
	<p>5.4. Expand on the type of exercises involved in management</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "And that's why I said we need to get your gym membership."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "One could be a little more than what someone should be doing right after surgery. So it could be the exercises that your doctor or physical therapist, like prescribes you as to not do something too fast."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "You're not sure what kind of muscles are talking about the kind of description of the treatment is unclear."</p>

		<p>Female, 41-50 yrs old - “Was just thinking is the range of movement and the flexion so there was so much emphasis with flexion and he needed to get it.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “I primarily sort of focused on the types of exercises, I just focus on giving them information about exercises. Giving them that and then sort of telling them that they need, like, probably adjunct therapies, like, hands on physiotherapy as well to go to go with the exercise as well.”</p>
<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46</p>	<p>5.5. Consider the long-term need for ongoing “hard work” and injury prevention</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - “This is a requirement to think about the longevity of it. And obviously staying light and life is going to support that structure better.”</p> <p>Female, 15-17 yrs old - “Without Surgery, you still put a lot of effort into your exercises, which is not easy to do and be consistent.”</p> <p>Female, 15-17 yrs old - “I wouldn't say like missing school, but I would just say time consuming.”</p> <p>Adults:</p> <p>Male, 21-30 yrs old - “Just emphasis on either option, you need to continuously keep it up. Something like both options, have uncertainty with the standard of recovery and require hard work. Yeah. With exercises now and continuously going forwards.”</p> <p>Male, 31-40 yrs old - “More emphasis on how on the hard work on exercises to get better. I guess a lot of people don't know that that's going to happen. So even like just that image of like, you know, someone doing the knee extension machine or something. Or like just an image of their quad and saying like it takes hard work.”</p> <p>Female, 18-20 yrs old - “I did mine four years ago, and like, I still have to go to the gym, otherwise, my knee feels weak. And like that was four. So I think some people assume that once you're back, you're back”</p> <p>Female, 18-20 yrs old - “Mean, to me now long term is like my whole life. whether we say like, you know, like, lifelong exercise or something like that to make them consider that.”</p> <p>For peer review only: http://dx.doi.org/10.1136/bmjopen-2015-008111</p>

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		<p>Parents:</p> <p>Female, 51-60 yrs old “Unfortunately, there's so much pressure on these kids to get back to sport. And, you know, they feel the need that they're missing out and stuff like that. There's, you know, and it's hard trying to tell someone not to rush not to rush it back.”</p> <p>Female, 41-50 yrs old - “I think it would say need a certain level of dedication or something like that. Yeah. Because I think that's what made her successful is that she was dedicated to doing it.”</p> <p>Female, 41-50 yrs old - “Because it's that consistency, as you probably saw, you know, you have to keep going with it.”</p> <p>Female, 41-50 yrs old - “Some people may think once I finished my nine months of therapy, I'm done. But it's like, it's a lifelong journey, if you will.”</p> <p>Female, 41-50 yrs old - “I've been reading a lot about them. And later on down the road, like a lot of people look at right now. And I want to look at how's the knee gonna be when they are 25 or 30.”</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - “But the recovery and the rehab is actually the hardest bit. And most surgeons will tell you, or at least most of the surgeons are as actually more and more don't really matter what sort of version of the surgery we do. As indeed, we do the hard work afterwards. We are the ones that have to. I think probably in terms of decision making, whichever one you choose, you need to do a boatload of hard work.”</p> <p>PT, Male, 41-50 yrs old - “So I stress immediately that the hard work begins on the moment you wake up from surgery and will not stop, you will have a year of rehab. And after that, you will still have to maintain the strength and do spend a lot of time focusing on your knee control. It becomes it needs to become a lifestyle change rather than just yeah, I'll turn up for physio every so often. And I don't think surgeons because they haven't got the time they stress it enough.”</p> <p>PT, Male, 31-40 yrs old - “But I liked that closing, you know, use, you know, require ongoing hard work and exercises and use the people around you for support and choose whatever option is best for your situation. I think that's nice as a closing statement.”</p>
6. Modify	6.1. Use simple review	Adolescents http://www.bmjopen.bmj.com/site/about/guidelines.xhtml

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language and formatting used	language	Female, 15-17 yrs old - "Irreparable was that a bit hard to understand"
		Adults:
		Male, 31-40 yrs old - "You're not using any technical, like overly technical terms, not using any jargon that people can't understand. It's simple language."
		Male, 31-40 yrs old - "Think it's all sort of worded. Like, easy to understand. it's all it's all pretty clear to me how its worded."
		Health Professionals:
	PT, Male, 31-40 yrs old - "Adult comprehension and health literacy isn't so good, but in kids, it may not be even as good."	
	PT, Male, 31-40 yrs old - "We're assuming that the patients who go to weigh all this information up will have the health literacy, the time to do so and the interest in doing so."	
	6.2. Make the section more concise	Adults:
		Male, 21-30 yrs old - "I like now it's nice and simple."
		Male, 21-30 yrs old - "No more stuff in the graph, I think we'll clutter it too much."
Health Professionals:		
PT, Female, 41-50 yrs old - "Yeah, I find this whole page quite confusing. I would say I would remove the issues of the knee not necessarily caused by the treatment choice." OS, Male, 41-50 yrs old - "I found this whole thing very wordy. wordy. Yeah. Yeah. So unless the parents are completely involved, right, they don't really would read all of it. They would not read all of it. Unless they're that sort of parents like very much. Totally involved. When he comes to see me, they just want to know, the very simple stuff."		
6.3. Modify presentation of harms, formatting, graphics, or statistics	Adolescents:	
	Female, 15-17 yrs old - "I think the little people, I just think it'd be better set. If like 10 of those people were purple, and it was just on the one graph than the rest of them were blue."	
	Adults: http://bmjopen.bmj.com/site/about/guidelines.xhtml	

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		<p>Male, 21-30 yrs old - "I liked on the other page, you had the little infographic with the people."</p> <p>Female, 18-20 yrs old - "If it does give way, pretty heavily, then it could definitely injure something else."</p> <p>Male, 31-40 yrs old - "If someone's got an unstable knee that keeps giving away and causing other injuries, is that not going to increase their risk? Of having osteoarthritis?"</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "It might be worth keeping the left-hand side as sort of a shaded blue, and then the right hand side, a shaded purple."</p> <p>Female, 41-50 yrs old - "It probably would be more clear, having the two distinct colours."</p> <p>Female, 41-50 yrs old - "My brain went straight to I want to know whether there's early onset arthritis, and you see that more in people who have had knee surgery than those who haven't for example, like that, that was a real question in my head."</p> <p>Female, 41-50 yrs old - "Visually the difference between the two actually jumps out at you. So what I would do is so these, this two to four weeks, move it up slightly"</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "The pictures could have more impact for a kid"</p> <p>PT, Male, 31-40 yrs old - "I think that's a better representation for the patient than two scores that they have to then interpret, you know, filter through another level, and which they're not necessarily have the skills to do. So if it turns out that yeah, the clinically, minimal clinically important difference isn't there, then I would just say that you think that even maybe remove the graph and just have that summary. And it could even simplify it further?"</p> <p>PT, Male, 41-50 yrs old - "Yeah, I think the next one looks too busy. I know what you've kind of tried to do. But if you're a parent or a kid that's going to look at that that one doesn't. You know, you've got the coloured in people, and then you've got a bar graph. And then I think the first one works better. Just in terms of how it looks. This one is just statistics. Yeah, it's just a statistic box on the right where one person returning to pre injury sports."</p>
	<p>6.4. Use positive</p>	<p>Adolescents. http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>

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	<p>messaging</p>	<p>Female, 15-17 yrs old - "It's hard because every injury is an individual injury and pending on how much you put into it, how active you are. You know, like, just because one person can do it doesn't mean the next person can't do it"</p> <p>Female, 15-17 yrs old - "When you've got a tough journey to get through, at least, you know, everyone else was stuck at home (COVID 19) as well, in some respects."</p> <p>Parents:</p> <p>Female, 51-60 yrs old - "Your knee you know might be stronger if you need surgery later or delay something like that"</p> <p>Female, 41-50 yrs old - "These are just averages of research. And, you know, that doesn't mean this is what you have Yeah, something like that, just so that they always like to look at things from a more optimistic lens."</p> <p>Female, 41-50 yrs old - "Making sure you've got people around you for support, you know, whole body health. Like we've mentioned before, taking care of like their mindset, some days, you're not going to feel like doing your exercises, and other days, you'll be more motivated. So being aware of that as well. And then staying positive, as you said, trying to be optimistic with how you're looking at it."</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "But we all when you when you talk to a patient, just to say, if it's unsuccessful, it's not your fault, it just happens. Sure, you know, and we need the time and from time to time we have just to change the process. Yeah. Because in my experience, people just react very self-criticism, like, 'Oh, if it's not working, it's my fault because I didn't do enough training or I was too lazy.'"</p> <p>PT, Male, 21-30 yrs old - "Yeah, and I really liked that last bit down the bottom, like, it's quite obvious that whatever works best for you, in your situation, at the best at your time with your sport, remain positive is one of the main things because like, we know, obviously, there's a big psychological problem following ACL stuff. So use the people around you for support. So I like that."</p>
<p>7. Understanding</p>	<p>7.1. Improve the</p>	<p>Adults: For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>

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<p>the translation of research</p>	<p>usability of the decision aid</p>	<p>Male, 21-30 yrs old - "If I had something like this I probably would have tried conservative but I didn't really have a there wasn't another option back then you're a young soccer player if you do your ACL you get surgery done."</p> <p>Male, 21-30 yrs old - "You have a list of healthcare professionals or the route you should take, like being a physio prior to going straight to surgery. Even before Doctor."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I think it's better it's better to use as an aid for someone explaining it rather than just handing it to someone to kind of decipher."</p> <p>Female, 51-60 yrs old - "Will this be like a document that people can look at? Or is it going to be like that, how's it going to be presented to people."</p> <p>Health professionals:</p> <p>PT, Male, 31-40 yrs old - "I would be a bit overwhelmed by this, I think it was a patient to be like, can't make this simple in my own head, like, I don't know, just my experience with patients. Not that it is a simple decision. But I find when patients are overwhelmed, they tend to just kind of they grasp for certainty. And I always get that from surgeons, because they make it so black and white. And so that's a priority is to make sure that the information isn't overwhelming. And I think it's just a bit too much content. Maybe more could be presented graphically."</p>
	<p>7.2. Clarify the uncertainty of evidence and outcomes of each option</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Even if you have surgery, I guess it's not a guarantee to get back to sport, even, you know, at school and that as well."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I didn't want to take the chance of trying something new if it was, yeah, if it was less researched on or if it was less used."</p> <p>Female, 18-20 yrs old - "I think maybe just something about like, both, like both options have uncertainty."</p> <p>Female, 18-20 yrs old - "I really liked the preface about not everyone will return to pre injury sport with either option."</p>

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		<p>Parents:</p> <p>Female, 41-50 yrs old - "The first thing he said was, her ACL is torn, she needs to have surgery. And he wasn't open to telling me anything else."</p> <p>Health professionals:</p> <p>PT, Male, 31-40 yrs old - "I always find it challenging when they're a little bit younger or elite level athletes, because obviously, they're not catered for in or looked at with the some of the research. So I think that's when it's really challenging, because you're already dealing with uncertainty. And I think it's always a difficult one, because they're looking for, I think they're kind of almost leaning on you for direct guidance. I think when you've got another operator, say, as a surgeon coming in and saying, This is what you need to do, it's much easier for them to take route, if that makes sense. I think, yeah, presenting uncertainty in itself, is a challenge to parents and adolescents, because I think they're looking at that stage in a, you know, what's probably a bit of a traumatic time for them for a clear answer and what they need to do."</p>
	<p>7.3. Keep or remove statistics using adult data</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Even if you are younger athlete, to see what the outcome is later on."</p> <p>Adults:</p> <p>Female 18-20 yrs old - "I feel like I have like, mixed feelings, because those could be this good. Adult is pretty much anyone over the age of 18. So I feel like you could do young adults, like let's say less than 25. Because I feel like the stats, if you can get that specific, wouldn't change the decision process behind let's say, the 17 year old if they work to re rupture in their early 20s."</p> <p>Male, 21-30 yrs old - "But I assume that if you were 19, and you had just done your ACL, then you'd want some data."</p> <p>Female, 18-20 yrs old - "What if someone was 17? Yeah. And they may want to look at both. If they're right on that edge, and not really knowing like, Okay, well, should I be considered an adolescent? Or should I be considered an adult, they may want to look at both."</p> <p>Male, 21-30 yrs old - "It's obviously adult data. I was just confused jumping between the two."</p> <p>Female, 18-20 yrs old - "Because well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that"</p>

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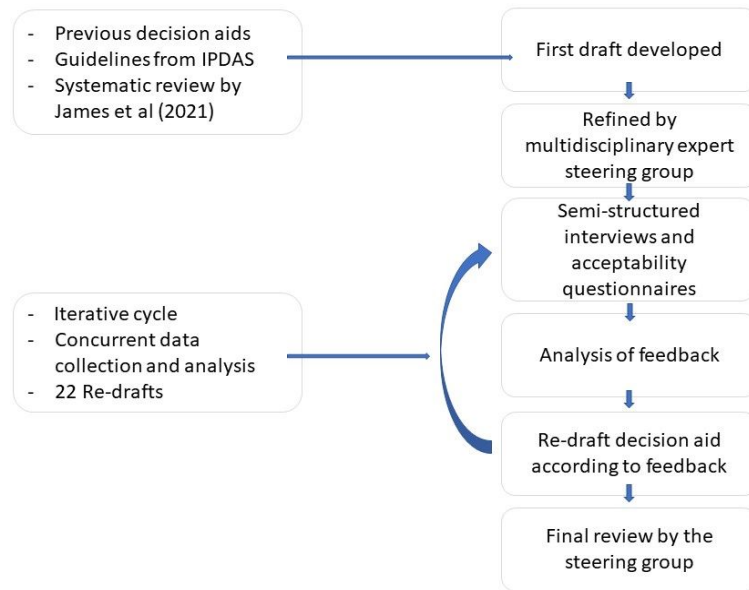
		<p>as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I thought that I thought the whole study was the under 18. So I didn't realise you had both over and under 18. I think that was my I just assumed everything could be under 18."</p> <p>Female, 41-50 yrs old - "I think you should give someone all the information."</p> <p>Female, 41-50 yrs old - "Good to know that, you know, say if you were 17 or closer 18. You know, maybe you could pay more attention to these numbers."</p> <p>Health professionals:</p> <p>PT, Female, 41-50 yrs old - "If I was explaining this to someone, I'd say, Look, we don't have lots and lots of research on someone your age. But we have research on people who are 20 and 30. And they're weekend warriors. They're not elite athletes. This is this is the information we have."</p> <p>OS, Male, 31-40 yrs old - "So these are two different populations. And I stress that to patients, I treat my adolescent patients, and my young adults very differently to my adults, or my degenerative ACLs that are in their 40s or 50s, they get treated very differently, and more often non operative managed for that reason. But I think I treat them as three different categories of patients, in my mind, it's probably because we have poor data and understanding of them. But very poorly, we have higher risk factors in patients under the age of depends on how you classify them, but maybe under the age of 18, or maybe under the age of 25. These factors are very different. So yeah, I don't think this data is appropriate to use in that setting."</p> <p>OS, Male, 31-40 yrs old - "And if this was an adult one, sure I think but highlighting some of the drawbacks of the data is important. But yes, this is kind of what that research says. I think to use in adolescence is not appropriate."</p> <p>OS, Male, 51-60 yrs old - "You're using adult data to aid in decisions for children, and you can't do that. So the whole thing is terrible. I really would suggest that you reconsider what you're doing."</p> <p>For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>
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PT = physiotherapist; OS = orthopaedic surgeon

For peer review only

Supplementary file 16: Flow chart of the development process



IPDAS, International Patient Decision Aid Standards.

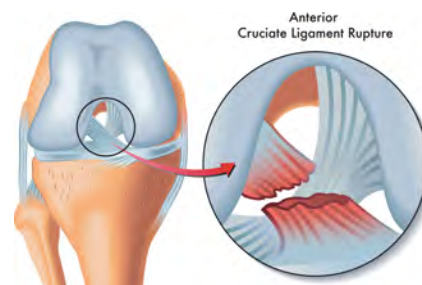
I RUPTURED MY ACL: SHOULD I HAVE SURGERY?

+ Who should read this decision aid?

This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL).

ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different.

This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.



OPTION 1 - REHAB ONLY*

(or delayed ACL surgery)



6 - 9 months

After 9 months

MANAGEMENT OPTIONS AFTER ACL RUPTURE

Health professionals will prescribe your exercises and perform testing to guide progression and return to activity, training or sport.

Potential return to sport

Continuous exercises + injury prevention

OPTION 2 - ACL SURGERY

(early ACL reconstruction)



9 - 12 months

After 12 months

*Talk to a health professional if your knee keeps 'giving way' despite following advice.

No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option.

Remember to consider long-term goals and see people who can support you (e.g., friends).

+ What is covered in the decision aid?

Page 2 - What are the treatment options covered in this decision aid?

Page 3 - Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Page 4 - Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Important information: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. Last reviewed: updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.

+ What are the treatment options covered in this decision aid?


OPTION 1 - REHAB ONLY*

(or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.

✓ **After an ACL rupture occurs** 

See a health professional.

✓ **0-1 month post injury** 

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.

✓ **1-3 months post injury** 

You may begin activities like running, swimming or outdoor cycling.

✓ **6-9 months post injury** 

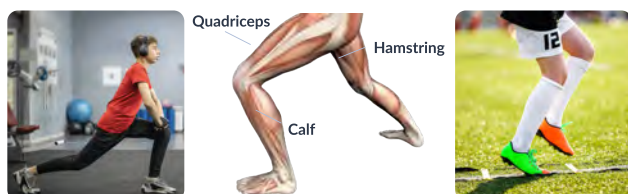
You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 9 months post injury** 

Continue exercises to help your functional recovery and keep the knee strong.

If you decide to have delayed **ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.

Caution: If your knee 'gives way' after **3 months**, talk to your health professional. You may be at risk of further injury.



OPTION 2 - ACL SURGERY

(early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.

✓ **After an ACL rupture occurs** 

See a health professional.

✓ **0-1 month post surgery** 

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.

✓ **1-3 months post surgery** 

With the help of a health professional, gradually start harder exercises at home or in a gym.

✓ **3 months post surgery** 

You may begin activities like running, swimming or outdoor cycling.

✓ **9-12 months post surgery** 

You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 12 months post surgery** 

Continue exercises to help your functional recovery and keep the knee strong.

Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹



+ Comparing potential benefits and harms

Practical issues

Between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).²

High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

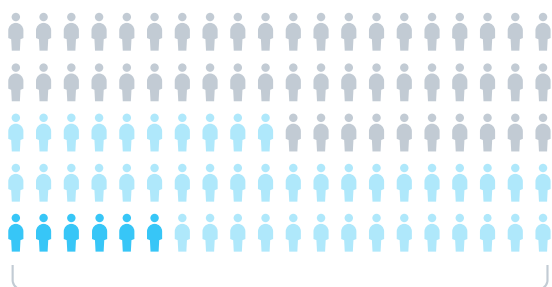
OPTION 1 - REHAB ONLY

(or delayed ACL surgery = 3 months or later)

Return to pre-injury sport

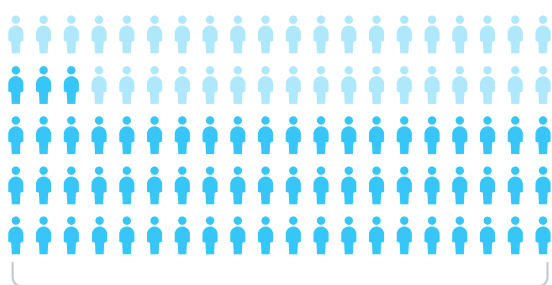
(Not everyone will return to their pre-injury level of sport)

Rehab only:



Between 6 and 50 people per 100 return to their pre-injury sport around 20 months after injury.²

Delayed ACL surgery:



Between 63 and 100 people per 100 return to their pre-injury sport around 22 months after injury.²

Precautions and potential harms

- Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²
- Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.²

*meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

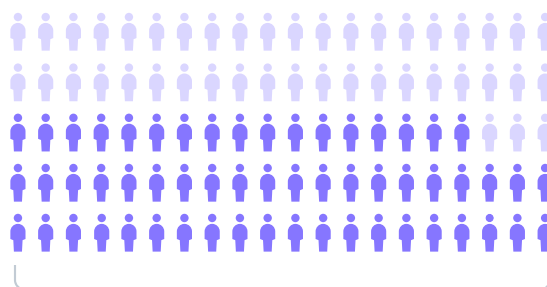
OPTION 2 - ACL SURGERY

(early ACL reconstruction = before 3 months)

Return to pre-injury sport

(Not everyone will return to their pre-injury level of sport)

Early ACL surgery:



Between 57 and 100 people per 100 return to their pre-injury sport around 20 months after injury.²



Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Summary of potential benefits and harms

Clinical issues

Of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

OPTION 1 - REHAB ONLY

(or delayed ACL surgery)

✓ Positives and potential benefits

- Between 41 - 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

– Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience 'giving way' of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

OPTION 2 - ACL SURGERY

(early ACL reconstruction)

✓ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

– Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Key points

- Choose what is best for your situation
- If you chose rehab only, you could still decide to have delayed ACL surgery later
- Listen and care for your whole-body
- See family, friends and health professionals for support
- Care for your mental and physical health
- Plan to try new activities
- Don't rush - expect challenges and stay positive!

+ Questions to consider when talking with a health professional...

- 🏃 Will my choice affect what sport I play?
- ❓ If I am still growing, will this affect my management?
- 📁 What type of graft is best for me if I have ACL surgery?
- 🗣️ Is there any psychological support available?
- 🔍 What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?

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Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

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3 **Development of a patient decision aid for children and adolescents following anterior**
4 **cruciate ligament rupture: an international mixed-methods study**
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ABSTRACT

Aim: To develop and user test an evidence-based patient decision aid for children and adolescents who are considering anterior cruciate ligament (ACL) reconstruction.

Design: Mixed-methods study describing the development of a patient decision aid.

Setting: A draft decision aid was developed by a multidisciplinary steering group informed by the best available evidence and existing patient decision aids.

Participants: People who ruptured their ACL when they were under 18 years old (i.e. adolescents), their parents, and health professionals who manage these patients. Participants were recruited through social media and the network outreach of the steering group.

Primary and secondary outcomes: Semi-structured interviews and questionnaires were used to gather feedback on the decision aid. The feedback was used to refine the decision aid and assess acceptability. An iterative cycle of interviews, refining the aid according to feedback and further interviews, was used. Interviews were analysed using reflexive thematic analysis. Questionnaire data were analysed descriptively.

Results: We conducted 32 interviews; 16 health professionals (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who ruptured their ACL when they were under 18 years old (7 were adolescents and 9 were adults at the time of the interview). Parents participated in 8 interviews. Most health professionals, patients, and parents rated the aid's acceptability as good or excellent. Health professionals and patients agreed on most aspects of the decision aid, but some health professionals had differing views on non-surgical management (rehabilitation only) in children and adolescents, the risk of harms, treatment protocols and evidence on benefits and harms.

Conclusion: Our patient decision aid is an acceptable tool to assist children and adolescents in choosing an appropriate management option following ACL rupture with their parents and health professionals. A randomised controlled trial evaluating the potential benefit of this tool for children and adolescents considering ACL reconstruction is warranted.

Keywords: ACL; children and adolescents: decision aids; orthopedics; shared decision making;

Strengths and limitations of this study:

- We developed a decision aid that satisfies the International Patient Decision Aid Standards criteria and used mixed methods to evaluate acceptability of the decision aid.
- One-on-one interviews conducted with participants from different countries allowed for rich feedback to be gathered on the decision aid, but the generalisability of the decision aid may be limited by the number of interviews with participants from each country.
- We were able to interview health professionals who manage children who have ruptured their anterior cruciate ligament but were unable to recruit children-participants to interview with their parents.
- Our patient decision aid was limited by the lack of high-quality evidence comparing rehabilitation only to ACL reconstruction followed by rehabilitation in children and adolescents.
- The systematic review used to inform estimates of benefits and harms included older studies that did not always report details of rehabilitation and may not reflect advances in treatment.

Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

1. Introduction

The incidence of anterior cruciate ligament (ACL) ruptures continues to increase[1]. The total annual incidence of ACL ruptures in children and adolescents rose by 46% between 1994 to 2013 in the United States and the overall annual rate increased by 147.8% between 2005 to 2015 in Australia[2,3]. This increase has been linked to more children and adolescents participating in organised sport, increased intensity of training, and, potentially, a focus on single-sport specialisation at an earlier age[4-6]. The number of ACL reconstruction surgeries in children and adolescents is also increasing globally[1,6-8] despite non-surgical treatment (rehabilitation only) being an option[9].

Recommended management options following ACL rupture include rehabilitation only, rehabilitation with the choice to undergo ACL reconstruction at a later time, or early ACL reconstruction[10,11]. Research comparing these options is scarce, particularly in children and adolescents[9]. Two randomised control trials (RCT) (n=167[11]; n=121,[10]) have shown that early ACL reconstruction in adults does not result in superior knee function, sports participation and quality of life compared to rehabilitation only with the option for delayed ACL reconstruction. A third RCT (n=316[12]) found that ACL reconstruction was clinically superior to rehabilitation alone for adults with ACL injury and long-term knee instability who had not trialled rehabilitation previously. However, there are no RCT's directly comparing these treatment options in children or adolescents[13].

All treatment options following ACL rupture have risks, with recent guidelines and systematic reviews highlighting uncertainty regarding which approach is superior for children and adolescents. International consensus guidelines state rehabilitation only is a viable and safe option following ACL rupture in skeletally immature children without associated injuries or major instability problems[9,14]. However, some guidelines also state 'repairable' injuries (e.g. bucket-handle meniscal tear) associated with an ACL rupture should be considered an indication for early ACL reconstruction and meniscal repair[9,15]. Two recent systematic reviews[13,16] present conflicting evidence on the certainty of meniscus injury risk when choosing rehabilitation alone or considering the timing of a potential ACL reconstruction. Given this uncertainty and potential impact of poor management choices, there is a need for better evidence-based resources.

Patient decision aids are resources that present balanced information on the benefits and harms of different treatment options. They aim to improve the likelihood of informed choices and active participation of patients in healthcare decisions without negative patient outcomes[17]. Supporting shared decision making in children and adolescents following ACL rupture is necessary given the possible consequences of poorly individualised treatment[9,18,19]. Currently there is no patient decision aid for children and adolescents who have ruptured their ACL. A patient decision aid could help align expectations with evidence and improve patient satisfaction.

Our aim was to develop and user-test a patient decision aid for children and adolescents following ACL rupture to be used with parent and health professionals that presents evidence-based information on treatment options.

2. Methods

Initial design of the decision aid

We developed a patient decision aid informed by the International Patient Decision Aid Standards (IPDAS) checklist and Collaboration Evidence Update 2.0[20]. A multidisciplinary steering group was assembled (study authors), including topic experts on ACL injury and physiotherapists with experience managing ACL ruptures (AG, JZ, MM, DA, EP, CM, SF, SM), people who have experienced an ACL rupture (SF, MM, EP, IAC) and one who was 18 years old when they ruptured their ACL (SF), an orthopaedic surgeon (IH) and patient decision aid and shared decision-making experts (KM, TH and RT). The first draft of the decision aid was informed by a template used for previous decision aids (for Achilles rupture[21], shoulder pain[22], antibiotics[23] and knee arthroscopy[24]) developed by some authors in the steering group (JZ, MM, KM, TH, RT, CM, and IH). Key features adopted from these decision aids included questions to consider when talking to health professionals, icon arrays to present statistics, and a table comparing the potential benefits and harms of each management option. Decision science evidence suggests these features improve patient decision making[25-28]. We also included statements of the quality of evidence, study participants demographic information and a reference list to give further context to statistics used in the decision aid.

We used evidence from a systematic review and meta-analysis on rehabilitation only and early or delayed ACL reconstruction in children and adolescents to inform the numeric estimates of benefits and harms[13]. We decided not to present benefits and harms data from the RCTs comparing rehabilitation only or delayed ACL reconstruction followed by rehabilitation to early ACL reconstruction followed by rehabilitation in adults[10-12,19]. The decision to exclude adult data was to avoid overloading children and adolescents with statistics that may not be relevant to them. Expert opinion and consensus from the multidisciplinary steering group was used to inform all information presented in the decision aid (e.g., the benefits, harms, and practical issues of each management option). The steering group provided feedback on the first draft of the decision aid before we began semi-structured interviews.

Recruitment

All participant groups were recruited through social media, snowballing, and using the steering group's collaboration network. Health professionals who participated in the study also assisted with recruitment of adolescent-, adult- and parent-participants through referrals.

Using a pre-interview questionnaire, we purposively sampled participants to achieve diversity in age, gender, and ethnicity. For health professionals, we also purposively sampled to achieve diversity in profession, years of experience and country of practice. We adjusted our purposive sampling to recruit people with different characteristics to those already recruited. Before proceeding to the pre-interview questionnaire, all participants provided consent by checking a box that confirmed they had read the participant information sheet and consent form, and agreed to participate in the study.

Data collection

The data collection process involved a pre-interview questionnaire (supplementary files 1, 2, 3 and 4), semi-structured interview (supplementary file 5, 6 and 7), and acceptability questionnaire (supplementary file 8 and 9).

Pre interview questionnaires

For adolescent-, adult- and parent-participants, we gathered data on demographics (e.g., gender, age), country of birth, schooling/employment details, time since first ACL rupture, details about any other structures that were damaged, use of ACL reconstruction, re-rupture, previous and current sports participation level, and factors related to treatment decision making (supplementary file 1, 2 and 3).

For health professionals, we gathered data on demographics, profession and country of training/qualification, type of health professional, years of experience, clinical setting, average number of patients they manage with an ACL rupture per year, and the percentage of patients they advise to have ACL reconstruction (supplementary file 4).

Semi structured interviews

In accordance with IPDAS guidance,[29,30] semi structured interviews were used to gather feedback on participant's views of the decision aid and establish the best way to present different aspects such as treatment options, numeric estimates of benefits and harms, questions to ask health professionals, practical issues, and visual layout. Interview guides were created to provide structure and group-specific prompts (supplementary files 5, 6 and 7). A trial interview was conducted as a test prior to beginning formal interviews. Interviews were conducted online via video conference (Zoom) by male researchers with experience in conducting qualitative interviews (AG, IAC), and lasted between 30-50 min. Four interviews were conducted by physiotherapy students who were under the supervision of the lead author.

Participants were informed of the reason for the study and provided a draft decision aid to view prior to the interview. However, not all participants viewed the decision aid before the interview. Changes to the decision aid were made throughout the interview process and participants were shown modifications against previous versions so they could provide input on whether changes were useful (supplementary file 10). All interviews were recorded (with verbal consent obtained from participants). Participants were asked to 'think out loud' and encouraged to provide feedback as they viewed each page of the decision aid (e.g., if they thought aspects of the decision aid could be improved or could be presented in a different way). During participant interviews, the interviewer took notes to highlight key concepts emerging from the interview and direct further questioning as needed. Following each interview, participants were sent an email thanking them for their time to participate; there was no incentive offered to participate in the study. All interviews were audio recorded and transcribed verbatim for analysis and participants had the opportunity to review the transcript of their interview prior to data analysis if they wished.

Acceptability questionnaires

Following each interview, an acceptability questionnaire was completed by participants, either during the interview or via a questionnaire link sent via email following the interview. A separate acceptability questionnaire, adapted from The Ottawa Hospital Research Institute[31], was created for adolescent-, adult- and parent-participants (supplementary file 8) and health professional-participants (supplementary file 9).

Data analysis

We reported the qualitative aspects of this study according to the 32-item Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (supplementary file 11)[32]. The COREQ is a 32-item checklist that allows for reporting of important aspects of the research team, study methods, context of the study, findings, analysis, and interpretation.

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4 Pre-interview and acceptability questionnaire responses were summarised using descriptive
5 statistics (means and SDs, counts and percentages). Adolescent-, adult-, and parent-
6 participant acceptability questionnaires (supplemental file 10) involved rating sections of the
7 decision aid as 'poor', 'fair', 'good' or 'excellent', the length of the decision aid, balance of
8 information presented and its potential usefulness. The health professional-participant
9 acceptability questionnaire (supplemental file 11) used a five-point Likert scale (strongly
10 agree=5; strongly disagree=1) to assess agreement with various statements. We presented
11 Likert scores as the percentage of responses for each category and as means (SD).
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15 All interview data were analysed using thematic analysis; a method for identifying, analysing
16 and reporting patterns within data[33]. Grounded theory using an inductive approach
17 underpinned how data were collected and analysed. Two researchers (AG and SM)
18 independently familiarised themselves with the interviews (via audio recordings or
19 transcripts), recorded initial observations and identified concepts relevant to the questions
20 asked. The two researchers developed a framework to organise concepts into broader themes
21 and subthemes in Excel. Any disagreements in categorising concepts into themes and
22 subthemes were discussed and resolved with a third author (JZ). The mapping of themes and
23 subthemes (figure 1) was iterative as new data emerged so that the decision aid was
24 continually updated before new interviews were conducted. Multiple iterative cycles of
25 revisions were performed, and new versions of the decision aid were circulated to the steering
26 group to reach consensus following changes from interviews. In some cases, revisions were
27 very minor changes (e.g., correcting typos, rewording a sentence). No further interviews were
28 conducted once data saturation was achieved (no new feedback emerged) and participants
29 had an overall positive impression of the decision aid.
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34 Figure 1: Formation of subthemes and themes.
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38 **Patient and Public involvement:**

39 People who experienced an ACL rupture were part of the authorship group (SF, MM, EP,
40 IAC). One was 18 years old when they ruptured their ACL (SF).
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45 **Results:**

46 *Adherence to the IPDAS criteria and user-centredness*

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48 The decision aid (supplementary file 12) met all 6 of the criteria to be considered a decision
49 aid, all 6 of the criteria to reduce the risk of harmful bias, and 21 of the 23 quality criteria
50 according to the IPDASi checklist (V.4.0)[34] (supplementary file 13). The two IPDASi
51 criteria that were not met involved evaluating the decision aid. Readability was assessed
52 including all the decision aid text (Grade 11.8) and without necessary complex words (Grade
53 9.7) using the SHeLL Editor (<https://shell.techlab.works>). Our decision aid also met 10 of the
54 11 criteria for user-centredness (supplementary file 14) as assessed by the User-Centred
55 Design 11-item measure[35].
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Participant characteristics and decision aid acceptability

A total of 32 initial interviews were completed; 16 health professionals who manage ACL ruptures (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who had ruptured their ACL (7 adolescents and 9 who were now adults), 8 of these interviews were with a parent (one parent was interviewed with two adolescents, one with an adult, and one alone).

Additional interviews were conducted with 3 health professionals (2 physiotherapists and 1 orthopaedic surgeon) who wanted to give further feedback but ran out of time in their initial interview. No participants withdrew from the study once their interview had commenced.

One parent and adolescent did not participate in an arranged interview as they had not been offered rehabilitation only treatment and the parent did not want to potentially upset them.

Participant characteristics are presented in tables 1 and 2. All participants completed the acceptability questionnaire except one adolescent participant (figure 2 and table 3).

Table 1: Characteristics of participants who sustained an ACL rupture and parents of adolescent children who sustained an ACL rupture.

Participant groups pre interview questionnaire responses (All statistics are reported as Mean (SD) or N (%), unless specified otherwise)		Adolescents (n=7)	Adults (n=9)	Parents (n=8)
Age (years) range		16 (1) 15-17	26 (5.1) 18-33	46 (3.8) 41-51
Female		5 (71%)	3 (33%)	8 (100%)
Country of Birth				
	Australia	3 (43%)	7 (78%)	3 (38%)
	Philippines	-	-	1 (13%)*
	United States of America (USA)	2 (29%)	1 (11%)	2 (25%)
	South Africa	2 (29%)	-	1 (13%)
	Sri Lanka	-	1 (11%)*	-
	Sweden	-	-	1 (13%)
Current grade at school				
	Grade 10	4 (57%)	-	-
	Grade 11	1 (14%)	-	-
	Grade 12 or completed Grade 12	2 (28%)	-	-
Highest level of education				
	University graduate or postgraduate degree/s	-	6 (66%)	7 (88%)
	TAFE/Trade	-	1 (11%)	1 (13%)
	High school (completed)	-	2 (22%)	-
Employment status				
	Employed full-time	-	5 (56%)	3 (38%)
	Employed part-time or casual	-	3 (33%)	3 (38%)
	Student	-	1 (11%)	-
	Other (e.g., self-employed)	-	-	2 (25%)
Private health insurance		7 (100%)	7 (78%)	7 (88%)
Age at the time of ACL rupture (years) range		14.7 (1) 13-16	15.7 (1) 14-17	14.4 (1) 13-16*
Concomitant injury at the time of ACL rupture**		4 (57%)	6 (67%)	6 (75%)*
	Lateral Meniscus	2 (29%)	1 (11%)	2 (25%)*
	Medial Meniscus	3 (43%)	4 (44%)	3 (38%)*
	MCL	-	1 (11%)	2 (25%)*
	PCL	1 (14%)	-	-
	Cartilage damage	-	2 (22%)	-

	Unsure of additional damaged structures	-	1 (11%)	-
Had ACL reconstruction		3 (43%)	9 (100%)	4 (50%)*
Had a subsequent ACL rupture (ipsilateral or contralateral) at the time of the interview***		0 (0%)	4 (44%)	0 (0%)*
Had another ACL reconstruction***		0 (0%)	3 (33%)	0 (0%)*
Time since ACL reconstruction***	6-12 months	2 (66%)	-	1 (25%)*
	12-24 months	-	2 (22%)	3 (75%)*
	>24 months	1 (33%)	7 (78%)	-
Highest level of activity participation prior to ACL rupture# (Median score (IQR))		9 (1)	7 (2)	9 (1.75)*
Highest current level of activity participation# (Median score (IQR))		6 (6)	4 (3.5)	2 (7.5)*
Which one factor most influenced the decision to have (or not have) an ACL reconstruction	Someone you know (e.g., a friend)	2 (29%)	-	-
	Choice due to age (e.g., being young)	1 (14%)	-	-
	Wanting to return to sport	2 (29%)	4 (44%)	2 (25%)
	Prevent further damage	-	2 (22%)	-
	Recommendation from a health professional	2 (29%)	3 (33%)	4 (50%)
	Other (e.g., research and beliefs)	-	-	2 (25%)
Happiness with treatment choice	Extremely happy	5 (71%)	6 (66%)	2 (25%)
	Somewhat happy	-	1 (11%)	2 (25%)
	Neither happy nor unhappy	1 (14%)	1 (11%)	1 (13%)
	Somewhat unhappy	1 (14%)	-	1 (13%)
	Extremely unhappy	-	1 (11%)	2 (25%)

N, number of adolescents and adults who ruptured their ACL and parents of adolescent children who ruptured their ACL. TAFE, Technical and Further Education. One parent was interviewed without their adolescent; one parent was interviewed with an adult and one parent was interviewed with two adolescents. † Management of ACL rupture were in Australia and not the country of birth. *Refers to data reported by parents about their adolescent child. **Some people had more than one concomitant injury to their ACL rupture. ***Percentage of those who had ACL reconstruction. #Scores are based on the Tegner Activity Scale (0-10), higher scores equal higher levels of patient reported activity.

Table 2: Characteristics of health professionals that manage patients with ACL ruptures.

Participant groups pre interview questionnaire responses (All statistics are reported as Mean (SD) or N (%), unless specified otherwise)		Health Professionals (n=16)
Age (years) range		39 (8.6) 23-54
Female		3 (19%)
Country of health professional training*	Australia	11 (69%)
	Germany	1 (6%)
	Switzerland	1 (6%)
	United Kingdom	1 (6%)
	United States of America (USA)	2 (13%)
Role	Physiotherapist	12 (75%)
	Orthopaedic surgeon	4 (25%)
Years of experience		11.5 (7.3)
Work setting	Private practice	11 (63%)
	Private hospital	1 (6%)
	Public hospital	4 (25%)
	Other	1 (6%)
Average number of patients with ACL rupture managed per year	5	1 (6%)
	5-10	5 (31%)
	10-20	2 (13%)
	20-30	3 (19%)
	>50	5 (31%)
The percentage of patients recommended to have ACL reconstruction following ACL rupture		67 (20.3)

N, number of health professionals that manage patients with ACL ruptures. *All health professional-participants were practicing in their country of training at the time of interviews.

Table 3: Acceptability questionnaire for people who sustained an ACL rupture (n=16) (adolescents (n=7)*, adults (n=9)) and parents of adolescent children who sustained an ACL rupture (n = 8).

Acceptability items (All statistics are reported as N (%))		Adolescents, adults, and parents (n=23)
Section of decision aid rated as excellent or good	Who should read this decision aid?	23 (100%)
	Diagram of management options following ACL rupture	23 (100%)
	The treatment options covered in this decision aid	23 (100%)
	Comparing benefits and harms of each management option for those aged under 18 years old	22 (96%)
	Summary of benefits and harms of each management option for those aged under 18 years old	23 (100%)
The length of the decision aid was	Just right	23 (100%)
The amount of information was	Just right	21 (91%)
	Too little	1 (4%)
	Too much	1 (4%)
I found the decision aid	Balanced	18 (78%)
	Slanted towards rehab only (or delayed ACL surgery)	2 (9%)
	Slanted towards ACL reconstruction surgery (early ACL surgery)	3 (13%)
Agreed they would have found this decision aid ‘extremely useful’ or ‘very useful’ when making the decision about ACL reconstruction surgery		18 (78%)
Agreed this decision aid would have made their decision easier		20 (87%)

N, number of adolescents and adults who have sustained an ACL rupture and parents of adolescent children who sustained an ACL rupture. *One adolescent-participant did not complete the acceptability questionnaire.

Feedback for each section of the decision aid

Although most suggestions were implemented, some conflicted with others or were not possible to implement. Online supplementary file 15 outlines feedback we did not incorporate in the decision aid and our justification for this.

Thematic analysis of interviews

Summary of interview themes and subthemes:

Theme 1 and 2: Positive and negative feedback

Most participants gave positive feedback about the design and usability of the decision aid, but health professionals expressed a range of views on the content.

“I wish I had something like this for either of my ACLs. Just to have it all in one place, is good” (M, 21-30 years old, adult).

“It would be wonderful to have this handed out” (F, 41-50 years old, parent).

“It's well thought out, nice and balanced. It's good” (M, 31-40 years old, orthopaedic surgeon).

“I really would suggest that you reconsider what you're doing” (M, 51-60 years old, orthopaedic surgeon).

“I found the whole thing very wordy” (M, 41-50 years old, orthopaedic surgeon).

Theme 3: How to use the decision aid in practice

Some health professionals suggested clarifying the influence of additional injuries (e.g., meniscus tear) or instability on management decisions. Most participants suggested the decision aid shouldn't replace professional advice and it should promote individual management.

“I also feel you have to have a health professional to guide you” (F, 41-50 years old, parent).

“I think a lot of it just comes down to the individual's context, and their goals, and then also their present functional limitation” (F, 21-30 years old, physiotherapist).

Theme 4: More information about specific considerations following ACL rupture

Adolescents frequently suggested including social and psychological support and whole-body health. Adolescents also suggested including information on planning for additional support and show fear of further injury or difficulties maintaining motivation is normal. Some health professionals suggested including ACL guidelines (e.g., Professionally endorsed ACL guidelines) and revising management options to include ACL healing, bracing and 'prehabilitation'. Some participants suggested including practical information on time needed to book ACL reconstruction, graft options, size of scars and loss of muscle strength and control. Modifying questions to ask health professionals were frequently suggested and some parents were particularly concerned about costs and pain relief.

“They don't talk about the psychological effects that it has on someone” (F, 15-17 years old, adolescent).

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3 *“As far as this child is going to really need high care and nurturing, what have you got in*
4 *place to ensure this person’s needs are going to be met?” (F, 41-50 years old, parent).*
5 *“The potential for the ACL to heal, I think parents and kids would be very interested in that”*
6 *(M, 31-40 years old, physiotherapist).*
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10 **Theme 5: Change or add information on rehabilitation, exercise and return to sport**

11 Some health professionals suggested return to sport following ACL rupture isn’t guaranteed
12 but most participants agreed rehabilitation timeframes gave realistic expectations. All
13 participant groups mentioned rehabilitation testing should be included (e.g., strength and hop
14 tests) and to differentiate between restricted/unrestricted training and competition sport. Most
15 participants also suggested including consideration for long-term goals and continuing to
16 exercise beyond 12 months.
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21 *“It’s easy to get ahead of yourself and many times parents want to rush as well” (F, 41-50*
22 *years old, parent).*

23 *“Some people may think once I finished my nine months of therapy, I’m done. But it’s like, it’s*
24 *a lifelong journey” (F, 41-50 years old, parent).*

25 *“You need a certain level of dedication” (F, 15-17 years old, adolescent).*
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28 **Theme 6: Modify language and formatting used**

29 Simple language, being concise and removing unnecessary text were frequently suggested.
30 All participant groups suggested modifications to formatting such as layout, graphs, colour,
31 pictures, or icons and statistics (e.g., most preferred icon array images to bar graphs or ‘x in
32 100 people’ to percentages).
33

34 Positive presentation of information, harms, and return to sport was frequently suggested by
35 all participant groups. Mixed views were expressed about risk of additional injury (e.g., the
36 relationship between meniscus damage and osteoarthritis), general surgery, paediatric
37 specific risks and return to sport.
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41 *“I feel like the language is too academic. To me, I think it could be dumbed down more” (M,*
42 *31-40 years old, physiotherapist).*

43 *“You want them to be finding the success stories and, yeah, have a positive outlook as well,*
44 *rather than focusing on who didn’t get back” (F, 41-50 years old, parent).*

45 *“You could say potential harms and precautions” (F, 41-50 years old, parent).*
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48 **Theme 7: Understanding the translation of research**

49 Some health professionals suggested the decision aid should be seen before an appointment
50 with a health professional (e.g., before seeing an orthopaedic surgeon). Participants
51 frequently suggested difficulty navigating the uncertainty of returning to sport with both
52 treatment options. Participants more frequently had views to remove adult data, but some
53 suggested providing context to adult statistics.
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57 *“When patients are overwhelmed, they, tend to just kind of they grasp for certainty” (M, 31-*
58 *40 years old, physiotherapist).*
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3 “You’re using adult data in a decision aid for children, and you can’t do that” (M, 51-60
4 years old, orthopaedic surgeon).

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6 “I would rather they have information that is relevant to their population and their category
7 only, even if it is lower quality” (M, 31-40 years old orthopaedic surgeon).

8 9 10 **Discussion:**

11 ***Summary of findings***

12 Most adolescents, parents, and adults rated all aspects of the decision aid as good-excellent
13 (e.g., presentation, comprehensibility, length, graphics, formatting, and amount of
14 information). Following interviews, we identified seven main themes with subthemes
15 (supplementary file 16). The interviews highlighted agreement with most of the decision aid
16 content (e.g., management options, questions to ask health professionals, summary of benefits
17 and harms). Most health professionals selected ‘strongly agree’ or ‘agree’ when asked to rate
18 statements about the decision aid but some health professionals had opposing views on
19 components of the decision aid (e.g., using statistics from studies including participants over
20 18 years old, potential risks and return to sport).

21 ***Meaning of the study***

22 Analysis of the interviews revealed that most aspects of the decision aid were agreed upon by
23 participants despite suggestions for refinement. However, some health professionals had
24 divided opinions on the evidence used to inform content and rehabilitation timeframes.
25 Feedback from all participant groups consistently highlighted the importance of positive
26 messaging, social and psychological support and considering long-term goals. Most
27 participant groups also gave positive feedback on ‘questions to consider asking health
28 professionals’.

29
30 Most participants agreed the decision aid clearly outlines its intended users and treatment
31 options but there were mixed views on deciding optimal management. Some participants
32 suggested bringing more attention to the impact of additional injury (e.g., meniscus damage)
33 to decision making or adding other treatment options (e.g., bracing, ACL healing and
34 ‘prehabilitation’). We decided to present only two management options side by side for ease
35 of comparison, which is similar to other decision aids for musculoskeletal conditions[22,36].
36 Opinions of the optimal management for children and adolescents who have additional
37 injuries to their ACL rupture were mixed, and evidence remains uncertain[13,16]. The
38 decision aid prompts patients to confirm their diagnosis with a team of health professionals to
39 gain a balanced opinion on their individual circumstance and discuss multiple factors that
40 may influence their choice (e.g., presence of ‘repairable’ injuries, if their knee gives way and
41 activity levels[9]).

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43 Some physiotherapists and orthopaedic surgeons had conflicting views on using evidence
44 from research that had included participants over 18 years old. Given the decision aid is not
45 for adults with an ACL rupture, we decided not to present data from studies in people over 18
46 years to avoid children and adolescents having to consider multiple data sources and
47 potentially becoming confused[37]. The decision aid is designed for children and adolescents
48 and includes prompts to encourage management that considers individual circumstances and
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3 different rates of child development (e.g., questions to consider when talking to a health
4 professional and key points).
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7 Although children and adolescents should be encouraged to take an active role in the
8 decision-making process, interviews with parents suggested that individual circumstances
9 may dictate how the decision aid is best used. Some parents suggested the decision aid would
10 save them time when researching information to help with making treatment choices (e.g.,
11 *“getting this handout instead of me having to go home and Google, I Googled many, many*
12 *nights trying to find you know, something like this”* (F, 41-50 years old, parent)). One parent
13 withdrew their adolescent child before the interview due to concerns that discussion of
14 potential harms could disrupt their child’s focus on rehabilitation. This adolescent recently
15 had ACL reconstruction and was not given the option to have non-surgical management
16 based on their injuries. Overall, parents and health professionals should consider encouraging
17 children and adolescents to be involved in shared decision-making[9,38,39] and consider that
18 the decision aid is designed to be used before making the management decision. Once a
19 decision is made, particularly an irreversible decision, parents and health professionals may
20 have an important role in guiding focus and promoting optimism.
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26 The decision aid can facilitate parents discussing their child’s treatment preference, sport
27 choice and potential harms of participation. Parents and health professionals should
28 acknowledge their supporting role in treatment decisions (e.g., *“it’s important that we listen*
29 *to the kids and what they have to say, it’s their body”* (F, 41-50 years old, parent)).
30 Discussions of sporting choice may solidify a decision or lead to diversifying sporting
31 participation that has been shown to encourage the development of resilient self-
32 identities[37]. Parental anxiety or pain catastrophising has been shown to negatively
33 influence children’s anxiety, postoperative pain and ability to perform rehabilitation[40].
34 While potential harms and uncertainty of returning to sport can be a sensitive topic, their
35 acknowledgment could also provide reassurance to children and adolescences if something
36 goes wrong (e.g., *“as a parent you’re trying to make sure they understand the decision*
37 *they’re making”* (F, 41-50 years old, parent)).
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42 Avoiding unrealistic expectations and including children and adolescents in decision making
43 was frequently mentioned by all participant groups. Using the decision aid could prevent
44 decisions being made based on unrealistic expectations and help improve treatment
45 satisfaction. It is accepted that patient satisfaction has been closely linked to expectations,[41]
46 the decision aid may help improve the mismatch between expectations and evidence. Many
47 young athletes (86%) expect to return to sport following ACL reconstruction by 6 months
48 which is much sooner than is recommended in accepted professional guidelines[42,43].
49 While return to sport rates may be higher in children who have ACL reconstruction followed
50 by rehabilitation compared to rehabilitation only[13], subsequent ipsilateral or contralateral
51 ACL rupture following ACL reconstruction followed by rehabilitation can be as high as 32%
52 in paediatric athletes[40]. The reality is that despite anatomical surgical success or well-
53 designed rehabilitation programs, many athletes may never return to their pre-injury athletic
54 performance level or their primary sport[44].
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3 Interviews frequently highlighted that information regarding psychological and social support
4 should be included in the decision aid. Sudden changes to sport participation can affect self-
5 identity in children and adolescents who particularly mentioned the mental struggle of
6 recovering post ACL rupture (e.g., *“the point that stands out to me, that was probably the*
7 *stay positive one. Because the other year, it was hard. But the mental part of it is the hardest*
8 *part, like getting past that”* (M, 15-17 years old, adolescent)). Children and adolescent self-
9 identities can be fragile and absence from participating in a sport they depend on can be
10 psychologically traumatising[40]. Therefore, we decided to include messages to encourage
11 the discussion and planning for psychological support. Health professionals should give early
12 recognition to psychosocial factors that have been shown to affect mental wellbeing and
13 ability to recover from injury[44]. The decision aid incorporates reassurance and encourages
14 monitoring physical and psychological recovery.
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19 **Strengths and Limitations**

20 Our development process (Supplementary file 17) had several strengths. The steering group
21 includes people who experienced an ACL rupture and one who was 18 years old when they
22 ruptured their ACL, the manuscript is transparent about the authors' professional
23 backgrounds, the design, conduct and reporting of this study were guided by the IPDAS
24 criteria, we conducted one-on-one interviews with participants which allowed for rich
25 feedback to be gathered on the decision aid, and used mixed methods to evaluate
26 acceptability of the decision aid. The readability of our tool measured higher (Grade 9 to 11)
27 than recommendations (Grade 8) but contains multiple features to support understanding and
28 readability that aligns with best practice[45] including bullet points, white space, images, and
29 sub-headers. The tool therefore performs well relative to existing decision aids in terms of its
30 attention to health literacy[45]. We also included justification of the evidence used to inform
31 numeric estimates of benefits and harms in the decision aid and used the highest quality
32 evidence available comparing rehabilitation only and ACL reconstruction followed by
33 rehabilitation for children and adolescents[13].
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39 Our patient decision aid was limited by the lack of high-quality evidence comparing
40 rehabilitation only to ACL reconstruction followed by rehabilitation in children and
41 adolescents. Emergence of future studies related to this topic will likely warrant an update of
42 the evidence used in the decision aid. Another limitation is that evidence from older studies
43 did not always report details of rehabilitation or consider advances in treatment to know if
44 they reflect current recommended practice. We were unable to recruit any children-
45 participants to interview and adolescent-participants were aged between 15-17 years old. We
46 did interview health professionals who treat children and younger adolescents, but not being
47 able to recruit children-participants means the decision aid was not directly influenced by
48 children's feedback. Most authors are physiotherapists, and most health professional-
49 participants were physiotherapists (75%), trained in Australia (69%) and worked in private
50 practice (63%) which may impact the themes that emerged from interviews (e.g., views on
51 costs and waiting time for ACL reconstruction). Recruitment of participants was difficult
52 which was expected without offering incentives for their time. We didn't directly involve
53 children or adolescents in all stages of the study as consumers, and stakeholder involvement
54 heavily influenced the design of the decision aid via feedback during online interviews and
55 questionnaires on the acceptability of the decision aid. Our aim was to interview participants
56 until we achieved data saturation, but we acknowledge that the majority of participants were
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3 Australian (60%). Including participants from several different countries may have made the
4 decision aid more globally acceptable (e.g., feedback was influenced by different cultures and
5 healthcare systems) but the sample size of participants from each country may limit the
6 generalisability of the decision aid for use in different countries. Future work includes
7 adapting this decision aid for culturally and linguistically diverse populations as it is only
8 presented in English.
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11 **Conclusion**

12 Our patient decision aid appears to be an acceptable tool to help children and adolescents
13 following ACL rupture choose between surgical and non-surgical management, with support
14 from their parents and health professionals. Feedback from adolescents frequently suggested
15 the importance of planning to include psychological and social support during rehabilitation.
16 Feedback also suggested that health professionals should use positive messaging despite
17 uncertainty of outcomes, while avoiding the creation of unrealistic expectations. Our patient
18 decision aid is a user-friendly tool that could improve decision making in children and
19 adolescents following ACL rupture. A randomised controlled trial evaluating its impact is the
20 next important step.
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25 **Supplementary files:**

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27 Supplementary file 1: Children and adolescent pre-interview questionnaire

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29 Supplementary file 2: Adult pre-interview questionnaire

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31 Supplementary file 3: Parent/guardian pre-interview questionnaire

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33 Supplementary file 4: Health professional pre-interview questionnaire

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35 Supplementary file 5: Children and adolescent and parent/guardian interview guide

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37 Supplementary file 6: Adult interview guide

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39 Supplementary file 7: Health professional interview guide

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41 Supplementary file 8: Acceptability questionnaire for children, adolescents, parents, and
42 adults

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44 Supplementary file 9: Acceptability questionnaire for health professional

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46 Supplementary file 10: Decision aid version from PowerPoint

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48 Supplementary file 11: 32-item Consolidated Criteria for Reporting Qualitative Research
(COREQ) checklist

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50 Supplementary file 12: Final decision aid

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52 Supplementary file 13: International Patient Decision Aid Standards Checklist (IPDASi v4.0)

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54 Supplementary file 14: User-Centred Design 11-item measure (UCD-11)

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56 Supplementary file 15: Reasons for not implementing feedback for each section of the
57 decision aid

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59 Supplementary file 16: Interview themes and subthemes, and example quotes
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3 Supplementary file 17: Flow chart of the development process
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7 **Contributors:**

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9 All authors critically revised the manuscript for important intellectual content and approved
10 the final manuscript. Please find below a detailed description of the role of each author.
11 ARG: Developed and designed data collection tools, conducted data collection, analysed, and
12 interpreted data, drafted, and revised the manuscript and approved the final version to be
13 published. MJM: Developed and designed data collection tools, interpreted data and
14 approved the final version to be published. DBA: Developed and designed data collection
15 tools, interpreted data and approved the final version to be published. EP: Developed and
16 designed data collection tools, interpreted data and approved the final version to be published
17 IAC: Developed and designed data collection tools, conducted data collection, analysed, and
18 interpreted data and approved the final version to be published. SM: Developed and designed
19 data collection tools, analysed and interpreted data and approved the final version to be
20 published. IAH: Developed and designed data collection tools, interpreted data and approved
21 the final version to be published. SRF: Developed and designed data collection tools, interpreted
22 data and approved the final version to be published. KM: Developed and designed data
23 collection tools, interpreted data and approved the final version to be published. TCH:
24 Developed and designed data collection tools, interpreted data and approved the final version
25 to be published. RT: Developed and designed data collection tools, interpreted data and
26 approved the final version to be published. CGM: Developed and designed data collection
27 tools, interpreted data and approved the final version to be published. JRZ: Developed and
28 designed data collection tools, conducted data collection, analysed, and interpreted data,
29 drafted, and revised the manuscript and approved the final version to be published. The
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33 the data, and controlled the decision to publish.
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47 Gamble at andrew.gamble@sydney.edu.au.
48

49 **Conflicts of interest statement:**

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51 TCH, KM and RT are unpaid members of the International Patient Decision Aid Standards
52 (IPDAS) Collaboration Steering Committee.
53

54 **Ethics approval:**

55
56 Sydney University Human Research Ethics Committee (HRECs) approval 2022/008.
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58

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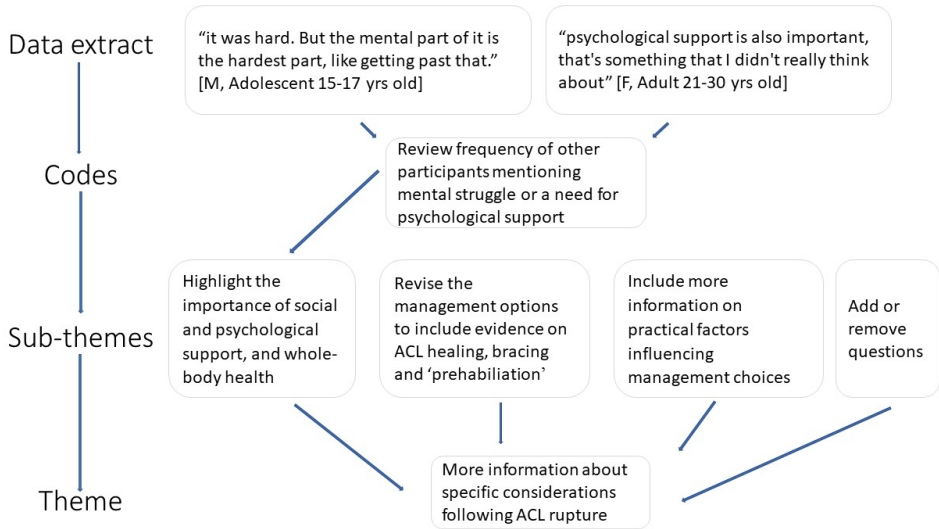


Figure 1: Formation of subthemes and themes.

338x190mm (96 x 96 DPI)

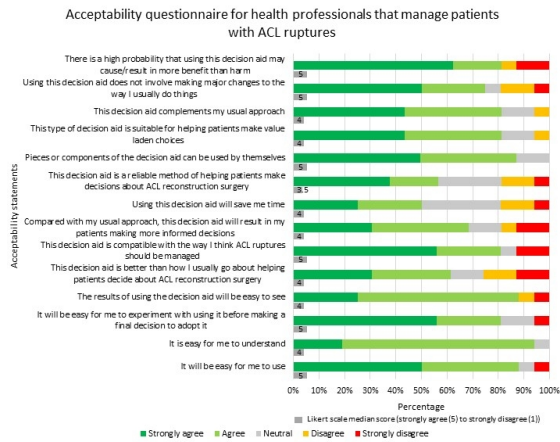


Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

338x190mm (96 x 96 DPI)

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Children and Adolescent Participant information statement before starting the survey.
2. CHILDREN AND ADOLESCENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

By saying yes to being in this study, I am saying that:

Tick/initial boxes

- I know what I will be asked to do and have been given a Study Information Sheet to keep.
 - I know that this study is about what information is important for children before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - Someone has talked to me about the study and what it means for me.
 - I know that I will be asked to answer a questionnaire (5-minutes) before I attend an interview to provide feedback on educational information of treatment options following ACL injury (online, via telephone or in person if the COVID-19 situation allows) that will last 30 minutes.
 - I know that I don't have to be in the study if I don't want to.
 - I know that I can choose not to talk about something if I don't want to.
 - I have been asked if it is ok or not ok to record what I say.
 - I have been told that I can change my mind at any time if I don't want to take part anymore.
 - I have been told that if I say yes or no it won't change how the study team feel about me.
 - I know that what I say or do in this study is private and when the study team write about what they learn they won't use my name or anything that could tell other people who I am.
 - I understand that after I sign and return this consent form it will be kept by the researcher, and that I can ask for a copy at any time.
-
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
 Male
 Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. Are you currently at school?

- Yes
 No

If Yes, What Grade are you in at school? _____

If No, What Grade did you finish/leave school? _____

5. Do you work?

- Yes
 No

If Yes,

- Part-time
 Full-time

What type of work do you do? _____

6. How long ago did you rupture your ACL (weeks, months or years)?

7. When you ruptured your ACL, did you also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?

- Yes
 No (skip to question 8)

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Unsure

Please specify the structures you damaged. Please select all that apply:

- Medial collateral ligament (MCL)
- Lateral collateral ligament (LCL)
- Posterior cruciate ligament (PCL)
- Medial meniscus
- Lateral meniscus
- Cartilage damage
- I am unsure of the structure

8. Did you have an ACL reconstruction surgery?

- Yes
- No > go to question 10

> If 'Yes' did you re-rupture your ACL after surgery?

- Yes
- No

> If 'Yes', did you have another ACL reconstruction?

- Yes
- No

9. How long ago did you have your most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

10. Please indicate in the spaces below the HIGHEST level of activity that you participated in BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.

BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite)
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

11. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

12. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Adult Participant information statement before starting the survey.
2. ADULT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

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3 7. How long ago did you rupture your ACL? _____
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7 8. When you ruptured your ACL, did you also damage any other structures in the knee (e.g.,
8 Meniscus or other ligament damage)?

- 9 Yes
10 No (skip to question 9)
11
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13 Please specify the structures you damaged. Please select all that apply:
14

- 15 Medial collateral ligament (MCL)
16 Lateral collateral ligament (LCL)
17 Posterior cruciate ligament (PCL)
18 Medial meniscus
19 Lateral meniscus
20 Cartilage damage
21 I am unsure of the structure
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25 9. Did you have an ACL reconstruction surgery?

- 26 Yes
27 No > go to question 11
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30 > If 'Yes' did you re-rupture your ACL after surgery?

- 31 Yes
32 No
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35 > If 'Yes', did you have another ACL reconstruction?

- 36 Yes
37 No
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39

40 10. How long ago did you have your most recent ACL reconstruction surgery?

- 41 <1 month ago
42 1-3 months ago
43 4-6 months ago
44 6-12 months ago
45 12-24 months ago
46 >24 months ago
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51 11. Please indicate in the spaces below the HIGHEST level of activity that you participated in
52 BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.
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54 BEFORE INJURY: Level _____ CURRENT: Level _____
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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite))
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

12. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Parent Participant information statement before starting the survey.
2. PARENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of any involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I and my child will both be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
- I understand that my participation will involve my interview to be recorded.
- I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to let my child participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
- I understand that we (myself and/or my child) are free to withdraw from this study at any time and can choose to withdraw any information already provided (unless the data has already been de-identified or published).
- I have been informed that the confidentiality of the information provided by myself and/or my child will be protected and will only be used for purposes that has been agreed to. I understand that information will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, and that publications will not contain any identifiable information about myself or my child.
 - Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

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7. How long ago did your child rupture their ACL? _____
8. When your child ruptured their ACL, did they also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?
- Yes
 - No (skip to question 9)
 - Unsure

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Please specify the structures your child damaged. Please select all that apply:

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- Medial collateral ligament (MCL)
 - Lateral collateral ligament (LCL)
 - Posterior cruciate ligament (PCL)
 - Medial meniscus
 - Lateral meniscus
 - Cartilage damage
 - I am unsure of the structure
- 25
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9. Has your child have an ACL reconstruction surgery?
- Yes
 - No > go to question 11

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> If 'Yes' did your child re-rupture their ACL after surgery?

- Yes
- No

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> If 'Yes', did your child have another ACL reconstruction?

- Yes
- No

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10. How long ago did your child have their most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

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11. Please indicate in the spaces below the HIGHEST level of activity that your child participated in BEFORE THEIR INJURY and the highest level they can participate in CURRENTLY.

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BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

- Level 10 Competitive Sports(Soccer, Football, Rugby (national elite))
- Level 9 Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
- Level 8 Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
- Level 7 Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track)
Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
- Level 6 Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
- Level 5 Work (Heavy Labor)
Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
- Level 4 Work (Moderately Heavy Labor (truck driving, etc)
Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
- Level 3 Work (Light Labor)
Comp & Rec Sports (Swimming), Hiking, Backpacking
- Level 2 Work (Light Labor)
Walking on uneven ground possible but impossible to backpack or hike
- Level 1 Work (Light Labor)
Walking on even ground possible
- Level 0 Sick leave or disability pension because of knee problems

12. Which one factor most influenced the decision for your child to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy was your child with their treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

We would like to interview you and your child together. Is this okay?

- Yes
- No

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via email

Consent section

1. Please make sure you have read the Health Professional Participant information statement before starting the survey.
2. HEALTH PROFESSIONAL PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
 Male
 Non-binary

2. Please indicate your age: [free text response]

3. In which country did you receive your health professional training/qualification? [free text response]

4. What type of health professional are you?

- Orthopaedic surgeon
 General practitioner
 Sports medicine doctor
 Physiotherapist
 Other (please specify) _____

5. How many years have you been practicing? [free text response]

6. Which clinical setting have you spent the most time practicing in?

- Private practice
 Public hospital
 Private hospital
 Sports teams
 Other (please specify) _____

7. On average, how many patients with an ACL rupture do you manage/review per year? [free text response]

8. On average, what percentage of these patients do you advise to have ACL reconstruction surgery when they first visit you? [free text response]

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Finally, when are the best times to schedule you for an online Zoom interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

Example structure of interviews with parents, children and adolescent participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to parents, children and adolescents (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?
- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Do you expect to return to your pre-injury level of sport?
- How long do you expect recovery to take?
- Would you consider activity modification?

Goals:

- What do you aim to achieve with management and how does this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with adult participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to adult participants (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material taking your experience into account.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?
- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Did you expect to return to your pre-injury level of sport?
- How long did you expect recovery to take?
- Did you consider activity modification?

Goals:

- What did you aim to achieve with management and how did this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with health professional participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What is your understanding of the treatment options following an anterior cruciate ligament (ACL) rupture? What causes it? How can it be treated?
- What do you think of ACL reconstruction surgery as a treatment?

Brief explanation of ACL reconstruction surgery to health professionals (depending on their current level of understanding e.g. do not explain this to an orthopedic surgeon)

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

Core questions

If we were designing an education leaflet to help patients decide whether to have ACL reconstruction surgery or not....

- What information is most important for them to know? (prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure, etc.)
- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure
- How would your response to the above options differ if the information was intended to be used during a consultation with a health professional?

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to health professionals (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have ACL reconstruction surgery or not. We would like for you to help us refine this material – for example, how you find the visual appeal, readability, content, and what are your overall thoughts on patients using this material?

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything confusing, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as health professionals are reading through the material:

- How do you think patients would find this section?
- Did you feel like patients will know where to look, and what to do next?

- Did you feel like patients knew the relevance of this section in their decision?
- How do you think patients will find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

For peer review only

Supplementary File 10: Acceptability questionnaire for children, adolescents, parents, and adults

We would like to know what you think about the patient decision aid you have just read.

Which participant group are you?

- Parent/Guardian
- Child or Adolescent
- Adult

1. Please rate each section by circling 'poor', 'fair', 'good', or 'excellent' to show what you think about the way the information was presented on:

Who should read this decision aid?	Poor	Fair	Good	Excellent
Diagram of management options following ACL rupture	Poor	Fair	Good	Excellent
The treatment options covered in this decision aid	Poor	Fair	Good	Excellent
Comparing benefits and harms of each management option for those aged < 18 years old	Poor	Fair	Good	Excellent
Summary of benefits and harms of each option	Poor	Fair	Good	Excellent

2. The length of the decision aid was:
 - a. Too long
 - b. Too short
 - c. Just right
3. The amount of information was:
 - a. Just right
 - b. Too much
 - c. Too little
4. I found the decision aid:
 - a. Balanced
 - b. Slanted towards rehab only (or delayed ACL surgery)
 - c. Slanted towards ACL reconstruction surgery (early ACL surgery)
5. Would you find (or would you have found) this decision aid useful when/if you were making your decision about ACL reconstruction surgery?
 - a. Not at all useful
 - b. Slightly useful
 - c. Moderately useful
 - d. Very useful

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- e. Extremely useful
6. Did this decision aid/would this decision aid make your decision to have ACL reconstruction surgery...?
 - a. Easier (option to comment)
 - b. More difficult (option to comment)

For peer review only

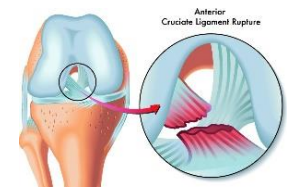
Supplementary File 11: Acceptability questionnaire for Health Professionals

We would like to know what you think about the patient decision aid you have just read.

Please rate each section by selecting 'strongly agree', 'agree', 'neutral', 'disagree' or 'strongly disagree' to show what you think about the way the information was presented on:

In general:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It will be easy for me to use	1	2	3	4	5
It is easy for me to understand	1	2	3	4	5
It will be easy for me to experiment with using it before making a final decision to adopt it	1	2	3	4	5
The results of using the decision aid will be easy to see	1	2	3	4	5
This decision aid is better than how I usually go about helping patients decide about ACL reconstruction surgery	1	2	3	4	5
This decision aid is compatible with the way I think ACL ruptures should be managed	1	2	3	4	5
Compared with my usual approach, this decision aid will result in my patients making more informed decisions	1	2	3	4	5
Using this decision aid will save me time	1	2	3	4	5
This decision aid is a reliable method of helping patients make decisions about ACL reconstruction surgery	1	2	3	4	5
Pieces or components of the decision aid can be used by themselves	1	2	3	4	5
This type of decision aid is suitable for helping patients make value laden choices	1	2	3	4	5
This decision aid complements my usual approach	1	2	3	4	5
Using this decision aid does not involve making major changes to the way I usually do things	1	2	3	4	5
There is a high probability that using this decision aid may cause/result in more benefit than harm	1	2	3	4	5

Who should read this decision aid?



This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL). ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different. This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.

Management options after ACL rupture

Option #1
Rehab only*
(or delayed ACL surgery)



Option #2
ACL surgery
(early ACL reconstruction)



Health professionals will prescribe your exercises and perform testing to guide progression and return to activity, training or sport.

6-9 months

Potential return to sport

9-12 months

After 9 months

Continue exercises + injury prevention

After 12 months

*Talk to a health professional if your knee keeps 'giving way' despite following advice. No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option. Remember to consider long-term goals and see people who can support you (e.g., friends).

What is covered in the decision aid?

- What are the treatment options covered in this decision aid?
- Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old
- Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

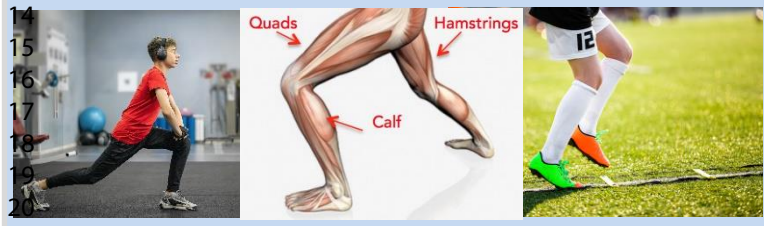
Important: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. **Last reviewed:** Updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.




1. Rehab only (or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.



After an ACL rupture occurs

See a health professional. 

0-1 month post injury

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.






1-3 months post injury



You may begin activities like running, swimming or outdoor cycling.



6-9 months post injury

You may return to sports like soccer, basketball, volleyball or rugby. 



After 9 months post injury

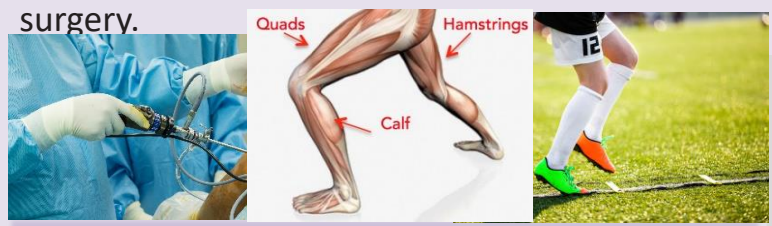
Continue exercises to help your functional recovery and keep the knee strong. 


If you decide to have **delayed ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.


Caution: If your knee 'gives way' after 3 months, talk to your health professional. You may be at risk of further injury.

2. ACL surgery (early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.



After an ACL rupture occurs

See a health professional. 

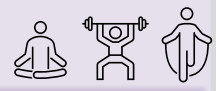
0-1 month post surgery

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.





1-3 months post surgery




With the help of a health professional, gradually start harder exercises at home or in a gym.





3 months post surgery

You may begin activities like running, swimming or outdoor cycling. 


9-12 months post surgery

You may return to sports like soccer, basketball, volleyball or rugby. 



After 12 months post surgery

Continue exercises to help your functional recovery and keep the knee strong. 


Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹

Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

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This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).² High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

1. Rehab only (or delayed ACL surgery)

Delayed ACL surgery = 3 months or later

2. ACL surgery (early ACL reconstruction)

Early ACL surgery = before 3 months

+ Return to pre-injury sport

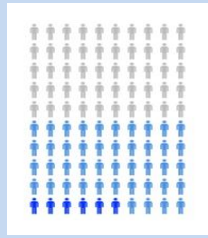
Not everyone will return to their pre-injury level of sport with either option.

Rehab only:

Between

6 and 50 people per 100

return to their pre-injury sport around 20 months after injury.²

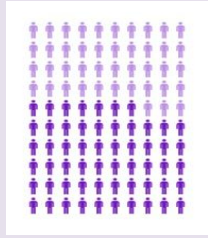


Early ACL surgery:

Between

57 and 100 people per 100

return to their pre-injury sport around 24 months after injury.²

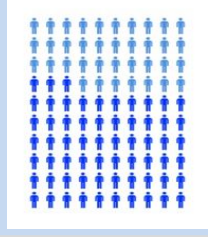


Delayed ACL surgery:

Between

63 and 100 people per 100

return to their pre-injury sport around 22 months after injury.²



- Precautions and potential harms

Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²

Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.²

meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

Questions to consider when talking to a health professional...



- Will my choice affect what sport I play?
- If I am still growing, will this affect my management?
- What type of graft is best for me if I have ACL surgery?
- Is there any psychological support available?
- What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?



Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

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1. Rehab only (or delayed ACL surgery)

+ Positives and potential benefits

- Between 41 – 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

- Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience ‘giving way’ of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

+ Key points

- Choose what is best for your situation
- If you chose rehab only, you could still decide to have delayed ACL surgery later
- See family, friends and health professionals for support

2. ACL surgery (early ACL reconstruction)

+ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

- Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

- Listen and care for your whole-body
- Care for your mental and physical health
- Plan to try new activities
- Don't rush – expect challenges
- Stay positive!

References:

1) Grindem H, et al. Br J Sports Med. 2016;50(13):804–8
 2) James EW, et al. Am J Sports Med. 2021; 49(14):4008-4017
 3) Frobell RB, et al. NEJM 2010;363(4):331-342
 4) Reijman M, et al. BMJ 2021;372-375
 5) Wiggins AJ, et al. Am J Sports Med. 2016;44(7):1861–76
 6) Frosch KH, Arthroscopy, 2010; 26:1539–50.
 7) Ardern CL, et al. KSST. 2018;26(4):898-1010
 8) Webster, K et al. CJSM. 2022;32(2):145-152
 9) Pitsillides, A et al. J Bodyw Mov Ther. 2021;28:246-254

COREQ (CONsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the interview or focus group?	
Duration	21	What was the duration of the interviews or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

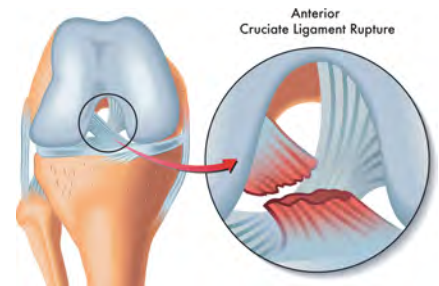
I RUPTURED MY ACL: SHOULD I HAVE SURGERY?

+ Who should read this decision aid?

This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL).

ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different.

This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.



OPTION 1 - REHAB ONLY* (or delayed ACL surgery)



6 - 9 months

After 9 months

MANAGEMENT OPTIONS AFTER ACL RUPTURE

Health professionals will prescribe your exercises and perform testing to guide progression and return to activity, training or sport.

Potential return to sport

Continuous exercises + injury prevention

OPTION 2 - ACL SURGERY (early ACL reconstruction)



9 - 12 months

After 12 months

*Talk to a health professional if your knee keeps 'giving way' despite following advice.

No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option.

Remember to consider long-term goals and see people who can support you (e.g., friends).

+ What is covered in the decision aid?

Page 2 - What are the treatment options covered in this decision aid?

Page 3 - Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Page 4 - Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Important information: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. Last reviewed: updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.

+ What are the treatment options covered in this decision aid?


OPTION 1 - REHAB ONLY*

(or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.

✓ **After an ACL rupture occurs** 

See a health professional.

✓ **0-1 month post injury** 

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.

✓ **1-3 months post injury** 

You may begin activities like running, swimming or outdoor cycling.

✓ **6-9 months post injury** 

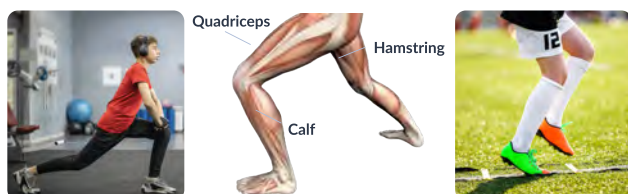
You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 9 months post injury** 

Continue exercises to help your functional recovery and keep the knee strong.

If you decide to have delayed **ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.

Caution: If your knee 'gives way' after **3 months**, talk to your health professional. You may be at risk of further injury.



OPTION 2 - ACL SURGERY

(early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.

✓ **After an ACL rupture occurs** 

See a health professional.

✓ **0-1 month post surgery** 

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.

✓ **1-3 months post surgery** 

With the help of a health professional, gradually start harder exercises at home or in a gym.

✓ **3 months post surgery** 

You may begin activities like running, swimming or outdoor cycling.

✓ **9-12 months post surgery** 

You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 12 months post surgery** 

Continue exercises to help your functional recovery and keep the knee strong.

Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹



+ Comparing potential benefits and harms

Practical issues

Between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).²

High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

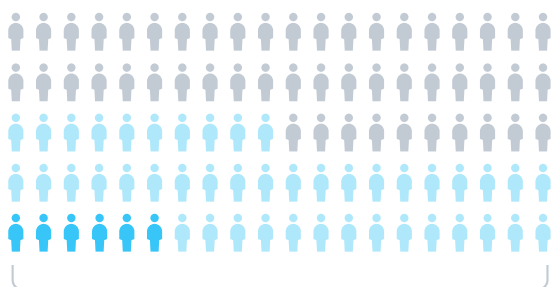
OPTION 1 - REHAB ONLY

(or delayed ACL surgery = 3 months or later)

Return to pre-injury sport

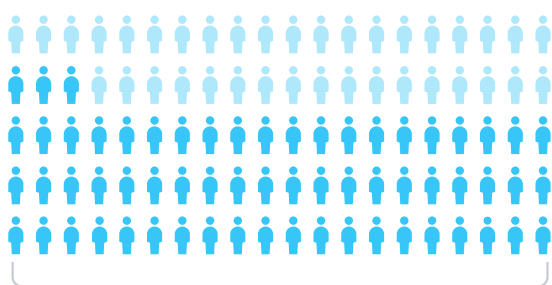
(Not everyone will return to their pre-injury level of sport)

Rehab only:



Between 6 and 50 people per 100 return to their pre-injury sport around 20 months after injury.²

Delayed ACL surgery:



Between 63 and 100 people per 100 return to their pre-injury sport around 22 months after injury.²

Precautions and potential harms

- Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²
- Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.²

*meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

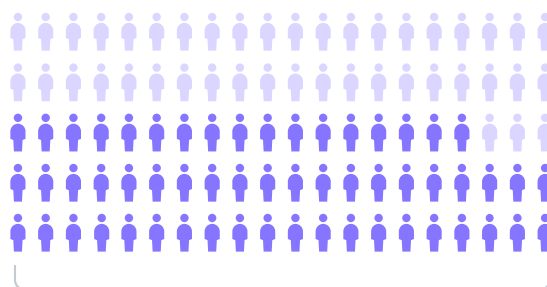
OPTION 2 - ACL SURGERY

(early ACL reconstruction = before 3 months)

Return to pre-injury sport

(Not everyone will return to their pre-injury level of sport)

Early ACL surgery:



Between 57 and 100 people per 100 return to their pre-injury sport around 20 months after injury.²



Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Summary of potential benefits and harms

Clinical issues

Of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

OPTION 1 - REHAB ONLY

(or delayed ACL surgery)

✓ Positives and potential benefits

- Between 41 - 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

– Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience 'giving way' of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

OPTION 2 - ACL SURGERY

(early ACL reconstruction)

✓ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

– Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Key points

- Choose what is best for your situation
- If you chose rehab only, you could still decide to have delayed ACL surgery later
- Listen and care for your whole-body
- See family, friends and health professionals for support
- Care for your mental and physical health
- Plan to try new activities
- Don't rush - expect challenges and stay positive!

+ Questions to consider when talking with a health professional...

- 🏃 Will my choice affect what sport I play?
- ❓ If I am still growing, will this affect my management?
- 📁 What type of graft is best for me if I have ACL surgery?
- 👤 Is there any psychological support available?
- 🔍 What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?

References: 1) Grindem H, et al. Br J Sports Med. 2016; 50(13):804-8
 2) James EW, et al. Am J Sports Med. 2021; 49(14):4008-4017
 3) Frobell RB, et al. NEJM 2010; 363(4):331-342
 4) Reijman M, et al. BMJ 2021; 372-375
 5) Wiggins AJ, et al. Am J Sports Med. 2016; 44(7):1861-76

6) Frosch KH, Arthroscopy, 2010; 26:1539-50
 7) Ardern CL, et al. KSST. 2018; 26 (4):898-1010
 8) Webster, Ketal. CJSM. 2022; 32(2):145-152
 9) Pitsillides, Aetal. J Bodyw Mov Ther, 2021; 28:246-254

Supplementary File 13. International Patient Decision Aid Standards checklist
(IPDASi v4.0)

Qualifying criteria	Answer
1. The patient decision aid describes the health condition or problem (treatment, procedure, or investigation) for which the index decision is required.	Yes
2. The patient decision aid explicitly states the decision that needs to be considered (index decision).	Yes
3. The patient decision aid describes the options available for the index decision.	Yes
4. The patient decision aid describes the positive features (benefits or advantages) of each option.	Yes
5. The patient decision aid describes the negative features (harms, side effects, or disadvantages) of each option.	Yes
6. The patient decision aid describes what it is like to experience the consequences of the options (e.g., physical, psychological, social).	Yes
Certification criteria	Answer
1. The patient decision aid shows the negative and positive features of options with equal detail (e.g., using similar fonts, sequence, presentation of statistical information).	Yes
2. The patient decision aid (or associated documentation) provides citations to the evidence selected.	Yes
3. The patient decision aid (or associated documentation) provides a production or publication date.	Yes
4. The patient decision aid (or associated documentation) provides information about the update policy.	Yes
5. The patient decision aid provides information about the levels of uncertainty around event or outcome probabilities (e.g., by giving a range or by using phases such as “our best estimate is . . .”).	Yes
6. The patient decision aid (or associated documentation) provides information about the funding source used for development.	Yes
7. The patient decision aid describes what the test is designed to measure.	N/A
8. If the test detects the condition or problem, the patient decision aid describes the next steps typically taken.	N/A
9. The patient decision aid describes the next steps if the condition or problem is not detected.	N/A
10. The patient decision aid has information about the consequences of detecting the condition or disease that would never have caused problems if screening had not been done (lead time bias).	N/A
Quality criteria	Answer
1. The patient decision aid describes the natural course of the health condition or problem, if no action is taken (when appropriate).	Yes
2. The patient decision aid makes it possible to compare the positive and negative features of the available options.	Yes
3. The patient decision aid provides information about outcome probabilities associated with the options (i.e., the likely consequences of decisions).	Yes
4. The patient decision aid specifies the defined group (reference class) of patients for whom the outcome probabilities apply.	Yes
5. The patient decision aid specifies the event rates for the outcome probabilities	Yes
6. The patient decision aid allows the user to compare outcome probabilities across options using the same time period (when feasible).	Yes

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3	7. The patient decision aid allows the user to compare outcome probabilities	Yes
4	across options using the same denominator (when feasible).	
5	8. The patient decision aid provides more than 1 way of viewing the	Yes
6	probabilities (e.g., words, numbers, and diagrams).	
7	9. The patient decision aid asks patients to think about which positive and	Yes
8	negative features of the options matter most to them (implicitly or	
9	explicitly).	
10	10. The patient decision aid provides a step-by step way to make a decision.	Yes
11	11. The patient decision aid includes tools like worksheets or lists of	Yes
12	questions to use when discussing options with a practitioner.	
13	12. The development process included a needs assessment with clients or	Yes
14	patients.	
15	13. The development process included a needs assessment with health	Yes
16	professionals.	
17	14. The development process included review by clients/patients not	Yes
18	involved in producing the decision support intervention.	
19	15. The development process included review by professionals not involved	Yes
20	in producing the decision support intervention.	
21	16. The patient decision aid was field tested with patients who were facing	Yes
22	the decision.	
23	17. The patient decision aid was field tested with practitioners who counsel	Yes
24	patients who face the decision.	
25	18. The patient decision aid (or associated documentation) describes how	Yes
26	research evidence was selected or synthesized.	
27	19. The patient decision aid (or associated documentation) describes the	Yes
28	quality of the research evidence used.	
29	20. The patient decision aid includes authors'/developers' credentials or	Yes
30	qualifications.	
31	21. The patient decision aid (or associated documentation) reports	Yes
32	readability levels (using 1 or more of the available scales).	
33	22. There is evidence that the patient decision aid improves the match	No*
34	between the preferences of the informed patient and the option that is	
35	chosen.	
36	23. There is evidence that the patient decision aid helps patients improve	No*
37	their knowledge about options' features.	
38	24. The patient decision aid includes information about the chances of	N/A
39	having a true-positive test result.	
40	25. The patient decision aid includes information about the chances of	N/A
41	having a true-negative test result.	
42	26. The patient decision aid includes information about the chances of	N/A
43	having a false-positive test result.	
44	27. The patient decision aid includes information about the chances of	N/A
45	having a false-negative test result.	
46	28. The patient decision aid describes the chances the disease is detected	N/A
47	with and without the use of the test.	
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3 N/A: not applicable.

4 *We plan to evaluate the decision aid in a randomised controlled trial.
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For peer review only

Supplementary File 14. User-Centered Design 11-item measure (UCD-11)

Items	Explanations and examples	Yes/No
1. Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps to help understand users (eg, who they are, in what context might they use the tool) and their needs?	Such steps could include various forms of user research, including formal or informal needs assessment, focus groups, surveys, contextual inquiry, ethnographic observation of existing practices, literature review in which users were involved in appraising and interpreting existing literature, development of user groups, personas, user profiles, tasks, or scenarios, or other activities	Yes
2. Were potential end users involved in any steps of designing, developing, and/or refining a prototype?	Such steps could include storyboarding, reviewing the draft design or content before starting to develop the tool, and designing, developing, or refining a prototype	Yes
3. Were potential end users involved in any steps intended to evaluate prototypes or a final version of the tool?	Such steps could include feasibility testing, usability testing with iterative prototypes, pilot testing, a randomized controlled trial of a final version of the tool, or other activities	Yes
4. Were potential end users asked their opinions of the tool in any way?	For example, they might be asked to voice their opinions in a focus group, interview, survey, or through other methods	Yes
5. Were potential end users observed using the tool in any way?	For example, they might be observed in a think-aloud study, cognitive interviews, through passive observation, logfiles, or other methods	Yes
6. Did the development process have 3 or more iterative cycles?	The definition of a cycle is that the team developed something and showed it to at least one person outside the team before making changes; each new cycle leads to a version of the tool that has been revised in some small or large way	Yes
7. Were changes between iterative cycles explicitly reported in any way?	For example, the team might have explicitly reported them in a peer-reviewed paper or in a technical report. In the case of rapid prototyping, such reporting could be, for example, a list of design decisions made and the rationale for the decisions	No
8. Were health professionals asked their opinion of the tool at any point?	Health professionals could be any relevant professionals, including physicians, nurses, allied health providers, etc. These professionals are not members of the research team. They provide care to people who are likely users of the tool. Asking for their opinion means simply asking for feedback, in contrast to, for example, observing their interaction with the tool or assessing the impact of the tool on health professionals' behavior	Yes

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4	9. Were health professionals	Consulting before the first prototype means	Yes
5	consulted before the first	consulting prior to developing anything. This	
6	prototype was developed?	may include a variety of consultation methods	
7	10. Were health	Consulting between initial and final prototypes	Yes
8	professionals consulted	means some initial design of the tool was	
9	between initial and final	already created when consulting with health	
10	prototypes?	professionals	
11	11. Was an expert panel	An expert panel is typically an advisory panel	Yes
12	involved?	composed of experts in areas relevant to the	
13		tool if such experts are not already present on	
14		the research team (eg, plain language experts,	
15		accessibility experts, designers, engineers,	
16		industrial designers, digital security experts,	
17		etc). These experts may be health professionals	
18		but not health professionals would provide	
19		<u>direct care to end users</u>	
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Supplementary file 12: Reasons for not implementing feedback for each section of the decision aid.

Themes	Sub themes	Feedback	Reason for not implementing feedback
Negative feedback on the decision aid	Negative feedback on the content	Health Professionals:	Health Professionals:
		A decision aid cannot be made for adolescents and children due to poor supporting evidence. [OS]	We believe that it is still possible to create a decision aid using the best available evidence.
		It was suggested that pictures were not necessary in the decision aid. [PT]	We had a large amount of opposing feedback that participants liked the inclusion of some pictures.
Outline how the decision aid should be used	Improve clarity on the target population	Health Professionals:	Health Professionals:
		Add who does well with each option. For example, how many episodes of giving way is acceptable. [PT]	We couldn't do this as there is no evidence on who does well with each outcome.
	Clarify that choices should be made based on individual circumstances	Adults:	Adults:
		Provide definitions of what a successful or unsuccessful outcome.	Treatment success is individualised.
		Health Professionals:	Health Professionals:
		Add that decisions should be made based on skeletal maturity rather than age. [OS]	We decided to specify a recommended age limit for use of the decision aid and did not mention skeletal maturity directly due to feedback it was too complex for children and adolescents to understand.
More information about specific considerations	Highlight the importance of social and psychological support, and whole-body health	Parents:	Parents:
		Some parents suggested including information about alternative medicine.	There is a lack of supporting evidence for alternative medicine in both adults and children.
		Health Professionals:	Health Professionals:

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following ACL rupture		Add information on methods of pain management. For example, the need for massage. [PT]	There is a lack of supporting evidence for pain management using massage in both adults and children.
Revise the management options to include evidence on ACL healing, bracing and ‘prehabilitation’	Children and adolescents:	Children and adolescents:	Children and adolescents:
	Include non-operative bracing as another option. Give an estimation of the percentage of people that can have ACL healing.		There is currently no evidence comparing non-operative bracing to rehab only and ACL reconstruction. There is currently no strong link between ACL healing and outcomes so we did not want to overload children and adolescents with more statistics.
	Adults:	Adults:	Adults:
	Include that it can take time to book ACL reconstruction, depending on if you have surgery privately or publicly.		This information was decided to be unnecessary as both rehabilitation timeframes mention the need to see a health professional.
	Health Professionals:	Health Professionals:	Health Professionals:
	Include recommendations of prehabilitation and checking if the ACL has healed after three months. [PT]		There is no evidence that prehabilitation is beneficial and there is currently no strong link between ACL healing and outcomes, so we did not want to overload children and adolescents with more statistics.
Include more information on practical factors influencing management choices	Children and adolescents:	Children and adolescents:	Children and adolescents:
	Include that COVID 19 may have influenced having an ACL rupture.		There is no evidence to support this claim, so we decide to exclude.
	Adults:	Adults:	Adults:
	Add consider the time it can take to book surgery.		This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.

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		Parents:	Parents:
		Add the consideration of scar size following ACL reconstruction surgery.	Scars are mentioned in the description of ACL reconstruction, but we do not expand beyond this as there is a lack of high-quality evidence on the importance of scar size following ACL reconstruction.
		Health Professionals:	Health Professionals:
		Add a statement that meniscus is a secondary restraint in pivoting without an ACL. [OS] Include the injury risk related to graft type. [PT]	We did not include this statement as it was beyond the scope of this decision aid. We included a question about graft choices which provides an opportunity to discuss graft choice with a health professional.
	Add or remove questions	Parents:	Parents:
		The decision aid could prompt children and adolescents to ask about other previous injuries not just the ACL.	We included a question about previous injuries, but this was otherwise beyond the scope of this decision aid.
		Health Professionals:	Health Professionals:
		Add 'what factors have been shown to make a bigger difference' in achieving outcomes. [PT] Add 'if I don't have surgery how would my knee function be in the future? [OS]	We did not include this statement directly as there is no evidence on who does well with each outcome. We did not include this question as it could be considered a leading question.
Change or add information on rehabilitation, exercises and return to sport	Include more detail on return to sport following ACL rupture	Health Professionals:	Health Professionals:
		Include a statistic that participation in change of direction sports in children following ACL rupture may mean a higher risk of meniscus damage. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
		Children and adolescents:	Children and adolescents:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Refine rehabilitation progression timeframes	Add remember to also focus on the uninjured leg during rehabilitation.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
		Adults:	Adults:
		Add to settle the knee with bed exercises to avoid confusion that you start harder exercise straight away.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
		Health Professionals:	Health Professionals:
		Add patient milestones or goals of each rehabilitation phase. [PT] Include when activities can be done. [OS]	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
21 22 23 24 25 26 27	Clarify the importance of testing rehabilitation progress and return to training or competition sport	Health Professionals:	Health Professionals:
		Add more detail on the classification of the individual's current level of sport and their desired level of sport. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46	Expand on the type of exercises involved in management	Children and adolescents:	Children and adolescents:
		Include the need to get a gym membership.	We did not include this statement as it was beyond the scope of this decision aid.
		Adult:	Adult:
		Include the importance of hard work on quadriceps muscle at the gym.	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.
		Health Professionals:	Health Professionals:
		It was suggested to provide more detail on muscle strengthening programs and how exercise can help to stabilise the knee. [PT]	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.

	Consider the long-term need for ongoing “hard work” and injury prevention	Health Professionals: Note that if meniscus and cartilage injuries happen, this can have major impact on the future osteoarthritis. [PT]	Health Professionals: We noted the link between meniscus damage and risk of osteoarthritis damage. The risk of cartilage damage can be discussed with a health professional.
Modify language and formatting used	Use simple language	Health Professionals:	Health Professionals:
		Reduce the number of words used in the headings to describe each option. [PT]	We decided to keep ‘or delayed ACL surgery’ and ‘early ACL surgery’ in brackets following the headings of each option throughout to keep consistency.
	Make the section more concise	Health Professionals:	Health Professionals:
		Remove the statement about quality of evidence. [PT] Soften the language around return to sport as people can return sooner and be ok [PT]	We did not remove the statement about the quality of evidence as we believe this is important in showing the uncertainty of evidence and feedback frequently reported this as important to convey. We used evidence-based ranges of times for an expected for return to sport.
	Modify presentation of harms, formatting, graphics, or statistics	Children and adolescents:	Children and adolescents:
Add more pictures to the decision aid.		We received opposing feedback that too many visuals may take away from key information.	
Adult:		Adult:	
Highlight the statistics that were ‘better’.		We did not apply highlighting around statistics to avoid bias.	
Parents:		Parents:	

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		Present statistics as percentages as it is easier to understand.	We received opposing feedback that ‘x amount of people per 100’ was preferable.
		Health Professionals:	Health Professionals:
		Include if there is a clinically significant difference in function scores between groups when presenting statistics. [PT] Use more visuals, pictures and make more like an infographic. [PT] Use a bar graph rather than an icon array. [PT] Suggestion to include definitions of a complication. [PT]	We included a statement about the quality of evidence and presented statistics without significance values to avoid making the decision aid too complex. We received opposing feedback that too many visuals may take away from key information. We received opposing feedback that using icon array was preferable than a bar graph to represent statistics. The decision aid is designed to be used with a health professional who can clarify this information.
	Use positive messaging	Parents:	Parents:
		Include a statement that research is only presenting the average outcomes.	We used evidence-based statistics, but avoided using statements that may give unrealistic expectations.
		Health Professionals:	Health Professionals:
		Add a positive message in the form of a sentence at the end of the decision aid [PT]	It was decided that key points were more appropriate.
Understanding the translation of research	Usability of the decision aid	Health Professionals:	Health Professionals:
		Move the summary page to be the first page of the decision aid. [PT]	We received opposing feedback that it was appropriate to present the summary page on the last page of the decision aid.
		Children and Adolescents:	Children and Adolescents:

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Clarify the uncertainty of evidence and outcomes of each option	Add statistics that females can be at a higher risk of ACL rupture.	We did not include this statement as it was beyond the scope of this decision aid.
	Health Professionals:	Health Professionals:
	It was suggested to include that the position of the graft in ACL reconstruction can influence outcomes. [OS]	The inclusion of graft position as a variable is beyond the scope of our decision aid.
Keep or remove statistics using adult data	Children and Adolescents:	Children and Adolescents:
	Adult statistics could be included as they may be more relevant for older skeletally mature adolescents.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
	Adults:	Adults:
	Include adult data because if someone was 19 years old and they wanted to look at adult data then it could be relevant for them.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
	Parents:	Parents:
	Include adult data as it was clear enough that it was data using adults.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.

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Supplementary file 15: Themes, sub-themes, and example quotes

Themes	Sub themes	Feedback
1. Positive feedback on the decision aid	1.1. Positive feedback on the content	Adolescents:
		Female, 15-17 yrs old - "I like the page and it makes sense to me everything that it's saying."
		Adults:
		Female, 18-20 yrs old - "So I guess informing people that have torn ACL and the benefits and limitations of each graph. And what they do would be good."
		Male, 21-30 yrs old - "I wish I had something like this for either of my ACL ruptures as following the first one I may have tried not having surgery as I was already back running."
		Male, 31-40 yrs old - "Giving them more information on what rehab they could be doing in the meantime, might lead to better outcomes until the surgery, there was for me, there was nothing in between in terms of exercise or rehab or anything. Yeah, and I didn't even know that, you know, that would have been something I should have been doing."
		Male, 21-30 yrs old - "Like it's giving you the clear picture but also showing you the downside simultaneously."
		Male, 21-30 yrs old - "Yeah, I like those, the data points there. That's pretty good. I like it as it shows you how many people out of 100. Nice. I also liked on the other page, you had the little infographic with the people bicolored."
		Parents:
		Female, 41-50 yrs old - "I like all the information, the statistics are really good."
		Female, 41-50 yrs old - "I think that's perfect." and "I think it's really good."
		Health Professionals:
		OS, Male, 31-40 yrs old - "Well thought out, nice and balanced."
PT, Male, 31-40 yrs old - "I like this. I like the summary. I think it's a good, I think is where you get a lot of information, which is really, really nice."		

	1.2. Positive feedback on design	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "I think it will be really valuable. It doesn't look boring as I get bored really quickly with medical brochures but this is engaging."</p> <p>Female, 15-17 yrs old - "I like reading it and I would go highlight it. I also like the cute little numbers and like percentage size. So I feel like this is like really good. So this is engaging."</p> <p>Female, 15-17 yrs old - "I think it's really good. I like the pictures"</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "I like that flowchart, it's pretty straight forward."</p> <p>Female, 21-30 yrs old - "I think the pictures are good."</p> <p>Female, 21-30 yrs old - "I do like that it kind of has a timeline shows you the differences and similarities and each timeline."</p> <p>Female, 21-30 yrs old - "I do like that they are like side by side. It's easy to look from one to the other."</p> <p>Female, 21-30 yrs old - "I think that I don't think that's too long or too short. I think it gives enough information without necessarily overloading someone with it. It gives you the information you need to know without being overwhelming."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I love the little pictures. Great. Easy to read. Logical. Succinct."</p> <p>Female, 41-50 yrs old - "I like it. I like how the benefits and harms are highlighted. And the numbers really pop out."</p> <p>Female, 41-50 yrs old - "Remember, choose what is best for your situation. Think of whole-body health. See family, friends and health professionals for support and stay positive. Love that."</p> <p>Health professionals:</p> <p>OS, Male, 31-40 yrs old - "That's really good, the pictures there are great and it's really good to compare"</p>
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	1.3. Positive feedback on usability	OS, Male, 31-40 yrs old - "It's really nicely displayed. So it's very easy to understand."
		Adults:
		Female, 21-30 yrs old - "I think this is probably something that would have been nice to have."
		Male, 31-40 yrs old - "It's easy to follow."
		Parents:
		Female, 41-50 yrs old - "Easy to follow."
		Female, 41-50 yrs old - "I like to timeframe because it sort of shows a comparison, especially what I've been reading a lot. So it kind of brings it together. So I can see, I like how it's broken down. Because most of the time when you go to the doctor, they don't discuss anything into this, this much detail"
		Female, 41-50 yrs old - "I actually had had a study in my hand and he didn't even look at it."
		Health professionals:
		PT, Female, 41-50 yrs old - "I really liked the first page, I think it makes it really clear that there are two options, it makes it clear that you know that if you try exercise, you still got the option for surgery, I think that's good. And that if you have successful rehab from either of them, then they return to sport or other activities. So I really liked that first page and I like the questions underneath."
2. Negative feedback on the decision aid	2.1. Negative feedback on the content	Adolescents:
		Male, 15-17 yrs old - "The pictures. I mean, it might make it look a little nicer, but it's not really giving you information. I think take the pictures away."
		Adults:
		Male, 21-30 yrs old - "Formatting could just be a no having pictures on both sides and having the legend somewhere else, but I think that was overkill with pictures."
		Health Professionals:
		OS, Male, 31-40 yrs old - "This language is too academic. Provide some more simple options."

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		PT, Male, 31-40 yrs old - "Could have it more infographic style." OS, Male, 51-60 yrs old - "What you're doing is intrinsically incorrect."
3. Outline how the decision aid should be used	3.1. Improve clarity on the target population	Children and adolescents:
		Female, 15-17 yrs old - "It makes sense to me."
		Parents:
		Female, 41-50 yrs old - "Have you thought about doing separate ones of these for boys versus girls being those girls have such a higher reinjury rate?"
		Female, 41-50 yrs old - "Females may be at a greater risk of re injury or something like along those lines."
		Health Professionals:
	PT, Female, 21-30 yrs old - "Because the well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic."	
	PT, Male, 31-40 yrs old - "So I think, obviously, there are patients that are going to do better with a reconstruction, particularly if they have a knee that for them feels unstable or is objectively unstable, either passively with bedside ligament testing, or in weight bearing their knee gives up or has given way."	
PT, Male, 41-50 yrs old - "I believe that as a sports physical therapist, there's a certain population of athletes and younger athletes that could be fine without an ACL reconstruction surgery. I don't know exactly in my mind what that percentage is, I do think it's a smaller number. And then those who will need a reconstruction surgery to get back to all functional activity and high level of sport, especially playing catch pivot activities."		
3.2. Highlight that patients need to discuss the decision	Adolescents:	
	Female, 15-17 yrs old - "So just knowing the fact that they've had some someone go in there, like a professional and fix everything up. I feel like that helps."	

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	aid with health professionals	<p>Adults:</p> <p>Male, 21-30 yrs old - "It was for children and adolescents. But should be used with a parent and guardian with health professional. So I thought that was good."</p> <p>Male, 21-30 yrs old - "But if that disclaimers at the top, and it's you know, in bigger writing, you say like, okay, if I'm going to do this option, I should still speak to a professional rather than making this decision on my own."</p> <p>Male, 21-30 yrs old - "Your final step should be going to see a healthcare professional like a physio before you go back."</p> <p>Female, 18-20 yrs old - "Added on to the second one. Like should be used with guardians and health professionals. And then like in brackets, it's not made to replace advice from health question or something."</p> <p>Male, 21-30 yrs old - "I think that when I got mine down, I didn't really know what they were doing. And you wake up and your knees so sore. And you're like, "Why was my knee so swollen? But they've drilled through your tibia to attach this new data graph there?"</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Discharge procedures is that they do the medications, etc. And again, for myself, as a mother, none of it was discussed with myself."</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "And it's also getting parents to understand what that is going to mean through the health professional. In terms of giving way – swelling, locking, hints of an unhappy knee is indicative of chondral damage, or meniscal tears."</p>
	3.3. Clarify that choices should be made based on individual circumstances	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Like the psychological issue, like it depends on like your circumstance, but I feel like it should still be talked about with your professional."</p> <p>Female, 15-17 yrs old - "You gotta listen to your own body, because someone could be telling you something, and you could not feel the same."</p>

		<p>Male, 15-17 yrs old - "You know you might get clearance from your health professional but you don't feel confident in your knee yet, for example."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "I do like to this says Not everyone will return to pre injury sport. Because lots of things can happen. And all of the recoveries can be different."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Delayed ACL surgery doesn't sound that bad. But also I feel like it is very circumstantial."</p> <p>Female, 41-50 yrs old - "It should be an individual choice. And I think what you're saying there is sort of reflecting that, you know, you make this decision."</p> <p>Female, 41-50 yrs old - "Remembers that everybody's gonna have different results."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "Yeah, I so I like it. And I what I really like about it, is the questions to consider, you know, particularly around, you know, individual factors, age, sporting participation cost, all those kinds of things."</p>
<p>4. More information about specific considerations following ACL rupture</p>	<p>4.1. Highlight the importance of social and psychological support, and whole-body health</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Only thing I think about is how long will I sort of be limited in my sort of getting around and being able to socialise or how long have you crutches for. like you're saying you to how long to kind of walk around and go see your friends that sort of thing. That's important."</p> <p>Female, 15-17 yrs old - "Yeah, I feel like the immobility that you have. I feel like that's really important. Because for like that first month, you're completely reliant on like, whoever you haven't house with you. Yeah, and you just can't do anything. Really."</p> <p>Female, 15-17 yrs old - "I wasn't really offered any psychological help."</p>

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		<p>Female, 15-17 yrs old - "I noticed that because I had put most of my weight on my right leg instead of my left like white bear in it. I my hip my like lowered discs in my back have like never really been the same."</p> <p>Female, 15-17 yrs old - "I didn't see any of my friends for like, two months, I barely saw my family. Like, I was literally in my house for like, two months, I didn't see anyone, so it was like, very isolating."</p> <p>Female, 15-17 yrs old - "But I think there should be a lot more psychological support. Yeah. I think mentally, it's just as hard or harder than the actual physical injury. And often, that's missed as well, like, it's not even talked about how hard it is."</p> <p>Female, 15-17 yrs old - "Fear of and it wouldn't be whether you have ACL surgery or not afraid of re injuring and I think that that's a really big psychological step to get over whether you have surgery or not."</p> <p>Female, 15-17 yrs old - "So, with weightlifting, I kind of I don't even back off, but like, I can feel that my legs are a lot weaker that certain time of the month. But then two days later, it'll be completely fine."</p> <p>Male, 15-17 yrs old - "It was hard. But the mental part of it the hardest part, like getting past that."</p> <p>Male, 15-17 yrs old - "Like mental health that you're looking after, as well. Yeah. Because it's such a mental battle for you to get back and feel ready to play and be confident. Or as well, because you're consistent with the rehab."</p>
Adults:		<p>Female, 21-30 yrs old - "Psychological support is also important, that's something that I didn't really think about. Yeah, was like, how tough it would be mentally. So that would definitely be a good thing to have."</p> <p>Male, 21-30 yrs old - "For example, my glutes not switching on because of the knee and then like not focusing enough on them, which then puts more pressure on the knee that puts more pressure on my back can lead to complications elsewhere? Like it's not just a knee problem?"</p>

		<p>Male, 21-30 yrs old - "So definitely highlighting the whole psychological impact of if you're not ready, you don't have to go back."</p> <p>Female, 18-20 yrs old - "Remember when I was disappointed people told me that, like, you're not a full-time athlete. You're not getting paid to rehab. Yeah. And yeah, so it's like, to me, it's, it's like, important that kids know that that like when they say nine to 12 months, like that's what professional athletes are coming back in."</p> <p>Female, 18-20 yrs old - "Um, the psychological health. I think that's good. And really important that it stays there."</p> <p>Male, 31-40 yrs old - "That's a big component as well. I think just anything with any injury, really just a psychological rehab."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Not just about that what sport she can play but about the effect of the slow recovery on their social life. Being able to go and like walk."</p> <p>Female, 41-50 yrs old - "It doesn't incorporate any alternative things."</p> <p>Female, 41-50 yrs old - "Especially the psychological support or something. I figured it would kick in eventually, when finally realising how severe I guess the injury was. But no one ever talks to us about that."</p> <p>Female, 41-50 yrs old - "If you don't feel like doing your exercises, things like that, to know that, you know, that's normal that, that, you know, a lot of people experience the same thing, which is why those groups are good. That you can see what other people are doing as well."</p> <p>Female, 41-50 yrs old - "The big thing with the ACL with them and actually speaking to people who have returned the ACLs, because we do know, quite a few people that have"</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "I think one of the factors that needs to be considered is your psychological support. That's probably the biggest one of the biggest issues that I think is coming more and more to the forefront."</p>
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		PT, Male, 21-30 yrs old - "Whether a patient needs surgery or not, is highly dependent on the person and what their needs and goals are."
	4.2. Revise the management options to include evidence on ACL healing, bracing and 'prehabilitation'	<p>Adults:</p> <p>Male, 21-30 yrs old - "I feel like besides those three routes, like you either, we could have option four do nothing."</p> <p>Male, 21-30 yrs old - "There's only like exercise and delayed and earlier ACL surgery – had you just thought about doing the other options like the brace protocol? If you've seen that the doctor cross brace one?"</p> <p>Male, 21-30 yrs old - "Like prehab like before you have surgery. It can take a long time to get an ACL surgery appointment. Even like, mine was two weeks. But like, in those two weeks, I was like, rehabbing my knee to the best I could before my surgery."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "So for us option one, we didn't really consider option one we considered our option one was bracing protocol option two surgery, and we decided we'd go first and bracing protocol."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "At the time, [ACL surgery] was what we thought was the only option. We thought that that was important to do. And then honestly, then I had a few people who, like, they weren't actually great surgical candidates, but they still went and had it because we thought that's what you had to do. And it really made me question like the necessity of it."</p> <p>PT, Male, 31-40 yrs old - "Yeah, so obviously, there is a few treatment options that are available in the sense of early reconstruction prehabilitation, or delayed reconstruction with a set date. So you can do prehab and then reconstruction, or rehabilitation exercise therapy/physiotherapy on its own with the option of surgery later if you need it."</p>
	4.3. Include more information on practical factors	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "It would have been good to know what like where the incisions would be, yeah, just so that you could have been prepared."</p>

	<p>influencing management choices</p>	<p>Adults:</p> <p>Female, 18-20 yrs old - "As someone who did it in high school, you've got school, you've got a job, or at a job, you've got, like, you got to go to the gym, like four or five times a week, and then go for it again, as well, whilst you're going to the gym."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "The length of time on crutches and sort of you know, those length of time using sort of walking aids or with braces those sorts of things? I think that'd be something that a kid wants to know about."</p> <p>Female, 41-50 yrs old - "The options of quad, the quad graft, the patella graft, the hamstring graft, the donor graft. I mean, those are all the things that we've looked at."</p> <p>Female, 41-50 yrs old - "Is there anything about the requirement to have it immobilised? With a teenager, it was very hard to get them to wear a big, ugly, chunky brace."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "I treated someone years ago, who was the donor site for their child. And so I don't know if they're still doing that"</p> <p>PT, Female, 21-30 yrs old - "Add in something around 'Maybe even if I do have surgery quickly, what should I be doing until then?'"</p>
	<p>4.4. Add or remove questions</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "I think they're good questions. I guess the main thing that you want to know is like, how long does it take to get back? If I don't have surgery?"</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "That's pretty good. Like that first one, because that's like, good, roundabout way of saying that you might not get back to pivoting sports, which is good."</p> <p>Female, 21-30 yrs old - "But a lot of people, well, they can be pretty clueless about these things. So I think that's a really good thing to have."</p> <p>Female, 18-20 yrs old - "I think the questions down the bottom are super good."</p>

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		<p>Parents:</p> <p>Female, 41-50 yrs old - "Considering the cost Yeah and even a child is gonna be aware of those stresses and a family's, economics. so maybe having a question about the cost as well."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "What happens in the surgery? You know, like, because we've paid, you've obviously got a few graft choices. So I think they should know whether they're going to have it taken from themselves, or whether they're going to have a donor, or whether they're going to get a cadaver for. And then what that entails, like, you know, so they kind of have an explanation of it. And so they need to ask about that would be my something that, I would say, just as a side point"</p> <p>OS, Male, 41-50 yrs old - "Yeah, basically, what happens if I don't have surgery? The benefits of surgery, basically, are the two main things. Well, I need to change if I don't have surgery. Well, I need to change what sport I play but also if I don't have surgery, what will happen in the future? Like, what if my knee function without the ACL? They want to know if there's any long-term problems."</p>
<p>5. Change or add information on rehabilitation, exercises and return to sport</p>	<p>5.1. Include more detail on return to sport following ACL rupture</p>	<p>Adolescents:</p> <p>Female 15-17 yrs old - "I don't have the desire to go into a club anymore. Because I'm so scared that it will happen again, because I know that they still like a huge chance that will happen."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I was all for surgery, because my goal was to get back to sport, and I just didn't think I trusted the process of having gone through rehab without having the surgery."</p> <p>Male, 21- 30 yrs old - "The takeaway you'd get from that page. Like it's possible. But it's, you know, a little bit of a risk. You know, yeah, you get through or not, but I guess you're doing it, knowing that's the case."</p> <p>Male, 21- 30 yrs old - "If you don't feel comfortable going back to sport, once fully recovered, you don't have to go straight back to sport."</p> <p>Female, 18-20 yrs old - "Feel like, yeah, you got a lot of false hope from people. Yeah. So I think that, like the tie, like giving a timeline is good. But it can also be like, really dangerous, because</p>

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		<p>then people get to that 12. Like, I mean, I was at 12 months being like, I'm still not playing sport like.”</p>
		<p>Parents:</p>
		<p>Female, 41-50 yrs old - “I read statistics like that. Something very, similar, in my little delving down little rabbit holes, to find out outcomes. And when there was talk about returning to play soccer, I wasn't supportive of that. Yeah, for that very reason.”</p>
		<p>Health Professionals:</p>
		<p>OS, Male, 31-40 yrs old - "I think patients might read that like running, cycling, swimming, and they might go, I can't do anything for three months. Yeah, rather than I can do some of this stuff, but I can't do it in the same fashion."</p>
		<p>OS, Male, 41-50 yrs old - "I would be very hesitant to recommend a return to pivoting sports with no ACL for the younger people, because they are already a little bit lax in their joints."</p>
	<p>5.2. Refine rehabilitation progression timeframes</p>	<p>Adults:</p>
		<p>Male, 21-30 yrs old - “Well, for my second one, where I did conservative I was, I was cycling within a couple of weeks. I'm running after about a month.”</p>
		<p>Male, 31-40 yrs old - “All those timeframes that seem pretty accurate.”</p>
		<p>Female, 18-20 yrs old - “These timelines are a guide. Like, and like aren't certain. Yeah, but yeah, I think the other thing that's hard with it as well is like adolescence.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “Rehabilitation for two to three months is not enough. Like it's just not enough. You know, we need at least three to six months like there's, it's hard because as we've said, it's like the research and guideline evidence is very thin on the ground, particularly for paediatric populations. But the Swedish guidelines for adults would be three to six months.”</p>
		<p>PT, Female, 41-50 yrs old - "Nine months, nine to 12 months with surgery. And without surgery, I don't see a reason why it should be shorter. Without of course, the [duration of] swelling may be shorter, because you don't have an operation. But it isn't always faster. It can be really the same. It depends on if it's only the ACL or there are also other structures which are injured."</p>

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		<p>PT, Male, 31-40 yrs old - "It's rare that I see anyone get back to sport at nine months, then maybe that's me holding them back a little bit. It's not almost always 12 plus. I, but I don't know, maybe that's a confidence thing, or not a confidence, but a motivational thing for patients to if you say to them talk, it's gonna be 12 months. Sometimes that can be a bit confronting early on No, nine sounds a little bit better. You know? I think they think, you know, we definitely know it's possible, right? "</p>
	<p>5.3. Clarify the importance of testing rehabilitation progress and return to training or competition sport</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "So because I know this is return to sport. But to me is returning to sport. Unrestricted."</p> <p>Male, 15-17 yrs old - "Physio was really good. So he'd basically tell us every week yeah, okay, you can do this. And then he'd give us a letter to say, okay, she's allowed to do, you know, this part of that in her training, she's not allowed to do directionals she was only allowed to run straight lines or whatever."</p> <p>Male, 15-17 yrs old - "I do think to add in the just for the general person a clearance for return to sport that then must do a proper documented return to play protocol and "when cleared by medical professional."</p> <p>Adults:</p> <p>Male, 31-40 yrs old - "In that middle section here could have like, you know, clearance or passing test or something."</p> <p>Male, 21-30 yrs old - "Like a clearance to return to sport with testing or like something like that."</p> <p>Female, 18-20 yrs old - "I don't know, maybe you could do like a staggered return to sport and other activities or like something."</p> <p>Female, 18-20 yrs old - "Even adding the word gradual into the return to sport."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Like with that clearance with a health professional. It's the what do you call it? like the return to sport criteria? I think that's really important."</p>

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		<p>Female, 41-50 yrs old - “Return to sport, they do a psychological assessment, as well. And it's sort of not just physical, it's a psychological test, as well. And I think that's pretty important.”</p> <p>Female, 41-50 yrs old - “You know, they look for, you know, strength testing of at least 90% of your other side. So, you know, on your leg press or knee extensions, or you know, isometric testing.”</p> <p>Health Professionals:</p> <p>PT, Male, 21-30 yrs old - “So you have a lot of people who come out of surgery if they're not like physically active in general did struggle or like physically active prior to surgery would find it much harder. Yeah, it would be a good way to like, have that looked at as for so like, objectively measuring whether your injured limb is at least at a certain percentage of your non injured limb prior to surgery.”</p> <p>PT, Female, 41-50 yrs old - “I would rather say “If your knee is giving way, please talk to your health professional” because if you write it like that it's kind of already the decision if it's more giving where you need to do the operation and I find it it's more individual and it's makes sense maybe to talk to a health professional to really decide if this is a reason to opt for the surgery or not.”</p> <p>PT, Male, 31-40 yrs old - “Mention that the body can or the muscle system can learn to take over the role of an injured ACL to restabilise the knee something like that.”</p>
	<p>5.4. Expand on the type of exercises involved in management</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - “And that's why I said we need to get your gym membership.”</p> <p>Adults:</p> <p>Female, 21-30 yrs old - “One could be a little more than what someone should be doing right after surgery. So it could be the exercises that your doctor or physical therapist, like prescribes you as to not do something too fast.”</p> <p>Parents:</p> <p>Female, 41-50 yrs old - “You're not sure what kind of muscles are talking about the kind of description of the treatment is unclear.”</p>

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		<p>Female, 41-50 yrs old - “Was just thinking is the range of movement and the flexion so there was so much emphasis with flexion and he needed to get it.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “I primarily sort of focused on the types of exercises, I just focus on giving them information about exercises. Giving them that and then sort of telling them that they need, like, probably adjunct therapies, like, hands on physiotherapy as well to go to go with the exercise as well.”</p>
	<p>5.5. Consider the long-term need for ongoing “hard work” and injury prevention</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - “This is a requirement to think about the longevity of it. And obviously staying light and life is going to support that structure better.”</p> <p>Female, 15-17 yrs old - “Without Surgery, you still put a lot of effort into your exercises, which is not easy to do and be consistent.”</p> <p>Female, 15-17 yrs old - “I wouldn't say like missing school, but I would just say time consuming.”</p> <p>Adults:</p> <p>Male, 21-30 yrs old - “Just emphasis on either option, you need to continuously keep it up. Something like both options, have uncertainty with the standard of recovery and require hard work. Yeah. With exercises now and continuously going forwards.”</p> <p>Male, 31-40 yrs old - “More emphasis on how on the hard work on exercises to get better. I guess a lot of people don't know that that's going to happen. So even like just that image of like, you know, someone doing the knee extension machine or something. Or like just an image of their quad and saying like it takes hard work.”</p> <p>Female, 18-20 yrs old - “I did mine four years ago, and like, I still have to go to the gym, otherwise, my knee feels weak. And like that was four. So I think some people assume that once you're back, you're back”</p> <p>Female, 18-20 yrs old - “Mean, to me now long term is like my whole life. whether we say like, you know, like, lifelong exercise or something like that to make them consider that.”</p>

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		<p>Parents:</p> <p>Female, 51-60 yrs old “Unfortunately, there's so much pressure on these kids to get back to sport. And, you know, they feel the need that they're missing out and stuff like that. There's, you know, and it's hard trying to tell someone not to rush not to rush it back.”</p> <p>Female, 41-50 yrs old - “I think it would say need a certain level of dedication or something like that. Yeah. Because I think that's what made her successful is that she was dedicated to doing it.”</p> <p>Female, 41-50 yrs old - “Because it's that consistency, as you probably saw, you know, you have to keep going with it.”</p> <p>Female, 41-50 yrs old - “Some people may think once I finished my nine months of therapy, I'm done. But it's like, it's a lifelong journey, if you will.”</p> <p>Female, 41-50 yrs old - “I've been reading a lot about them. And later on down the road, like a lot of people look at right now. And I want to look at how's the knee gonna be when they are 25 or 30.”</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - “But the recovery and the rehab is actually the hardest bit. And most surgeons will tell you, or at least most of the surgeons are as actually more and more don't really matter what sort of version of the surgery we do. As indeed, we do the hard work afterwards. We are the ones that have to. I think probably in terms of decision making, whichever one you choose, you need to do a boatload of hard work.”</p> <p>PT, Male, 41-50 yrs old - “So I stress immediately that the hard work begins on the moment you wake up from surgery and will not stop, you will have a year of rehab. And after that, you will still have to maintain the strength and do spend a lot of time focusing on your knee control. It becomes it needs to become a lifestyle change rather than just yeah, I'll turn up for physio every so often. And I don't think surgeons because they haven't got the time they stress it enough.”</p> <p>PT, Male, 31-40 yrs old - “But I liked that closing, you know, use, you know, require ongoing hard work and exercises and use the people around you for support and choose whatever option is best for your situation. I think that's nice as a closing statement.”</p>
	<p>6.1. Use simple language</p>	<p>Adolescents:</p> <p>http://www.bmjopen.bmj.com/site/about/guidelines.xhtml</p>

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6. Modify language and formatting used		Female, 15-17 yrs old - "Irreparable was that a bit hard to understand"	
		Adults:	
		Male, 31-40 yrs old - "You're not using any technical, like overly technical terms, not using any jargon that people can't understand. It's simple language."	
		Male, 31-40 yrs old - "Think it's all sort of worded. Like, easy to understand. it's all it's all pretty clear to me how its worded."	
		Health Professionals:	
		PT, Male, 31-40 yrs old - "Adult comprehension and health literacy isn't so good, but in kids, it may not be even as good."	
		PT, Male, 31-40 yrs old - "We're assuming that the patients who go to weigh all this information up will have the health literacy, the time to do so and the interest in doing so."	
	6.2. Make the section more concise		Adults:
			Male, 21-30 yrs old - "I like now it's nice and simple."
			Male, 21-30 yrs old - "No more stuff in the graph, I think we'll clutter it too much."
		Health Professionals:	
		PT, Female, 41-50 yrs old - "Yeah, I find this whole page quite confusing. I would say I would remove the issues of the knee not necessarily caused by the treatment choice." OS, Male, 41-50 yrs old - "I found this whole thing very wordy. wordy. Yeah. Yeah. So unless the parents are completely involved, right, they don't really would read all of it. They would not read all of it. Unless they're that sort of parents like very much. Totally involved. When he comes to see me, they just want to know, the very simple stuff."	
6.3. Modify presentation of harms, formatting, graphics, or statistics		Adolescents:	
		Female, 15-17 yrs old - "I think the little people, I just think it'd be better set. If like 10 of those people were purple, and it was just on the one graph than the rest of them were blue."	
		Adults: <small>For peer review only: http://bmjopen.bmj.com/site/about/guidelines.xhtml</small>	

		<p>Male, 21-30 yrs old - "I liked on the other page, you had the little infographic with the people."</p> <p>Female, 18-20 yrs old - "If it does give way, pretty heavily, then it could definitely injure something else."</p> <p>Male, 31-40 yrs old - "If someone's got an unstable knee that keeps giving away and causing other injuries, is that not going to increase their risk? Of having osteoarthritis?"</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "It might be worth keeping the left-hand side as sort of a shaded blue, and then the right hand side, a shaded purple."</p> <p>Female, 41-50 yrs old - "It probably would be more clear, having the two distinct colours."</p> <p>Female, 41-50 yrs old - "My brain went straight to I want to know whether there's early onset arthritis, and you see that more in people who have had knee surgery than those who haven't for example, like that, that was a real question in my head."</p> <p>Female, 41-50 yrs old - "Visually the difference between the two actually jumps out at you. So what I would do is so these, this two to four weeks, move it up slightly"</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "The pictures could have more impact for a kid"</p> <p>PT, Male, 31-40 yrs old - "I think that's a better representation for the patient than two scores that they have to then interpret, you know, filter through another level, and which they're not necessarily have the skills to do. So if it turns out that yeah, the clinically, minimal clinically important difference isn't there, then I would just say that you think that even maybe remove the graph and just have that summary. And it could even simplify it further?"</p> <p>PT, Male, 41-50 yrs old - "Yeah, I think the next one looks too busy. I know what you've kind of tried to do. But if you're a parent or a kid that's going to look at that that one doesn't. You know, you've got the coloured in people, and then you've got a bar graph. And then I think the first one works better. Just in terms of how it looks. This one is just statistics. Yeah, it's just a statistic box on the right where one person returning to pre injury sports."</p>
	For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	Adolescents.

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	<p>6.4. Use positive messaging</p>	<p>Female, 15-17 yrs old - "It's hard because every injury is an individual injury and pending on how much you put into it, how active you are. You know, like, just because one person can do it doesn't mean the next person can't do it"</p> <p>Female, 15-17 yrs old - "When you've got a tough journey to get through, at least, you know, everyone else was stuck at home (COVID 19) as well, in some respects."</p> <p>Parents:</p> <p>Female, 51-60 yrs old - "Your knee you know might be stronger if you need surgery later or delay something like that"</p> <p>Female, 41-50 yrs old - "These are just averages of research. And, you know, that doesn't mean this is what you have Yeah, something like that, just so that they always like to look at things from a more optimistic lens."</p> <p>Female, 41-50 yrs old - "Making sure you've got people around you for support, you know, whole body health. Like we've mentioned before, taking care of like their mindset, some days, you're not going to feel like doing your exercises, and other days, you'll be more motivated. So being aware of that as well. And then staying positive, as you said, trying to be optimistic with how you're looking at it."</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "But we all when you when you talk to a patient, just to say, if it's unsuccessful, it's not your fault, it just happens. Sure, you know, and we need the time and from time to time we have just to change the process. Yeah. Because in my experience, people just react very self-criticism, like, 'Oh, if it's not working, it's my fault because I didn't do enough training or I was too lazy.'"</p> <p>PT, Male, 21-30 yrs old - "Yeah, and I really liked that last bit down the bottom, like, it's quite obvious that whatever works best for you, in your situation, at the best at your time with your sport, remain positive is one of the main things because like, we know, obviously, there's a big psychological problem following ACL stuff. So use the people around you for support. So I like that."</p>
		<p>Adults: For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>

<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28</p> <p>7. Understanding the translation of research</p>	<p>7.1. Improve the usability of the decision aid</p>	<p>Male, 21-30 yrs old - "If I had something like this I probably would have tried conservative but I didn't really have a there wasn't another option back then you're a young soccer player if you do your ACL you get surgery done."</p> <p>Male, 21-30 yrs old - "You have a list of healthcare professionals or the route you should take, like being a physio prior to going straight to surgery. Even before Doctor."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I think it's better it's better to use as an aid for someone explaining it rather than just handing it to someone to kind of decipher."</p> <p>Female, 51-60 yrs old - "Will this be like a document that people can look at? Or is it going to be like that, how's it going to be presented to people."</p> <p>Health professionals:</p> <p>PT, Male, 31-40 yrs old - "I would be a bit overwhelmed by this, I think it was a patient to be like, can't make this simple in my own head, like, I don't know, just my experience with patients. Not that it is a simple decision. But I find when patients are overwhelmed, they tend to just kind of they grasp for certainty. And I always get that from surgeons, because they make it so black and white. And so that's a priority is to make sure that the information isn't overwhelming. And I think it's just a bit too much content. Maybe more could be presented graphically."</p>
	<p>7.2. Clarify the uncertainty of evidence and outcomes of each option</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Even if you have surgery, I guess it's not a guarantee to get back to sport, even, you know, at school and that as well."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I didn't want to take the chance of trying something new if it was, yeah, if it was less researched on or if it was less used."</p> <p>Female, 18-20 yrs old - "I think maybe just something about like, both, like both options have uncertainty."</p> <p>Female, 18-20 yrs old - "I really liked the preface about not everyone will return to pre injury sport with either option."</p>

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		Parents:
		Female, 41-50 yrs old - "The first thing he said was, her ACL is torn, she needs to have surgery. And he wasn't open to telling me anything else."
		Health professionals:
		PT, Male, 31-40 yrs old - "I always find it challenging when they're a little bit younger or elite level athletes, because obviously, they're not catered for in or looked at with the some of the research. So I think that's when it's really challenging, because you're already dealing with uncertainty. And I think it's always a difficult one, because they're looking for, I think they're kind of almost leaning on you for direct guidance. I think when you've got another operator, say, as a surgeon coming in and saying, This is what you need to do, it's much easier for them to take route, if that makes sense. I think, yeah, presenting uncertainty in itself, is a challenge to parents and adolescents, because I think they're looking at that stage in a, you know, what's probably a bit of a traumatic time for them for a clear answer and what they need to do."
	7.3. Keep or remove statistics using adult data	Adolescents:
		Female, 15-17 yrs old - "Even if you are younger athlete, to see what the outcome is later on."
		Adults:
		Female 18-20 yrs old - "I feel like I have like, mixed feelings, because those could be this good. Adult is pretty much anyone over the age of 18. So I feel like you could do young adults, like let's say less than 25. Because I feel like the stats, if you can get that specific, wouldn't change the decision process behind let's say, the 17 year old if they work to re rupture in their early 20s."
		Male, 21-30 yrs old - "But I assume that if you were 19, and you had just done your ACL, then you'd want some data."
		Female, 18-20 yrs old - "What if someone was 17? Yeah. And they may want to look at both. If they're right on that edge, and not really knowing like, Okay, well, should I be considered an adolescent? Or should I be considered an adult, they may want to look at both."
		Male, 21-30 yrs old - "It's obviously adult data. I was just confused jumping between the two."
		Female, 18-20 yrs old - "Because well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that

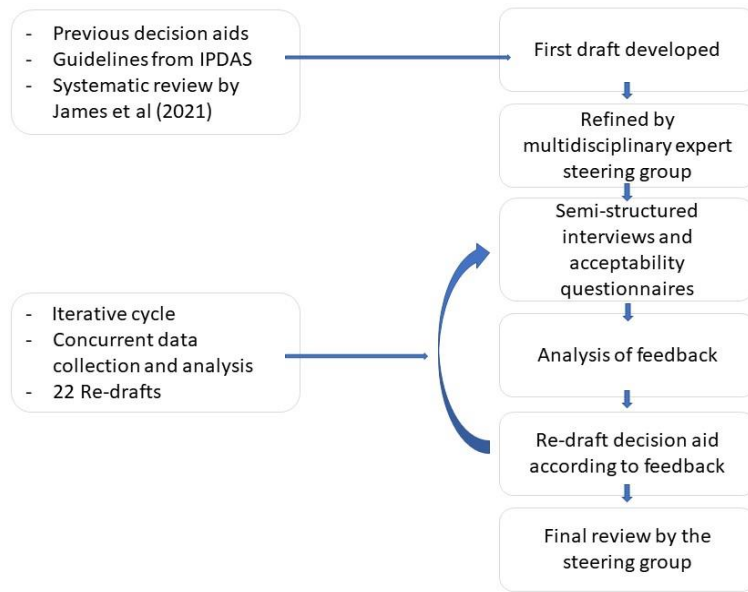
		<p>as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I thought that I thought the whole study was the under 18. So I didn't realise you had both over and under 18. I think that was my I just assumed everything could be under 18."</p> <p>Female, 41-50 yrs old - "I think you should give someone all the information."</p> <p>Female, 41-50 yrs old - "Good to know that, you know, say if you were 17 or closer 18. You know, maybe you could pay more attention to these numbers."</p> <p>Health professionals:</p> <p>PT, Female, 41-50 yrs old - "If I was explaining this to someone, I'd say, Look, we don't have lots and lots of research on someone your age. But we have research on people who are 20 and 30. And they're weekend warriors. They're not elite athletes. This is this is the information we have."</p> <p>OS, Male, 31-40 yrs old - "So these are two different populations. And I stress that to patients, I treat my adolescent patients, and my young adults very differently to my adults, or my degenerative ACLs that are in their 40s or 50s, they get treated very differently, and more often non operative managed for that reason. But I think I treat them as three different categories of patients, in my mind, it's probably because we have poor data and understanding of them. But very poorly, we have higher risk factors in patients under the age of depends on how you classify them, but maybe under the age of 18, or maybe under the age of 25. These factors are very different. So yeah, I don't think this data is appropriate to use in that setting."</p> <p>OS, Male, 31-40 yrs old - "And if this was an adult one, sure I think but highlighting some of the drawbacks of the data is important. But yes, this is kind of what that research says. I think to use in adolescence is not appropriate."</p> <p>OS, Male, 51-60 yrs old - "You're using adult data to aid in decisions for children, and you can't do that. So the whole thing is terrible. I really would suggest that you reconsider what you're doing."</p>
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PT = physiotherapist; OS = orthopaedic surgeon

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Supplementary file 17: Flow chart of the development process



IPDAS, International Patient Decision Aid Standards.

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Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

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3 **Development of a patient decision aid for children and adolescents following anterior**
4 **cruciate ligament rupture: an international mixed-methods study**
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ABSTRACT

Aim: To develop and user test an evidence-based patient decision aid for children and adolescents who are considering anterior cruciate ligament (ACL) reconstruction.

Design: Mixed-methods study describing the development of a patient decision aid.

Setting: A draft decision aid was developed by a multidisciplinary steering group (including various types of health professionals and researchers, and consumers) informed by the best available evidence and existing patient decision aids.

Participants: People who ruptured their ACL when they were under 18 years old (i.e. adolescents), their parents, and health professionals who manage these patients. Participants were recruited through social media and the network outreach of the steering group.

Primary and secondary outcomes: Semi-structured interviews and questionnaires were used to gather feedback on the decision aid. The feedback was used to refine the decision aid and assess acceptability. An iterative cycle of interviews, refining the aid according to feedback and further interviews, was used. Interviews were analysed using reflexive thematic analysis.

Results: We conducted 32 interviews; 16 health professionals (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who ruptured their ACL when they were under 18 years old (7 were adolescents and 9 were adults at the time of the interview). Parents participated in 8 interviews. Most health professionals, patients, and parents rated the aid's acceptability as good-to-excellent. Health professionals and patients agreed on most aspects of the decision aid, but some health professionals had differing views on non-surgical management, risk of harms, treatment protocols and evidence on benefits and harms.

Conclusion: Our patient decision aid is an acceptable tool to help children and adolescents choose an appropriate management option following ACL rupture with their parents and health professionals. A clinical trial evaluating the potential benefit of this tool for children and adolescents considering ACL reconstruction is warranted.

Keywords: ACL; children and adolescents: decision aids; orthopedics; shared decision making;

Strengths and limitations of this study:

- We developed a decision aid that satisfies the International Patient Decision Aid Standards criteria and used mixed methods to evaluate acceptability of the decision aid.
- One-on-one interviews conducted with participants from different countries allowed for in-depth feedback to be gathered on the decision aid, but the usability of the decision aid may be limited by the number of interviews with participants from each country.
- We were able to interview health professionals who manage children who have ruptured their anterior cruciate ligament but were unable to recruit children-participants to interview with their parents.
- Our patient decision aid was limited by the lack of high-quality evidence comparing rehabilitation only to ACL reconstruction followed by rehabilitation in children and adolescents.
- The systematic review used to inform estimates of benefits and harms included older studies that did not always report details of rehabilitation and may not reflect advances in treatment.

Development of a patient decision aid for children and adolescents following anterior cruciate ligament rupture: an international mixed-methods study

1. Introduction

The incidence of anterior cruciate ligament (ACL) ruptures continues to increase[1]. The total annual incidence of ACL ruptures in children and adolescents rose by 46% between 1994 to 2013 in the United States and the overall annual rate increased by 147.8% between 2005 to 2015 in Australia[2,3]. This increase has been linked to more children and adolescents participating in organised sport, increased intensity of training, and, potentially, a focus on single-sport specialisation at an earlier age[4-6]. The number of ACL reconstruction surgeries in children and adolescents is also increasing globally[1,6-8] despite non-surgical treatment (rehabilitation only) being an option[9].

Recommended management options following ACL rupture include rehabilitation only, rehabilitation with the choice to undergo ACL reconstruction at a later time, or early ACL reconstruction[10,11]. Research comparing these options is scarce, particularly in children and adolescents[9]. Two randomised control trials (RCT) (n=167[11]; n=121,[10]) have shown that early ACL reconstruction in adults does not result in superior knee function, sports participation and quality of life compared to rehabilitation only with the option for delayed ACL reconstruction. A third RCT (n=316[12]) found that ACL reconstruction was clinically superior to rehabilitation alone for adults with non-acute ACL injury and long-term knee instability. However, there are no RCT's directly comparing these treatment options in children or adolescents[13].

All treatment options following ACL rupture have risks, with recent guidelines and systematic reviews highlighting uncertainty regarding which approach is superior for children and adolescents. International consensus guidelines state rehabilitation only is a viable and safe option following ACL rupture in skeletally immature children without associated injuries or major instability problems[9,14]. However, some guidelines also state 'repairable' injuries (e.g. bucket-handle meniscal tear) associated with an ACL rupture should be considered an indication for early ACL reconstruction and meniscal repair[9,15]. Two recent systematic reviews[13,16] present conflicting evidence on the certainty of meniscus injury risk when choosing rehabilitation alone or considering the timing of a potential ACL reconstruction. Given this uncertainty and potential impact of poor management choices, there is a need for better evidence-based resources.

Patient decision aids are resources that present balanced information on the benefits and harms of different treatment options. They aim to improve the likelihood of informed choices and active participation of patients in healthcare decisions without negative patient outcomes[17]. Supporting shared decision making in children and adolescents following ACL rupture is necessary given the possible consequences of poorly individualised treatment[9,18,19]. Currently there is no patient decision aid for children and adolescents who have ruptured their ACL. A patient decision aid could help align expectations with evidence and improve patient satisfaction.

Our aim was to develop and user-test a patient decision aid for children and adolescents following ACL rupture to be used with parent and health professionals that presents evidence-based information on treatment options.

2. Methods

Initial design of the decision aid

We developed a patient decision aid informed by the International Patient Decision Aid Standards (IPDAS) checklist and Collaboration Evidence Update 2.0[20]. A multidisciplinary steering group was assembled (study authors), including topic experts on ACL injury and physiotherapists with experience managing ACL ruptures (AG, JZ, MM, DA, EP, CM, SF, SM), people who have experienced an ACL rupture (SF, MM, EP, IAC) and one who was 18 years old when they ruptured their ACL (SF), an orthopaedic surgeon (IH) and patient decision aid and shared decision-making experts (KM, TH and RT). The first draft of the decision aid was informed by a template used for previous decision aids (for Achilles rupture[21], shoulder pain[22], antibiotics[23] and knee arthroscopy[24]) developed by some authors in the steering group (JZ, MM, KM, TH, RT, CM, and IH). Key features adopted from these decision aids included questions to consider when talking to health professionals, icon arrays to present statistics, and a table comparing the potential benefits and harms of each management option. Decision science evidence suggests these features improve patient decision making[25-28]. We also included statements of the quality of evidence, study participants demographic information and a reference list to give further context to statistics used in the decision aid.

We used evidence from a systematic review and meta-analysis on rehabilitation only and early or delayed ACL reconstruction in children and adolescents to inform the numeric estimates of benefits and harms[13]. We decided not to present benefits and harms data from the RCTs comparing rehabilitation only or delayed ACL reconstruction followed by rehabilitation to early ACL reconstruction followed by rehabilitation in adults[10-12,19]. The decision to exclude adult data was to avoid overloading children and adolescents with statistics that may not be relevant to them. Expert opinion and consensus from the multidisciplinary steering group was used to inform all information presented in the decision aid (e.g., the benefits, harms, and practical issues of each management option). The steering group provided feedback on the first draft of the decision aid before we began semi-structured interviews.

Recruitment

All participant groups were recruited through social media, snowballing, and using the steering group's collaboration network. Health professionals who participated in the study also assisted with recruitment of adolescent-, adult- and parent-participants through referrals.

Using a pre-interview questionnaire, we purposively sampled participants to achieve diversity in age, gender, and ethnicity. For health professionals, we also purposively sampled to achieve diversity in profession, years of experience and country of practice. We adjusted our purposive sampling to recruit people with different characteristics to those already recruited. Before proceeding to the pre-interview questionnaire, all participants provided consent by checking a box that confirmed they had read the participant information sheet and consent form, and agreed to participate in the study.

Data collection

The data collection process involved a pre-interview questionnaire (supplementary files 1, 2, 3 and 4), semi-structured interview (supplementary file 5, 6 and 7), and acceptability questionnaire (supplementary file 8 and 9).

Pre interview questionnaires

For adolescent-, adult- and parent-participants, we gathered data on demographics (e.g., gender, age), country of birth, schooling/employment details, time since first ACL rupture, details about any other structures that were damaged, use of ACL reconstruction, re-rupture, previous and current sports participation level, and factors related to treatment decision making (supplementary file 1, 2 and 3).

For health professionals, we gathered data on demographics, profession and country of training/qualification, type of health professional, years of experience, clinical setting, average number of patients they manage with an ACL rupture per year, and the percentage of patients they advise to have ACL reconstruction (supplementary file 4).

Semi structured interviews

In accordance with IPDAS guidance[29,30], semi structured interviews were used to gather feedback on participant's views of the decision aid and establish the best way to present different aspects such as treatment options, numeric estimates of benefits and harms, questions to ask health professionals, practical issues, and visual layout. Interview guides were created to provide structure and group-specific prompts (supplementary files 5, 6 and 7). A trial interview was conducted as a test prior to beginning formal interviews. Interviews were conducted online via video conference (Zoom) by male researchers with experience in conducting qualitative interviews (AG, IAC), and lasted between 30-50 min. Four interviews were conducted by physiotherapy students who were under the supervision of the lead author.

Participants were informed of the reason for the study and provided a draft decision aid to view prior to the interview. However, not all participants viewed the decision aid before the interview. Changes to the decision aid were made throughout the interview process and participants were shown modifications against previous versions so they could provide input on whether changes were useful (supplementary file 10). All interviews were recorded (with verbal consent obtained from participants). Participants were asked to 'think out loud' and encouraged to provide feedback as they viewed each page of the decision aid (e.g., if they thought aspects of the decision aid could be improved or could be presented in a different way). During participant interviews, the interviewer took notes to highlight key concepts emerging from the interview and direct further questioning as needed. Following each interview, participants were sent an email thanking them for their time to participate; there was no incentive offered to participate in the study. All interviews were audio recorded and transcribed verbatim for analysis and participants had the opportunity to review the transcript of their interview prior to data analysis if they wished.

Acceptability questionnaires

Following each interview, an acceptability questionnaire was completed by participants, either during the interview or via a questionnaire link sent via email following the interview. A separate acceptability questionnaire, adapted from The Ottawa Hospital Research Institute[31], was created for adolescent-, adult- and parent-participants (supplementary file 8) and health professional-participants (supplementary file 9).

Data analysis

We reported the qualitative aspects of this study according to the 32-item Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (supplementary file 11)[32]. The COREQ is a 32-item checklist that allows for reporting of important aspects of the research team, study methods, context of the study, findings, analysis, and interpretation.

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4 Pre-interview and acceptability questionnaire responses were summarised using descriptive
5 statistics (means and SDs, counts and percentages). Adolescent-, adult-, and parent-
6 participant acceptability questionnaires (supplemental file 10) involved rating sections of the
7 decision aid as 'poor', 'fair', 'good' or 'excellent', the length of the decision aid, balance of
8 information presented and its potential usefulness. The health professional-participant
9 acceptability questionnaire (supplemental file 11) used a five-point Likert scale (strongly
10 agree=5; strongly disagree=1) to assess agreement with various statements. We presented
11 Likert scores as the percentage of responses for each category and as means (SD).
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15 All interview data were analysed using thematic analysis; a method for identifying, analysing
16 and reporting patterns within data[33]. Grounded theory using an inductive approach
17 underpinned how data were collected and analysed. Two researchers (AG and SM)
18 independently familiarised themselves with the interviews (via audio recordings or
19 transcripts), recorded initial observations and identified concepts relevant to the questions
20 asked. The two researchers developed a framework to organise concepts into broader themes
21 and subthemes in Excel. Any disagreements in categorising concepts into themes and
22 subthemes were discussed and resolved with a third author (JZ). The mapping of themes and
23 subthemes (figure 1) was iterative as new data emerged so that the decision aid was
24 continually updated before new interviews were conducted. Multiple iterative cycles of
25 revisions were performed, and new versions of the decision aid were circulated to the steering
26 group to reach consensus following changes from interviews. Consensus was reached by the
27 majority of the steering group agreeing with proposed changes. In some cases, revisions were
28 very minor changes (e.g., correcting typos, rewording a sentence). No further interviews were
29 conducted once data saturation was achieved (no new feedback emerged) and participants
30 had an overall positive impression of the decision aid.
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35 Figure 1: Formation of subthemes and themes.
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39 **Patient and Public involvement:**

40 People who experienced an ACL rupture were part of the authorship group (SF, MM, EP,
41 IAC). One was 18 years old when they ruptured their ACL (SF).
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45 **Results:**

46 *Adherence to the IPDAS criteria and user-centredness*

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48 The decision aid (supplementary file 12) met all 6 of the criteria to be considered a decision
49 aid, all 6 of the criteria to reduce the risk of harmful bias, and 21 of the 23 quality criteria
50 according to the IPDASi checklist (V.4.0)[34] (supplementary file 13). The two IPDASi
51 criteria that were not met involved evaluating the decision aid. Readability was assessed
52 including all the decision aid text (Grade 11.8) and without necessary complex words (Grade
53 9.7) using the SHeLL Editor (<https://shell.techlab.works>). Our decision aid also met 10 of the
54 11 criteria for user-centredness (supplementary file 14) as assessed by the User-Centred
55 Design 11-item measure[35].
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Participant characteristics and decision aid acceptability

A total of 32 initial interviews were completed; 16 health professionals who manage ACL ruptures (12 physiotherapists, 4 orthopaedic surgeons) and 16 people who had ruptured their ACL (7 adolescents and 9 who were now adults), 8 of these interviews were with a parent (one parent was interviewed with two adolescents, one with an adult, and one alone).

Additional interviews were conducted with 3 health professionals (2 physiotherapists and 1 orthopaedic surgeon) who wanted to give further feedback but ran out of time in their initial interview. No participants withdrew from the study once their interview had commenced.

One parent and adolescent did not participate in an arranged interview as they had not been offered rehabilitation only treatment and the parent did not want to potentially upset them.

Participant characteristics are presented in tables 1 and 2. All participants completed the acceptability questionnaire except one adolescent participant (figure 2 and table 3).

Table 1: Characteristics of participants who sustained an ACL rupture and parents of adolescent children who sustained an ACL rupture.

Participant groups pre interview questionnaire responses (All statistics are reported as Mean (SD) or N (%), unless specified otherwise)		Adolescents (n=7)	Adults (n=9)	Parents (n=8)
Age (years) range		16 (1) 15-17	26 (5.1) 18-33	46 (3.8) 41-51
Female		5 (71%)	3 (33%)	8 (100%)
Country of Birth				
	Australia	3 (43%)	7 (78%)	3 (38%)
	Philippines	-	-	1 (13%)*
	United States of America (USA)	2 (29%)	1 (11%)	2 (25%)
	South Africa	2 (29%)	-	1 (13%)
	Sri Lanka	-	1 (11%)*	-
	Sweden	-	-	1 (13%)
Current grade at school				
	Grade 10	4 (57%)	-	-
	Grade 11	1 (14%)	-	-
	Grade 12 or completed Grade 12	2 (28%)	-	-
Highest level of education				
	University graduate or postgraduate degree/s	-	6 (66%)	7 (88%)
	TAFE/Trade	-	1 (11%)	1 (13%)
	High school (completed)	-	2 (22%)	-
Employment status				
	Employed full-time	-	5 (56%)	3 (38%)
	Employed part-time or casual	-	3 (33%)	3 (38%)
	Student	-	1 (11%)	-
	Other (e.g., self-employed)	-	-	2 (25%)
Private health insurance		7 (100%)	7 (78%)	7 (88%)
Age at the time of ACL rupture (years) range		14.7 (1) 13-16	15.7 (1) 14-17	14.4 (1) 13-16*
Concomitant injury at the time of ACL rupture**		4 (57%)	6 (67%)	6 (75%)*
	Lateral Meniscus	2 (29%)	1 (11%)	2 (25%)*
	Medial Meniscus	3 (43%)	4 (44%)	3 (38%)*
	MCL	-	1 (11%)	2 (25%)*
	PCL	1 (14%)	-	-
	Cartilage damage	-	2 (22%)	-

	Unsure of additional damaged structures	-	1 (11%)	-
Had ACL reconstruction		3 (43%)	9 (100%)	4 (50%)*
Had a subsequent ACL rupture (ipsilateral or contralateral) at the time of the interview***		0 (0%)	4 (44%)	0 (0%)*
Had another ACL reconstruction***		0 (0%)	3 (33%)	0 (0%)*
Time since ACL reconstruction***	6-12 months	2 (66%)	-	1 (25%)*
	12-24 months	-	2 (22%)	3 (75%)*
	>24 months	1 (33%)	7 (78%)	-
Highest level of activity participation prior to ACL rupture# (Median score (IQR))		9 (1)	7 (2)	9 (1.75)*
Highest current level of activity participation# (Median score (IQR))		6 (6)	4 (3.5)	2 (7.5)*
Which one factor most influenced the decision to have (or not have) an ACL reconstruction	Someone you know (e.g., a friend)	2 (29%)	-	-
	Choice due to age (e.g., being young)	1 (14%)	-	-
	Wanting to return to sport	2 (29%)	4 (44%)	2 (25%)
	Prevent further damage	-	2 (22%)	-
	Recommendation from a health professional	2 (29%)	3 (33%)	4 (50%)
	Other (e.g., research and beliefs)	-	-	2 (25%)
Happiness with treatment choice	Extremely happy	5 (71%)	6 (66%)	2 (25%)
	Somewhat happy	-	1 (11%)	2 (25%)
	Neither happy nor unhappy	1 (14%)	1 (11%)	1 (13%)
	Somewhat unhappy	1 (14%)	-	1 (13%)
	Extremely unhappy	-	1 (11%)	2 (25%)

N, number of adolescents and adults who ruptured their ACL and parents of adolescent children who ruptured their ACL. TAFE, Technical and Further Education. One parent was interviewed without their adolescent; one parent was interviewed with an adult and one parent was interviewed with two adolescents. *Management of ACL rupture were in Australia and not the country of birth. *Refers to data reported by parents about their adolescent child. **Some people had more than one concomitant injury to their ACL rupture. ***Percentage of those who had ACL reconstruction. #Scores are based on the Tegner Activity Scale (0-10), higher scores equal higher levels of patient reported activity.

Table 2: Characteristics of health professionals that manage patients with ACL ruptures.

Participant groups pre interview questionnaire responses (All statistics are reported as Mean (SD) or N (%), unless specified otherwise)	Health Professionals (n=16)	
Age (years) range	39 (8.6) 23-54	
Female	3 (19%)	
Country of health professional training*	Australia	11 (69%)
	Germany	1 (6%)
	Switzerland	1 (6%)
	United Kingdom	1 (6%)
	United States of America (USA)	2 (13%)
Role	Physiotherapist	12 (75%)
	Orthopaedic surgeon	4 (25%)
Years of experience	11.5 (7.3)	
Work setting	Private practice	11 (63%)
	Private hospital	1 (6%)
	Public hospital	4 (25%)
	Other	1 (6%)
Average number of patients with ACL rupture managed per year	5	1 (6%)
	5-10	5 (31%)
	10-20	2 (13%)
	20-30	3 (19%)
	>50	5 (31%)
The percentage of patients recommended to have ACL reconstruction following ACL rupture	67 (20.3)	

N, number of health professionals that manage patients with ACL ruptures. *All health professional-participants were practicing in their country of training at the time of interviews.

Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

Table 3: Acceptability questionnaire for people who sustained an ACL rupture (n=16) (adolescents (n=7)*, adults (n=9)) and parents of adolescent children who sustained an ACL rupture (n = 8).

Acceptability items (All statistics are reported as N (%))		Adolescents, adults, and parents (n=23)
Section of decision aid rated as excellent or good	Who should read this decision aid?	23 (100%)
	Diagram of management options following ACL rupture	23 (100%)
	The treatment options covered in this decision aid	23 (100%)
	Comparing benefits and harms of each management option for those aged under 18 years old	22 (96%)
	Summary of benefits and harms of each management option for those aged under 18 years old	23 (100%)
The length of the decision aid was	Just right	23 (100%)
The amount of information was	Just right	21 (91%)
	Too little	1 (4%)
	Too much	1 (4%)
I found the decision aid	Balanced	18 (78%)
	Slanted towards rehab only (or delayed ACL surgery)	2 (9%)
	Slanted towards ACL reconstruction surgery (early ACL surgery)	3 (13%)
Agreed they would have found this decision aid ‘extremely useful’ or ‘very useful’ when making the decision about ACL reconstruction surgery		18 (78%)
Agreed this decision aid would have made their decision easier		20 (87%)

N, number of adolescents and adults who have sustained an ACL rupture and parents of adolescent children who sustained an ACL rupture. *One adolescent-participant did not complete the acceptability questionnaire.

Feedback for each section of the decision aid

Although most suggestions were implemented, some conflicted with others or were not possible to implement. Online supplementary file 15 outlines feedback we did not incorporate in the decision aid and our justification for this.

Thematic analysis of interviews

Summary of interview themes and subthemes:

Theme 1 and 2: Positive and negative feedback

Most participants gave positive feedback about the design and usability of the decision aid, but health professionals expressed a range of views on the content.

“I wish I had something like this for either of my ACLs. Just to have it all in one place, is good” (M, 21-30 years old, adult).

“It would be wonderful to have this handed out” (F, 41-50 years old, parent).

“It's well thought out, nice and balanced. It's good” (M, 31-40 years old, orthopaedic surgeon).

“I really would suggest that you reconsider what you're doing” (M, 51-60 years old, orthopaedic surgeon).

“I found the whole thing very wordy” (M, 41-50 years old, orthopaedic surgeon).

Theme 3: How to use the decision aid in practice

Some health professionals suggested clarifying the influence of additional injuries (e.g., meniscus tear) or instability on management decisions. Most participants suggested the decision aid shouldn't replace professional advice and it should promote individual management.

“I also feel you have to have a health professional to guide you” (F, 41-50 years old, parent).

“I think a lot of it just comes down to the individual's context, and their goals, and then also their present functional limitation” (F, 21-30 years old, physiotherapist).

Theme 4: More information about specific considerations following ACL rupture

Adolescents frequently suggested including social and psychological support and whole-body health. Adolescents also suggested including information on planning for additional support and show fear of further injury or difficulties maintaining motivation is normal. Some health professionals suggested including ACL guidelines (e.g., Professionally endorsed ACL guidelines) and revising management options to include ACL healing, bracing and 'prehabilitation'. Some participants suggested including practical information on time needed to book ACL reconstruction, graft options, size of scars and loss of muscle strength and control. Modifying questions to ask health professionals were frequently suggested and some parents were particularly concerned about costs and pain relief.

“They don't talk about the psychological effects that it has on someone” (F, 15-17 years old, adolescent).

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3 *“As far as this child is going to really need high care and nurturing, what have you got in*
4 *place to ensure this person’s needs are going to be met?” (F, 41-50 years old, parent).*
5 *“The potential for the ACL to heal, I think parents and kids would be very interested in that”*
6 *(M, 31-40 years old, physiotherapist).*
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10 **Theme 5: Change or add information on rehabilitation, exercise and return to sport**

11 Some health professionals suggested return to sport following ACL rupture isn’t guaranteed
12 but most participants agreed rehabilitation timeframes gave realistic expectations. All
13 participant groups mentioned rehabilitation testing should be included (e.g., strength and hop
14 tests) and to differentiate between restricted/unrestricted training and competition sport. Most
15 participants also suggested including consideration for long-term goals and continuing to
16 exercise beyond 12 months.
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21 *“It’s easy to get ahead of yourself and many times parents want to rush as well” (F, 41-50*
22 *years old, parent).*

23 *“Some people may think once I finished my nine months of therapy, I’m done. But it’s like, it’s*
24 *a lifelong journey” (F, 41-50 years old, parent).*

25 *“You need a certain level of dedication” (F, 15-17 years old, adolescent).*
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28 **Theme 6: Modify language and formatting used**

29 Simple language, being concise and removing unnecessary text were frequently suggested.
30 All participant groups suggested modifications to formatting such as layout, graphs, colour,
31 pictures, or icons and statistics (e.g., most preferred icon array images to bar graphs or ‘x in
32 100 people’ to percentages).
33

34 Positive presentation of information, harms, and return to sport was frequently suggested by
35 all participant groups. Mixed views were expressed about risk of additional injury (e.g., the
36 relationship between meniscus damage and osteoarthritis), general surgery, paediatric
37 specific risks and return to sport.
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41 *“I feel like the language is too academic. To me, I think it could be dumbed down more” (M,*
42 *31-40 years old, physiotherapist).*

43 *“You want them to be finding the success stories and, yeah, have a positive outlook as well,*
44 *rather than focusing on who didn’t get back” (F, 41-50 years old, parent).*

45 *“You could say potential harms and precautions” (F, 41-50 years old, parent).*
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48 **Theme 7: Understanding the translation of research**

49 Some health professionals suggested the decision aid should be seen before an appointment
50 with a health professional (e.g., before seeing an orthopaedic surgeon). Participants
51 frequently suggested difficulty navigating the uncertainty of returning to sport with both
52 treatment options. Participants more frequently had views to remove adult data, but some
53 suggested providing context to adult statistics.
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57 *“When patients are overwhelmed, they, tend to just kind of they grasp for certainty” (M, 31-*
58 *40 years old, physiotherapist).*
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3 “You’re using adult data in a decision aid for children, and you can’t do that” (M, 51-60
4 years old, orthopaedic surgeon).

5 “I would rather they have information that is relevant to their population and their category
6 only, even if it is lower quality” (M, 31-40 years old orthopaedic surgeon).
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10 **Discussion:**

11 ***Summary of findings***

12 Most adolescents, parents, and adults rated all aspects of the decision aid as good-excellent
13 (e.g., presentation, comprehensibility, length, graphics, formatting, and amount of
14 information). Following interviews, we identified seven main themes with subthemes
15 (supplementary file 16). The interviews highlighted agreement with most of the decision aid
16 content (e.g., management options, questions to ask health professionals, summary of benefits
17 and harms). Most health professionals selected ‘strongly agree’ or ‘agree’ when asked to rate
18 statements about the decision aid but some health professionals had opposing views on
19 components of the decision aid (e.g., using statistics from studies including participants over
20 18 years old, potential risks and return to sport).
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25 ***Meaning of the study***

26 Analysis of the interviews revealed that most aspects of the decision aid were agreed upon by
27 participants despite suggestions for refinement. However, some health professionals had
28 divided opinions on the evidence used to inform content and rehabilitation timeframes.
29 Feedback from all participant groups consistently highlighted the importance of positive
30 messaging, social and psychological support and considering long-term goals. Most
31 participant groups also gave positive feedback on ‘questions to consider asking health
32 professionals’.
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37 Most participants agreed the decision aid clearly outlines its intended users and treatment
38 options but there were mixed views on deciding optimal management. Some participants
39 suggested bringing more attention to the impact of additional injury (e.g., meniscus damage)
40 to decision making or adding other treatment options (e.g., bracing, ACL healing and
41 ‘prehabilitation’). We decided to present only two management options side by side for ease
42 of comparison, which is similar to other decision aids for musculoskeletal conditions[22,36].
43 Opinions of the optimal management for children and adolescents who have additional
44 injuries to their ACL rupture were mixed, and evidence remains uncertain[13,16]. The
45 decision aid prompts patients to confirm their diagnosis with a team of health professionals to
46 gain a balanced opinion on their individual circumstance and discuss multiple factors that
47 may influence their choice (e.g., presence of ‘repairable’ injuries, if their knee gives way and
48 activity levels[9]).
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53 Some physiotherapists and orthopaedic surgeons had conflicting views on using evidence
54 from research that had included participants over 18 years old. Given the decision aid is not
55 for adults with an ACL rupture, we decided not to present data from studies in people over 18
56 years to avoid children and adolescents having to consider multiple data sources and
57 potentially becoming confused[37]. The decision aid is designed for children and adolescents
58 and includes prompts to encourage management that considers individual circumstances and
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3 different rates of child development (e.g., questions to consider when talking to a health
4 professional and key points).
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7 Although children and adolescents should be encouraged to take an active role in the
8 decision-making process, interviews with parents suggested that individual circumstances
9 may dictate how the decision aid is best used. Some parents suggested the decision aid would
10 save them time when researching information to help with making treatment choices (e.g.,
11 *“getting this handout instead of me having to go home and Google, I Googled many, many*
12 *nights trying to find you know, something like this”* (F, 41-50 years old, parent)). One parent
13 withdrew their adolescent child before the interview due to concerns that discussion of
14 potential harms could disrupt their child’s focus on rehabilitation. This adolescent recently
15 had ACL reconstruction and was not given the option to have non-surgical management
16 based on their injuries. Overall, parents and health professionals should consider encouraging
17 children and adolescents to be involved in shared decision-making[9,38,39] and consider that
18 the decision aid is designed to be used before making the management decision. Once a
19 decision is made, particularly an irreversible decision, parents and health professionals may
20 have an important role in guiding focus and promoting optimism.
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26 The decision aid can facilitate parents discussing their child’s treatment preference, sport
27 choice and potential harms of participation. Parents and health professionals should
28 acknowledge their supporting role in treatment decisions (e.g., *“it’s important that we listen*
29 *to the kids and what they have to say, it’s their body”* (F, 41-50 years old, parent)).
30 Discussions of sporting choice may solidify a decision or lead to diversifying sporting
31 participation that has been shown to encourage the development of resilient self-
32 identities[37]. Parental anxiety or pain catastrophising has been shown to negatively
33 influence children’s anxiety, postoperative pain and ability to perform rehabilitation[40].
34 While potential harms and uncertainty of returning to sport can be a sensitive topic, their
35 acknowledgment could also provide reassurance to children and adolescences if something
36 goes wrong (e.g., *“as a parent you’re trying to make sure they understand the decision*
37 *they’re making”* (F, 41-50 years old, parent)).
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42 Avoiding unrealistic expectations and including children and adolescents in decision making
43 was frequently mentioned by all participant groups. Using the decision aid could prevent
44 decisions being made based on unrealistic expectations and help improve treatment
45 satisfaction. It is accepted that patient satisfaction has been closely linked to expectations,[41]
46 the decision aid may help improve the mismatch between expectations and evidence. Many
47 young athletes (86%) expect to return to sport following ACL reconstruction by 6 months
48 which is much sooner than is recommended in accepted professional guidelines[42,43].
49 While return to sport rates may be higher in children who have ACL reconstruction followed
50 by rehabilitation compared to rehabilitation only[13], subsequent ipsilateral or contralateral
51 ACL rupture following ACL reconstruction followed by rehabilitation can be as high as 32%
52 in paediatric athletes[40]. The reality is that despite anatomical surgical success or well-
53 designed rehabilitation programs, many athletes may never return to their pre-injury athletic
54 performance level or their primary sport[44].
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3 Interviews frequently highlighted that information regarding psychological and social support
4 should be included in the decision aid. Sudden changes to sport participation can affect self-
5 identity in children and adolescents who particularly mentioned the mental struggle of
6 recovering post ACL rupture (e.g., *“the point that stands out to me, that was probably the*
7 *stay positive one. Because the other year, it was hard. But the mental part of it is the hardest*
8 *part, like getting past that”* (M, 15-17 years old, adolescent)). Children and adolescent self-
9 identities can be fragile and absence from participating in a sport they depend on can be
10 psychologically traumatising[40]. Therefore, we decided to include messages to encourage
11 the discussion and planning for psychological support. Health professionals should give early
12 recognition to psychosocial factors that have been shown to affect mental wellbeing and
13 ability to recover from injury[44]. The decision aid incorporates reassurance and encourages
14 monitoring physical and psychological recovery.
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19 **Strengths and Limitations**

20 Our development process (Supplementary file 17) had several strengths. The steering group
21 includes people who experienced an ACL rupture and one who was 18 years old when they
22 ruptured their ACL, the manuscript is transparent about the authors' professional
23 backgrounds, the design, conduct and reporting of this study were guided by the IPDAS
24 criteria, we conducted one-on-one interviews with participants which allowed for in-depth
25 feedback to be gathered on the decision aid, and used mixed methods to evaluate
26 acceptability of the decision aid. The readability of our tool measured higher (Grade 9 to 11)
27 than recommendations (Grade 8) but contains multiple features to support understanding and
28 readability that aligns with best practice[45] including bullet points, white space, images, and
29 sub-headers. The tool therefore performs well relative to existing decision aids in terms of its
30 attention to health literacy[45]. We also included justification of the evidence used to inform
31 numeric estimates of benefits and harms in the decision aid and used the highest quality
32 evidence available comparing rehabilitation only and ACL reconstruction followed by
33 rehabilitation for children and adolescents[13].
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39 Our patient decision aid was limited by the lack of high-quality evidence comparing
40 rehabilitation only to ACL reconstruction followed by rehabilitation in children and
41 adolescents. Emergence of future studies related to this topic will likely warrant an update of
42 the evidence used in the decision aid. Another limitation is that evidence from older studies
43 did not always report details of rehabilitation or consider advances in treatment to know if
44 they reflect current recommended practice. We were unable to recruit any children-
45 participants to interview and adolescent-participants were aged between 15-17 years old. We
46 did interview health professionals who treat children and younger adolescents, but not being
47 able to recruit children-participants means the decision aid was not directly influenced by
48 children's feedback. Most authors are physiotherapists, and most health professional-
49 participants were physiotherapists (75%), trained in Australia (69%) and worked in private
50 practice (63%) which may impact the themes that emerged from interviews (e.g., views on
51 costs and waiting time for ACL reconstruction). Recruitment of participants was difficult
52 which was expected without offering incentives for their time. We didn't directly involve
53 children or adolescents in all stages of the study as consumers, and stakeholder involvement
54 heavily influenced the design of the decision aid via feedback during online interviews and
55 questionnaires on the acceptability of the decision aid. Our aim was to interview participants
56 until we achieved data saturation, but we acknowledge that the majority of participants were
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3 Australian (60%). Including participants from several different countries may have made the
4 decision aid more globally acceptable (e.g., feedback was influenced by different cultures and
5 healthcare systems) but the sample size of participants from each country may limit the
6 usability of the decision aid for use in different countries. Future work includes adapting this
7 decision aid for culturally and linguistically diverse populations as it is only presented in
8 English.
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11 **Conclusion**

12 Our patient decision aid appears to be an acceptable tool to help children and adolescents
13 following ACL rupture choose between surgical and non-surgical management, with support
14 from their parents and health professionals. Feedback from adolescents frequently suggested
15 the importance of planning to include psychological and social support during rehabilitation.
16 Feedback also suggested that health professionals should use positive messaging despite
17 uncertainty of outcomes, while avoiding the creation of unrealistic expectations. Our patient
18 decision aid is a user-friendly tool that could improve decision making in children and
19 adolescents following ACL rupture. A randomised controlled trial evaluating its impact is the
20 next important step.
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27 **Supplementary files:**

28 Supplementary file 1: Children and adolescent pre-interview questionnaire

29 Supplementary file 2: Adult pre-interview questionnaire

30 Supplementary file 3: Parent/guardian pre-interview questionnaire

31 Supplementary file 4: Health professional pre-interview questionnaire

32 Supplementary file 5: Children and adolescent and parent/guardian interview guide

33 Supplementary file 6: Adult interview guide

34 Supplementary file 7: Health professional interview guide

35 Supplementary file 8: Acceptability questionnaire for children, adolescents, parents, and
36 adults

37 Supplementary file 9: Acceptability questionnaire for health professional

38 Supplementary file 10: Decision aid version from PowerPoint

39 Supplementary file 11: 32-item Consolidated Criteria for Reporting Qualitative Research
40 (COREQ) checklist

41 Supplementary file 12: Final decision aid

42 Supplementary file 13: International Patient Decision Aid Standards Checklist (IPDASi v4.0)

43 Supplementary file 14: User-Centred Design 11-item measure (UCD-11)

44 Supplementary file 15: Reasons for not implementing feedback for each section of the
45 decision aid

46 Supplementary file 16: Interview themes and subthemes, and example quotes
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Supplementary file 17: Flow chart of the development process

Figure 1: Formation of subthemes and themes.

Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

Contributors:

All authors critically revised the manuscript for important intellectual content and approved the final manuscript. Please find below a detailed description of the role of each author. ARG: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data, drafted, and revised the manuscript and approved the final version to be published. MJM: Developed and designed data collection tools, interpreted data and approved the final version to be published. DBA: Developed and designed data collection tools, interpreted data and approved the final version to be published. EP: Developed and designed data collection tools, interpreted data and approved the final version to be published. IAC: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data and approved the final version to be published. SM: Developed and designed data collection tools, analysed and interpreted data and approved the final version to be published. IAH: Developed and designed data collection tools, interpreted data and approved the final version to be published. SRF: Developed and designed data collection tools, interpreted data and approved the final version to be published. KM: Developed and designed data collection tools, interpreted data and approved the final version to be published. TCH: Developed and designed data collection tools, interpreted data and approved the final version to be published. RT: Developed and designed data collection tools, interpreted data and approved the final version to be published. CGM: Developed and designed data collection tools, interpreted data and approved the final version to be published. JRZ: Developed and designed data collection tools, conducted data collection, analysed, and interpreted data, drafted, and revised the manuscript and approved the final version to be published. The corresponding author (ARG) attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. As the guarantor, the corresponding author (ARG) accepts full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

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5

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8 Gamble at andrew.gamble@sydney.edu.au.
9

10 **Conflicts of interest statement:**

11
12 TCH, KM and RT are unpaid members of the International Patient Decision Aid Standards
13 (IPDAS) Collaboration Steering Committee.
14

15 **Ethics approval:**

16 Sydney University Human Research Ethics Committee (HRECs) approval 2022/008
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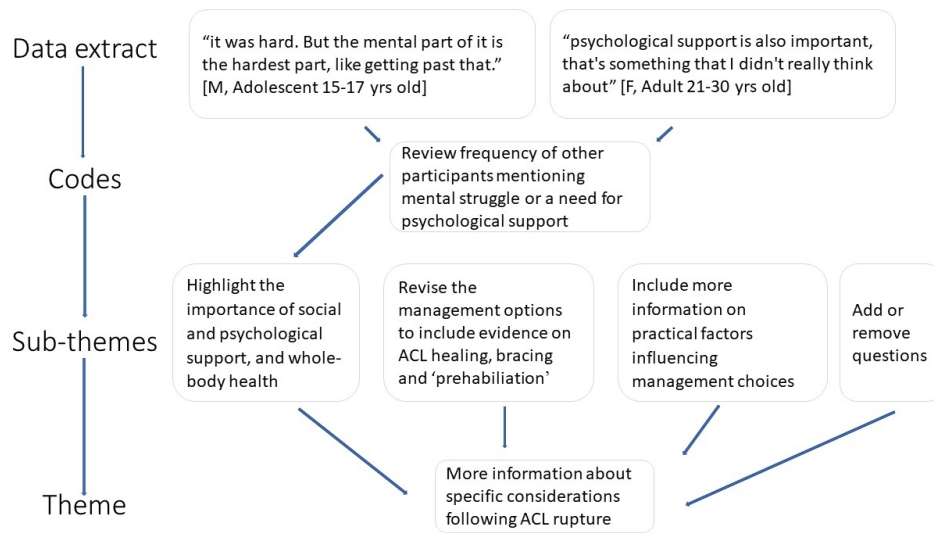


Figure 1: Formation of subthemes and themes.

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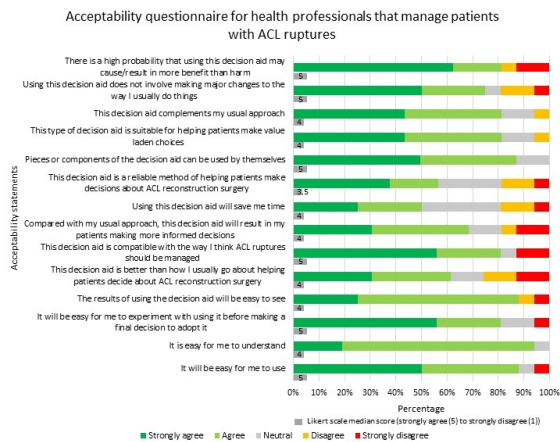


Figure 2: Acceptability questionnaire for health professionals that manage patients with ACL ruptures (n=16; 12 physiotherapists, 4 orthopaedic surgeons).

338x190mm (96 x 96 DPI)

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Children and Adolescent Participant information statement before starting the survey.
2. CHILDREN AND ADOLESCENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

By saying yes to being in this study, I am saying that:

Tick/initial boxes

- I know what I will be asked to do and have been given a Study Information Sheet to keep.
 - I know that this study is about what information is important for children before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - Someone has talked to me about the study and what it means for me.
 - I know that I will be asked to answer a questionnaire (5-minutes) before I attend an interview to provide feedback on educational information of treatment options following ACL injury (online, via telephone or in person if the COVID-19 situation allows) that will last 30 minutes.
 - I know that I don't have to be in the study if I don't want to.
 - I know that I can choose not to talk about something if I don't want to.
 - I have been asked if it is ok or not ok to record what I say.
 - I have been told that I can change my mind at any time if I don't want to take part anymore.
 - I have been told that if I say yes or no it won't change how the study team feel about me.
 - I know that what I say or do in this study is private and when the study team write about what they learn they won't use my name or anything that could tell other people who I am.
 - I understand that after I sign and return this consent form it will be kept by the researcher, and that I can ask for a copy at any time.
-
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
 Male
 Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. Are you currently at school?

- Yes
 No

If Yes, What Grade are you in at school? _____

If No, What Grade did you finish/leave school? _____

5. Do you work?

- Yes
 No

If Yes,

- Part-time
 Full-time

What type of work do you do? _____

6. How long ago did you rupture your ACL (weeks, months or years)?

7. When you ruptured your ACL, did you also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?

- Yes
 No (skip to question 8)

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Unsure

Please specify the structures you damaged. Please select all that apply:

- Medial collateral ligament (MCL)
- Lateral collateral ligament (LCL)
- Posterior cruciate ligament (PCL)
- Medial meniscus
- Lateral meniscus
- Cartilage damage
- I am unsure of the structure

8. Did you have an ACL reconstruction surgery?

- Yes
- No > go to question 10

> If 'Yes' did you re-rupture your ACL after surgery?

- Yes
- No

> If 'Yes', did you have another ACL reconstruction?

- Yes
- No

9. How long ago did you have your most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

10. Please indicate in the spaces below the HIGHEST level of activity that you participated in BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.

BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite))
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc)) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

11. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

12. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Adult Participant information statement before starting the survey.
2. ADULT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

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3 7. How long ago did you rupture your ACL? _____
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7 8. When you ruptured your ACL, did you also damage any other structures in the knee (e.g.,
8 Meniscus or other ligament damage)?

- 9 Yes
10 No (skip to question 9)
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13 Please specify the structures you damaged. Please select all that apply:
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- 15 Medial collateral ligament (MCL)
16 Lateral collateral ligament (LCL)
17 Posterior cruciate ligament (PCL)
18 Medial meniscus
19 Lateral meniscus
20 Cartilage damage
21 I am unsure of the structure
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25 9. Did you have an ACL reconstruction surgery?
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- 27 Yes
28 No > go to question 11
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30 > If 'Yes' did you re-rupture your ACL after surgery?
31

- 32 Yes
33 No
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35 > If 'Yes', did you have another ACL reconstruction?
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- 37 Yes
38 No
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40 10. How long ago did you have your most recent ACL reconstruction surgery?
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- 42 <1 month ago
43 1-3 months ago
44 4-6 months ago
45 6-12 months ago
46 12-24 months ago
47 >24 months ago
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51 11. Please indicate in the spaces below the HIGHEST level of activity that you participated in
52 BEFORE YOUR INJURY and the highest level you can participate in CURRENTLY.
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54 BEFORE INJURY: Level _____ CURRENT: Level _____
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What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite))
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

12. Which one factor most influenced your decision to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy were you with your treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via social media

Consent section

1. Please make sure you have read the Parent Participant information statement before starting the survey.
2. PARENT PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of any involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I and my child will both be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
- I understand that my participation will involve my interview to be recorded.
- I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to let my child participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
- I understand that we (myself and/or my child) are free to withdraw from this study at any time and can choose to withdraw any information already provided (unless the data has already been de-identified or published).
- I have been informed that the confidentiality of the information provided by myself and/or my child will be protected and will only be used for purposes that has been agreed to. I understand that information will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, and that publications will not contain any identifiable information about myself or my child.
 - Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

1
2
3 3. I would like to be emailed a copy of the study results:

4 Yes

5 No

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7 If YES, my email address is _____

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10 4. I consent to the future use of any data I provide for research purposes. I understand that
11 before the investigators or their collaborators use any data that I provide, they must seek
12 additional ethics approval.

13 Yes

14 No

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For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children under 18 years old.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country were you born? [free text response]

4. What option best describes your highest level of education?

- Primary school or less
- High school (not completed)
- High school (completed)
- TAFE/Trade
- University- undergraduate degree/s (completed)
- University- postgraduate degree/s e.g. Masters, PhD (completed)
- Other (please specify) _____

5. What is your employment status?

- Employed part-time
- Employed full-time
- Casual work
- Retired
- Unemployed
- Student
- Sick/disability leave
- Other (please specify) _____

6. Do you have private health insurance?

- Yes
- No

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

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7. How long ago did your child rupture their ACL? _____
8. When your child ruptured their ACL, did they also damage any other structures in the knee (e.g., Meniscus or other ligament damage)?
- Yes
 - No (skip to question 9)
 - Unsure

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Please specify the structures your child damaged. Please select all that apply:

- Medial collateral ligament (MCL)
 - Lateral collateral ligament (LCL)
 - Posterior cruciate ligament (PCL)
 - Medial meniscus
 - Lateral meniscus
 - Cartilage damage
 - I am unsure of the structure
- 25
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9. Has your child have an ACL reconstruction surgery?
- Yes
 - No > go to question 11

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> If 'Yes' did your child re-rupture their ACL after surgery?

- Yes
- No

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> If 'Yes', did your child have another ACL reconstruction?

- Yes
- No

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10. How long ago did your child have their most recent ACL reconstruction surgery?

- <1 month ago
- 1-3 months ago
- 4-6 months ago
- 6-12 months ago
- 12-24 months ago
- >24 months ago

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11. Please indicate in the spaces below the HIGHEST level of activity that your child participated in BEFORE THEIR INJURY and the highest level they can participate in CURRENTLY.

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BEFORE INJURY: Level _____ CURRENT: Level _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Please choose one of the following which best describes your current activity level.

<input type="radio"/>	Level 10	Competitive Sports(Soccer, Football, Rugby (national elite))
<input type="radio"/>	Level 9	Competitive Sports(Soccer, Football, Rugby (lower divisions), hockey, wrestling, gymnastics)
<input type="radio"/>	Level 8	Competitive Sports(Racquetball, Squash, Track and Field, Alpine Skiing)
<input type="radio"/>	Level 7	Competitive Sports(Tennis, Athletics(Running), Handball, Basketball, Motorcross, Cross country track) Recreational Sports (Soccer, Football, Hockey, Squash, Athletics(jumping), Cross country track)
<input type="radio"/>	Level 6	Recreational Sports (Tennis, Handball, Basketball, Alpine skiing, Jogging 5X/week)
<input type="radio"/>	Level 5	Work (Heavy Labor) Competitive Sports (Cycling, X-country Skiing) Recreational (Jogging on uneven ground 2x/week)
<input type="radio"/>	Level 4	Work (Moderately Heavy Labor (truck driving, etc) Recreational Sports (Cycling, Cross Country Skiing, Jogging on even ground 2X/week)
<input type="radio"/>	Level 3	Work (Light Labor) Comp & Rec Sports (Swimming), Hiking, Backpacking
<input type="radio"/>	Level 2	Work (Light Labor) Walking on uneven ground possible but impossible to backpack or hike
<input type="radio"/>	Level 1	Work (Light Labor) Walking on even ground possible
<input type="radio"/>	Level 0	Sick leave or disability pension because of knee problems

12. Which one factor most influenced the decision for your child to have (or not have) an ACL reconstruction?

- Pain
- Return to sport
- Prevent further damage
- Age
- Recommendation from a health professional (e.g., an Orthopaedic surgeon or Physiotherapist)
- Online information
- Someone you know (e.g., a Friend)
- I don't know

13. How happy was your child with their treatment choice (either ACL reconstruction or non-surgical management)?

- Extremely unhappy
- Somewhat unhappy
- Neither happy or unhappy
- Somewhat happy
- Extremely happy

Finally, when are the best times to schedule you for an online interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Best contact telephone number: _____

Best time/s to call: _____

We would like to interview you and your child together. Is this okay?

Yes

No

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

For recruitment via email

Consent section

1. Please make sure you have read the Health Professional Participant information statement before starting the survey.
2. HEALTH PROFESSIONAL PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

In giving my consent, I confirm that that:

Tick/initial boxes

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
 - I understand the purpose of the study is to investigate what information is important for children under 18 years old before deciding to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction.
 - I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
 - I understand that in this study I will be required to answer a pre-interview questionnaire (5-minutes) and attend an interview to provide feedback on an educational pamphlet on treatment options following ACL rupture (online, via telephone or in person pending on the COVID-19 situation) that will last 30-minutes.
 - I understand that my participation will involve my interview to be recorded.
 - I understand that information may be used in future research and the data collected for this study may use it in future projects. By providing consent I allow my information to be shared locally and internationally with other research collaborators as needed. I understand that it is unknown at this stage what these other projects will involve, and ethical approval will be gained before my information is used in these future projects.
 - I understand that being in this study is completely voluntary.
 - I am assured that my decision to participate will not have an impact on any relationship with the research team or the University of Sydney or the Local Health District.
 - I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
 - I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
 - I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
-
- Yes, I would be happy to participate in this study
 - No, I would prefer not to participate in this study

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

3. I would like to be emailed a copy of the study results:

Yes

No

If YES, my email address is _____

4. I consent to the future use of any data I provide for research purposes. I understand that before the investigators or their collaborators use any data that I provide, they must seek additional ethics approval.

Yes

No

For peer review only

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Pre-interview Questionnaire

Study ID: _____

Thank you for your participation in this study, which is investigating what information is important when considering early anterior cruciate ligament (ACL) reconstruction in children.

We would like you to answer a few questions before the interview. This should not take more than 5-minutes.

First some quick questions about you...

1. Please indicate your gender:

- Female
- Male
- Non-binary

2. Please indicate your age: [free text response]

3. In which country did you receive your health professional training/qualification? [free text response]

4. What type of health professional are you?

- Orthopaedic surgeon
- General practitioner
- Sports medicine doctor
- Physiotherapist
- Other (please specify) _____

5. How many years have you been practicing? [free text response]

6. Which clinical setting have you spent the most time practicing in?

- Private practice
- Public hospital
- Private hospital
- Sports teams
- Other (please specify) _____

7. On average, how many patients with an ACL rupture do you manage/review per year? [free text response]

8. On average, what percentage of these patients do you advise to have ACL reconstruction surgery when they first visit you? [free text response]

What information is important when considering early anterior cruciate ligament (ACL) reconstruction in children?

Finally, when are the best times to schedule you for an online Zoom interview...

Please provide below your best contact details for a researcher from the University of Sydney to contact you and arrange the follow-up interview:

Name: _____

Email: _____

Best contact telephone number: _____

Best time/s to call: _____

Please mark the times that are suitable to arrange an interview in the boxes below:

	Monday	Tuesday	Wednesday	Thursday	Friday
8 – 10am					
10 – 12pm					
12 – 2pm					
2 – 4pm					
4 – 6pm					

Thank you for completing the questionnaire.

Example structure of interviews with parents, children and adolescent participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to parents, children and adolescents (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?

- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Do you expect to return to your pre-injury level of sport?
- How long do you expect recovery to take?
- Would you consider activity modification?

Goals:

- What do you aim to achieve with management and how does this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with adult participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What treatments options have you heard of or been suggested to try following your ACL rupture?
- What do you think of ACL reconstruction surgery as a treatment?

Explain ACL reconstruction surgery to patients

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to adult participants (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have early ACL reconstruction surgery or rehabilitation with the option for delayed ACL reconstruction surgery. We would like for you to help us better understand your experience of this material – for example, how you find the visual appeal, readability, content, and what are your overall experiences using this material taking your experience into account.

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything challenging, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as patients are reading through the material:

- How are you finding reading through this section?
- Did you feel like you knew where to look, and what to do next?
- Did you feel like you knew the relevance of this section in your decision?
- How did you find the content of this section?
- Were the instructions clear/helpful?
- How easy was it to understand the section? (readability)
- Was there anything that was unclear or confusing?
- How were the visual aids?
- How was the functionality?
- Is there anything that you would improve in this section?
- What did you like most about this material?
- What did you like least about this material?

Core questions

If we were designing an education leaflet to help you decide whether to have early ACL reconstruction surgery or begin rehabilitation with the option for delayed ACL reconstruction....

- What information is most important to know? (Prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure)

“How do the following statements influence your thoughts about ACL reconstruction and non-surgical management?”

Osteoarthritis risk

- Surgery does not reduce the risk of OA compared to rehabilitation only or delayed surgery.

Rehabilitation with the option for delayed surgery:

Harms:

- Delayed ACL reconstruction > 12 weeks significantly increases the risk of meniscus injury in children.

Benefits:

- Studies in those aged 20-30 years old show 50% can avoid ACL reconstruction with rehabilitation.

ACL reconstruction:

Harms:

- Those younger than <20-25 years old who return to high-risk sport following ACL reconstruction have a second ACL injury rate of 23% (nearly 1 in 4).
- Note: Less risky sports were defined as: “pivoting with no contact”, “weight bearing with no pivoting”, and “non-weight bearing”.

Benefits:

- Studies showed that you are 10 % more likely to return to your previous level of sport and 9% less likely to experience a serious complication with early ACL reconstruction.”

(Ask if need prompting) “Do any of these statements stand out to you?”

Further questions:

Return to sport:

- Did you expect to return to your pre-injury level of sport?
- How long did you expect recovery to take?
- Did you consider activity modification?

Goals:

- What did you aim to achieve with management and how did this influence your decision?

Decision regret:

- Do you regret your decision (if they already had ACL reconstruction or re-rupture)?
- If you re-injure your knee, would you take the same management approach?

- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (Example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure

General feedback at the end

- Are there any topics that you would like to see in future versions of this tool?
- Do you have any other general feedback, thoughts, or comments?

Example structure of interviews with health professional participants

Note: The topics below will serve as an outline to guide the interview

Introductions

- Brief explanation of the interview

Opening questions

- What is your understanding of the treatment options following an anterior cruciate ligament (ACL) rupture? What causes it? How can it be treated?
- What do you think of ACL reconstruction surgery as a treatment?

Brief explanation of ACL reconstruction surgery to health professionals (depending on their current level of understanding e.g. do not explain this to an orthopedic surgeon)

"I am now going to give you a short explanation of ACL reconstruction and why it is indicated that has been standardised to read to each participant."

"ACL reconstruction requires admission to hospital, anesthetic and multiple surgical cuts to the knee. A 'graft' taken from the patient's own hamstring or quadriceps tendon, from another person's or made from synthetic material is used to reconstruct the ruptured ACL by fixating it between the bones of the knee joint. Immediately following surgery there is pain, swelling, reduced movement and a need for crutches. The aim of ACL reconstruction is to restore functional stability of the knee."

Core questions

If we were designing an education leaflet to help patients decide whether to have ACL reconstruction surgery or not....

- What information is most important for them to know? (prompt for views on presenting different treatment options, benefits and harms, recovery time, likelihood of need for revision surgery, details of the procedure, etc.)
- How would you like information to be presented in terms of visual aids, text, tables, pictures, etc.? (example below, but exact topics will depend on what arose from the previous question)
 - Different treatment options
 - Benefits and harms
 - Recovery time
 - Likelihood of need for revision surgery
 - Details of the procedure
- How would your response to the above options differ if the information was intended to be used during a consultation with a health professional?

If reviewing an existing patient decision aid or investigator-developed one (relevant to focus groups in the later stages of developing the patient decision aid)

Instructions to health professionals (as an example): The material we want you to review has been developed for parents, children and adolescents to improve their knowledge and confidence in making the decision to have ACL reconstruction surgery or not. We would like for you to help us refine this material – for example, how you find the visual appeal, readability, content, and what are your overall thoughts on patients using this material?

To do this, I am going to ask you to think out loud while you read through the material. Just say everything that goes through your mind- if you are finding anything confusing, what your eye is drawn to. If a page is easy, and you understand what to do – just say that. Providing examples is very helpful (e.g. "look at a table", "look at a page with just text vs with an image").

Prompt questions as health professionals are reading through the material:

- How do you think patients would find this section?
- Did you feel like patients will know where to look, and what to do next?

- 1 • Did you feel like patients knew the relevance of this section in their decision?
- 2 • How do you think patients will find the content of this section?
- 3 • Were the instructions clear/helpful?
- 4 • How easy was it to understand the section? (readability)
- 5 • Was there anything that was unclear or confusing?
- 6 • How were the visual aids?
- 7 • How was the functionality?
- 8 • Is there anything that you would improve in this section?
- 9 • What did you like most about this material?
- 10 • What did you like least about this material?
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16 **General feedback at the end**

- 17 • Are there any topics that you would like to see in future versions of this tool?
- 18 • Do you have any other general feedback, thoughts, or comments?
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Supplementary File 10: Acceptability questionnaire for children, adolescents, parents, and adults

We would like to know what you think about the patient decision aid you have just read.

Which participant group are you?

- Parent/Guardian
- Child or Adolescent
- Adult

1. Please rate each section by circling 'poor', 'fair', 'good', or 'excellent' to show what you think about the way the information was presented on:

Who should read this decision aid?	Poor	Fair	Good	Excellent
Diagram of management options following ACL rupture	Poor	Fair	Good	Excellent
The treatment options covered in this decision aid	Poor	Fair	Good	Excellent
Comparing benefits and harms of each management option for those aged < 18 years old	Poor	Fair	Good	Excellent
Summary of benefits and harms of each option	Poor	Fair	Good	Excellent

2. The length of the decision aid was:
 - a. Too long
 - b. Too short
 - c. Just right
3. The amount of information was:
 - a. Just right
 - b. Too much
 - c. Too little
4. I found the decision aid:
 - a. Balanced
 - b. Slanted towards rehab only (or delayed ACL surgery)
 - c. Slanted towards ACL reconstruction surgery (early ACL surgery)
5. Would you find (or would you have found) this decision aid useful when/if you were making your decision about ACL reconstruction surgery?
 - a. Not at all useful
 - b. Slightly useful
 - c. Moderately useful
 - d. Very useful

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- e. Extremely useful
6. Did this decision aid/would this decision aid make your decision to have ACL reconstruction surgery...?
- a. Easier (option to comment)
 - b. More difficult (option to comment)

For peer review only

Supplementary File 11: Acceptability questionnaire for Health Professionals

We would like to know what you think about the patient decision aid you have just read.

Please rate each section by selecting 'strongly agree', 'agree', 'neutral', 'disagree' or 'strongly disagree' to show what you think about the way the information was presented on:

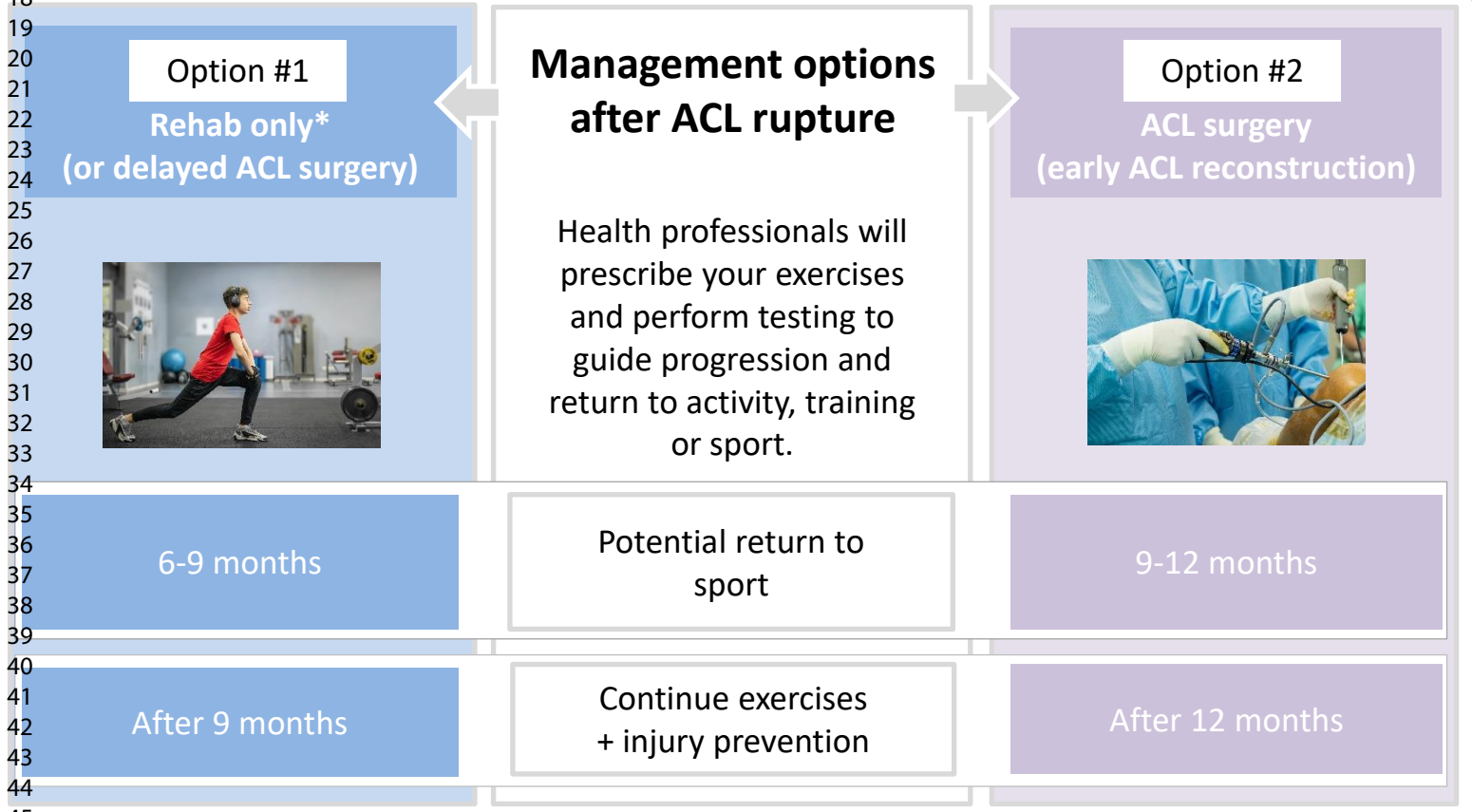
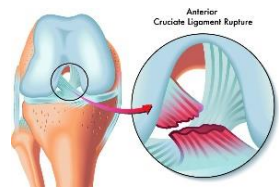
In general:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
It will be easy for me to use	1	2	3	4	5
It is easy for me to understand	1	2	3	4	5
It will be easy for me to experiment with using it before making a final decision to adopt it	1	2	3	4	5
The results of using the decision aid will be easy to see	1	2	3	4	5
This decision aid is better than how I usually go about helping patients decide about ACL reconstruction surgery	1	2	3	4	5
This decision aid is compatible with the way I think ACL ruptures should be managed	1	2	3	4	5
Compared with my usual approach, this decision aid will result in my patients making more informed decisions	1	2	3	4	5
Using this decision aid will save me time	1	2	3	4	5
This decision aid is a reliable method of helping patients make decisions about ACL reconstruction surgery	1	2	3	4	5
Pieces or components of the decision aid can be used by themselves	1	2	3	4	5
This type of decision aid is suitable for helping patients make value laden choices	1	2	3	4	5
This decision aid complements my usual approach	1	2	3	4	5
Using this decision aid does not involve making major changes to the way I usually do things	1	2	3	4	5
There is a high probability that using this decision aid may cause/result in more benefit than harm	1	2	3	4	5

I ruptured my ACL: Should I have surgery?

Who should read this decision aid?

This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL). ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different.

This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.



*Talk to a health professional if your knee keeps 'giving way' despite following advice.

No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option.

Remember to consider long-term goals and see people who can support you (e.g., friends).


What is covered in the decision aid?

- What are the treatment options covered in this decision aid?
- Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old
- Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Important: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

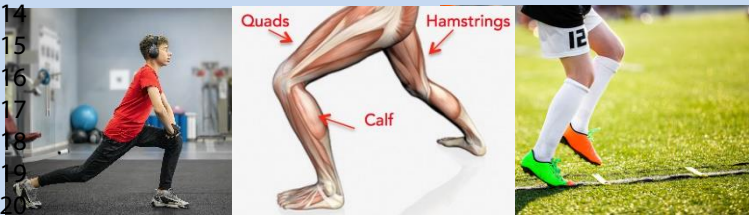
Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. **Last reviewed:** Updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.

Institute for Musculoskeletal Health




1. Rehab only (or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.



After an ACL rupture occurs

See a health professional. 

0-1 month post injury

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.



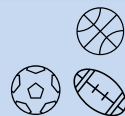
1-3 months post injury

You may begin activities like running, swimming or outdoor cycling.



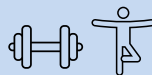
6-9 months post injury

You may return to sports like soccer, basketball, volleyball or rugby.



After 9 months post injury

Continue exercises to help your functional recovery and keep the knee strong.

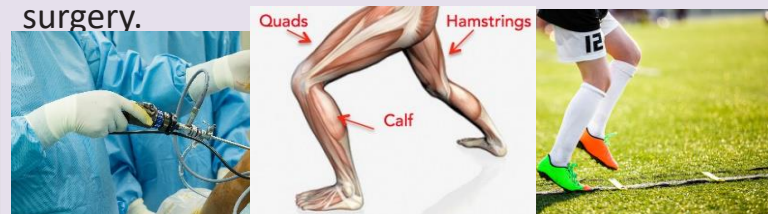


If you decide to have **delayed ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.


Caution: If your knee 'gives way' after 3 months, talk to your health professional. You may be at risk of further injury.

2. ACL surgery (early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.



After an ACL rupture occurs

See a health professional. 

0-1 month post surgery

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.



1-3 months post surgery

With the help of a health professional, gradually start harder exercises at home or in a gym.



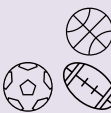
3 months post surgery

You may begin activities like running, swimming or outdoor cycling.



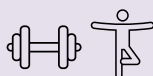
9-12 months post surgery

You may return to sports like soccer, basketball, volleyball or rugby.



After 12 months post surgery

Continue exercises to help your functional recovery and keep the knee strong.



Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹

Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

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This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).² High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

1. Rehab only (or delayed ACL surgery)

Delayed ACL surgery = 3 months or later

2. ACL surgery (early ACL reconstruction)

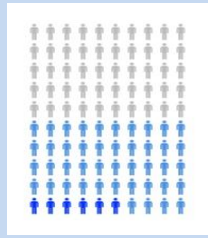
Early ACL surgery = before 3 months

+ Return to pre-injury sport

Not everyone will return to their pre-injury level of sport with either option.

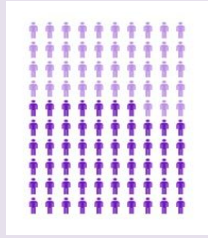
Rehab only:

Between 6 and 50 people per 100 return to their pre-injury sport around 20 months after injury.²



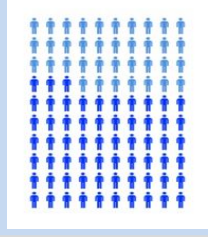
Early ACL surgery:

Between 57 and 100 people per 100 return to their pre-injury sport around 24 months after injury.²



Delayed ACL surgery:

Between 63 and 100 people per 100 return to their pre-injury sport around 22 months after injury.²



- Precautions and potential harms

Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²

Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.² Meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

Questions to consider when talking to a health professional...



- Will my choice affect what sport I play?
- If I am still growing, will this affect my management?
- What type of graft is best for me if I have ACL surgery?
- Is there any psychological support available?
- What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?



Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

1. Rehab only (or delayed ACL surgery)

2. ACL surgery (early ACL reconstruction)

+ Positives and potential benefits

- Between 41 – 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

+ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

- Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience ‘giving way’ of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

- Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Key points

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Choose what is best for your situation • If you chose rehab only, you could still decide to have delayed ACL surgery later • See family, friends and health professionals for support | <ul style="list-style-type: none"> • Listen and care for your whole-body • Care for your mental and physical health • Plan to try new activities • Don't rush – expect challenges • Stay positive! |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

References:

1) Grindem H, et al. Br J Sports Med. 2016;50(13):804–8	5) Wiggins AJ, et al. Am J Sports Med. 2016;44(7):1861–76
2) James EW, et al. Am J Sports Med. 2021; 49(14):4008-4017	6) Frosch KH, Arthroscopy, 2010; 26:1539–50.
3) Frobell RB, et al. NEJM 2010;363(4):331-342	7) Ardern CL, et al. KSST. 2018;26(4):898-1010
4) Reijman M, et al. BMJ 2021;372-375	8) Webster, K et al. CJSM. 2022;32(2):145-152
	9) Pitsillides, A et al. J Bodyw Mov Ther. 2021;28:246-254

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the interview or focus group?	
Duration	21	What was the duration of the interviews or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

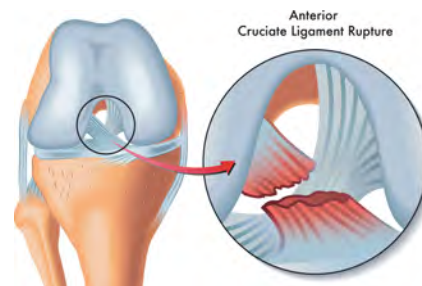
I RUPTURED MY ACL: SHOULD I HAVE SURGERY?

+ Who should read this decision aid?

This decision aid is for children or adolescents who have ruptured their anterior cruciate ligament (ACL).

ACL rupture is when the two ends of the ligament become completely separated, often because of quickly changing direction or landing from a jump. If you also injured other parts of your knee (e.g., meniscus) or your knee continues to 'give way' or feel unsteady, your treatment needs may be different.

This decision aid should be used with parents/guardians and a health professional team. For example: Physiotherapist, Orthopaedic surgeon, General Practitioner.



OPTION 1 - REHAB ONLY*

(or delayed ACL surgery)



6 - 9 months

After 9 months

MANAGEMENT OPTIONS AFTER ACL RUPTURE

Health professionals will prescribe your exercises and perform testing to guide progression and return to activity, training or sport.

Potential return to sport

Continuous exercises + injury prevention

OPTION 2 - ACL SURGERY

(early ACL reconstruction)



9 - 12 months

After 12 months

*Talk to a health professional if your knee keeps 'giving way' despite following advice.

No option guarantees you won't injure your knee again, but this decision aid was developed to assist patients with choosing the best option.

Remember to consider long-term goals and see people who can support you (e.g., friends).

+ What is covered in the decision aid?

Page 2 - What are the treatment options covered in this decision aid?

Page 3 - Comparing potential benefits and harms between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Page 4 - Summary of potential benefits and harms of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

Important information: This decision aid is not a substitute for advice from a health professional who should confirm your diagnosis.

Disclosure: There was no funding to develop this tool. The developers of this decision aid include orthopaedic surgeons, physiotherapists, psychology researchers & occupational therapists. None of the developers will gain or lose anything based on the choices that people make. Last reviewed: updated 17.10.2023 and to be updated by 17.10.2025. Developed by Andrew Gamble, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney, NSW, Australia.

+ What are the treatment options covered in this decision aid?


OPTION 1 - REHAB ONLY*

(or delayed ACL surgery)

Exercise-based rehabilitation is used to improve movement, strength, control and fitness. You can see if you can gradually progress to harder exercises without surgery. It is okay to experience some discomfort with exercise.

✓ **After an ACL rupture occurs** 

See a health professional.

✓ **0-1 month post injury** 

With the help of a health professional, gradually perform harder exercises at home or in a gym. You may be recommended to wear a brace.

✓ **1-3 months post injury** 

You may begin activities like running, swimming or outdoor cycling.

✓ **6-9 months post injury** 

You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 9 months post injury** 

Continue exercises to help your functional recovery and keep the knee strong.

If you decide to have delayed **ACL surgery** at any point, then you should follow the milestones from option 2 (ACL surgery) from the beginning.

Caution: If your knee 'gives way' after **3 months**, talk to your health professional. You may be at risk of further injury.



OPTION 2 - ACL SURGERY

(early ACL reconstruction)

During surgery you are put to sleep. A replacement ACL from another part of your leg or from a donor is attached by drilling into the bone inside the knee. For weeks after surgery, you will need crutches to walk and for months, you will have pain and swelling in the knee. Expect to have small scars from surgery.

✓ **After an ACL rupture occurs** 


See a health professional.

✓ **0-1 month post surgery** 

After surgery you will have pain and difficulty with self-care/walking. With the help of a health professional, gradually start exercises. You may be recommended to wear a brace.

✓ **1-3 months post surgery** 


With the help of a health professional, gradually start harder exercises at home or in a gym.

✓ **3 months post surgery** 

You may begin activities like running, swimming or outdoor cycling.

✓ **9-12 months post surgery** 

You may return to sports like soccer, basketball, volleyball or rugby.

✓ **After 12 months post surgery** 

Continue exercises to help your functional recovery and keep the knee strong.

Caution: You are twice as likely to have another ACL rupture if you return to competitive sport at 8 months compared to 9 months. The risk is even higher if you return to sport before 8 months.¹



+ Comparing potential benefits and harms

Practical issues

Between rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

This page is based on the best but **very low-quality evidence** in people under 18 years old at approximately 2 years post injury. People participated in pivoting sports (e.g., soccer or skiing).²

High-quality evidence shows that adults who choose rehab only (with the option for delayed ACL surgery) or early ACL surgery can achieve similar function and return to sport outcomes.^{3,4}

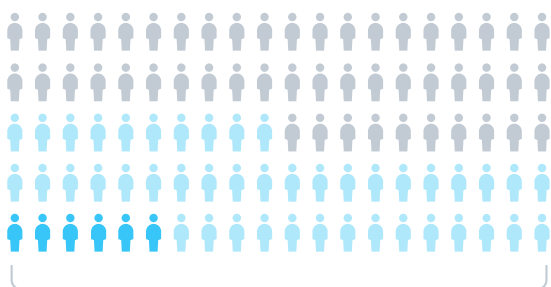
OPTION 1 - REHAB ONLY

(or delayed ACL surgery = 3 months or later)

Return to pre-injury sport

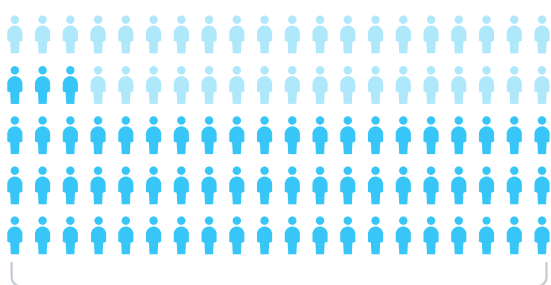
(Not everyone will return to their pre-injury level of sport)

Rehab only:



Between 6 and 50 people per 100 return to their pre-injury sport around 20 months after injury.²

Delayed ACL surgery:



Between 63 and 100 people per 100 return to their pre-injury sport around 22 months after injury.²

Precautions and potential harms

- Between 0 and 40 people per 100 decide to have **ACL surgery** after 6 months or longer.²
- Delaying **ACL surgery** if the knee is unstable may increase the risk of meniscus* injury or ongoing knee instability.²

*meniscus are important shock absorbing structures that protect the knee against osteoarthritis.²

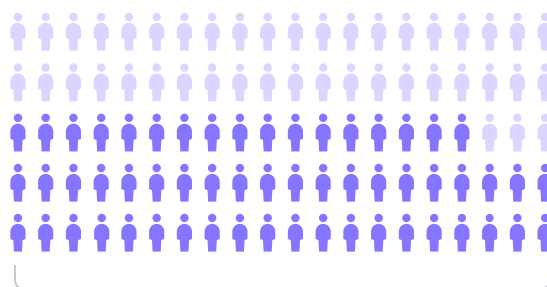
OPTION 2 - ACL SURGERY

(early ACL reconstruction = before 3 months)

Return to pre-injury sport

(Not everyone will return to their pre-injury level of sport)

Early ACL surgery:



Between 57 and 100 people per 100 return to their pre-injury sport around 20 months after injury.²



Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- 2 people per 100 can experience growth issues due to ACL surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Summary of potential benefits and harms

Clinical issues

Of rehab only (or delayed ACL surgery) and ACL surgery (early ACL surgery) using data from people under 18 years old

OPTION 1 - REHAB ONLY

(or delayed ACL surgery)

✓ Positives and potential benefits

- Between 41 - 100 children and adolescents per 100 may avoid having ACL surgery.²
- In some countries you may save money by avoiding ACL surgery.
- You may return to sport sooner.²
- You will not increase your risk of knee osteoarthritis.⁸
- Your ACL may heal.⁹

– Precautions and potential harms

- You may still have delayed ACL surgery and slow your return to sport or activity.
- You may experience 'giving way' of the knee which could cause further injury.
- Cost of rehabilitation.
- Consider the risk of meniscus damage if the knee continues to be unstable.²
- You may be recommended to use a brace when returning to activity and sport.²

OPTION 2 - ACL SURGERY

(early ACL reconstruction)

✓ Positives and potential benefits

- You may be more likely to return to your pre-injury level of sport.²

– Precautions and potential harms

- On average, 1 in 4 people rupture their ACL graft or have another ACL rupture on the other knee after 12 months or longer.⁵
- It can take 12 months to return to competitive sport.⁷
- Cost of ACL surgery plus rehabilitation.
- You will need time off school/work due to pain, swelling, reduced movement and the need to use crutches.
- 2 children per 100 may experience growth issues following surgery.⁶
- ACL surgery also has other risks (e.g., infection, general anaesthetic, graft site issues and loss of feeling around the knee).⁷

+ Key points

- Choose what is best for your situation
- If you chose rehab only, you could still decide to have delayed ACL surgery later
- Listen and care for your whole-body
- See family, friends and health professionals for support
- Care for your mental and physical health
- Plan to try new activities
- Don't rush - expect challenges and stay positive!

+ Questions to consider when talking with a health professional...

- Will my choice affect what sport I play?
- If I am still growing, will this affect my management?
- What type of graft is best for me if I have ACL surgery?
- Is there any psychological support available?
- What should I do now? How do previous injuries and the timing of the sport season influence me? What experience do you have with people my age? Do I need pain medication? and what are the potential costs involved?

References: 1) Grindem H, et al. Br J Sports Med. 2016; 50(13):804-8
 2) James EW, et al. Am J Sports Med. 2021; 49(14):4008-4017
 3) Frobell RB, et al. NEJM 2010; 363(4):331-342
 4) Reijman M, et al. BMJ 2021; 372-375
 5) Wiggins AJ, et al. Am J Sports Med. 2016; 44(7):1861-76
 6) Frosch KH, Arthroscopy, 2010; 26:1539-50
 7) Ardern CL, et al. KSST. 2018; 26 (4):898-1010
 8) Webster, Ketal. CJSM. 2022; 32(2):145-152
 9) Pitsillides, Aetal. J Bodyw Mov Ther, 2021; 28:246-254

Supplementary File 13. International Patient Decision Aid Standards checklist
(IPDASi v4.0)

Qualifying criteria	Answer
1. The patient decision aid describes the health condition or problem (treatment, procedure, or investigation) for which the index decision is required.	Yes
2. The patient decision aid explicitly states the decision that needs to be considered (index decision).	Yes
3. The patient decision aid describes the options available for the index decision.	Yes
4. The patient decision aid describes the positive features (benefits or advantages) of each option.	Yes
5. The patient decision aid describes the negative features (harms, side effects, or disadvantages) of each option.	Yes
6. The patient decision aid describes what it is like to experience the consequences of the options (e.g., physical, psychological, social).	Yes
Certification criteria	Answer
1. The patient decision aid shows the negative and positive features of options with equal detail (e.g., using similar fonts, sequence, presentation of statistical information).	Yes
2. The patient decision aid (or associated documentation) provides citations to the evidence selected.	Yes
3. The patient decision aid (or associated documentation) provides a production or publication date.	Yes
4. The patient decision aid (or associated documentation) provides information about the update policy.	Yes
5. The patient decision aid provides information about the levels of uncertainty around event or outcome probabilities (e.g., by giving a range or by using phases such as “our best estimate is . . .”).	Yes
6. The patient decision aid (or associated documentation) provides information about the funding source used for development.	Yes
7. The patient decision aid describes what the test is designed to measure.	N/A
8. If the test detects the condition or problem, the patient decision aid describes the next steps typically taken.	N/A
9. The patient decision aid describes the next steps if the condition or problem is not detected.	N/A
10. The patient decision aid has information about the consequences of detecting the condition or disease that would never have caused problems if screening had not been done (lead time bias).	N/A
Quality criteria	Answer
1. The patient decision aid describes the natural course of the health condition or problem, if no action is taken (when appropriate).	Yes
2. The patient decision aid makes it possible to compare the positive and negative features of the available options.	Yes
3. The patient decision aid provides information about outcome probabilities associated with the options (i.e., the likely consequences of decisions).	Yes
4. The patient decision aid specifies the defined group (reference class) of patients for whom the outcome probabilities apply.	Yes
5. The patient decision aid specifies the event rates for the outcome probabilities	Yes
6. The patient decision aid allows the user to compare outcome probabilities across options using the same time period (when feasible).	Yes

7. The patient decision aid allows the user to compare outcome probabilities across options using the same denominator (when feasible).	Yes
8. The patient decision aid provides more than 1 way of viewing the probabilities (e.g., words, numbers, and diagrams).	Yes
9. The patient decision aid asks patients to think about which positive and negative features of the options matter most to them (implicitly or explicitly).	Yes
10. The patient decision aid provides a step-by step way to make a decision.	Yes
11. The patient decision aid includes tools like worksheets or lists of questions to use when discussing options with a practitioner.	Yes
12. The development process included a needs assessment with clients or patients.	Yes
13. The development process included a needs assessment with health professionals.	Yes
14. The development process included review by clients/patients not involved in producing the decision support intervention.	Yes
15. The development process included review by professionals not involved in producing the decision support intervention.	Yes
16. The patient decision aid was field tested with patients who were facing the decision.	Yes
17. The patient decision aid was field tested with practitioners who counsel patients who face the decision.	Yes
18. The patient decision aid (or associated documentation) describes how research evidence was selected or synthesized.	Yes
19. The patient decision aid (or associated documentation) describes the quality of the research evidence used.	Yes
20. The patient decision aid includes authors'/developers' credentials or qualifications.	Yes
21. The patient decision aid (or associated documentation) reports readability levels (using 1 or more of the available scales).	Yes
22. There is evidence that the patient decision aid improves the match between the preferences of the informed patient and the option that is chosen.	No*
23. There is evidence that the patient decision aid helps patients improve their knowledge about options' features.	No*
24. The patient decision aid includes information about the chances of having a true-positive test result.	N/A
25. The patient decision aid includes information about the chances of having a true-negative test result.	N/A
26. The patient decision aid includes information about the chances of having a false-positive test result.	N/A
27. The patient decision aid includes information about the chances of having a false-negative test result.	N/A
28. The patient decision aid describes the chances the disease is detected with and without the use of the test.	N/A

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N/A: not applicable.

*We plan to evaluate the decision aid in a randomised controlled trial.

For peer review only

Supplementary File 14. User-Centered Design 11-item measure (UCD-11)

Items	Explanations and examples	Yes/No
1. Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps to help understand users (eg, who they are, in what context might they use the tool) and their needs?	Such steps could include various forms of user research, including formal or informal needs assessment, focus groups, surveys, contextual inquiry, ethnographic observation of existing practices, literature review in which users were involved in appraising and interpreting existing literature, development of user groups, personas, user profiles, tasks, or scenarios, or other activities	Yes
2. Were potential end users involved in any steps of designing, developing, and/or refining a prototype?	Such steps could include storyboarding, reviewing the draft design or content before starting to develop the tool, and designing, developing, or refining a prototype	Yes
3. Were potential end users involved in any steps intended to evaluate prototypes or a final version of the tool?	Such steps could include feasibility testing, usability testing with iterative prototypes, pilot testing, a randomized controlled trial of a final version of the tool, or other activities	Yes
4. Were potential end users asked their opinions of the tool in any way?	For example, they might be asked to voice their opinions in a focus group, interview, survey, or through other methods	Yes
5. Were potential end users observed using the tool in any way?	For example, they might be observed in a think-aloud study, cognitive interviews, through passive observation, logfiles, or other methods	Yes
6. Did the development process have 3 or more iterative cycles?	The definition of a cycle is that the team developed something and showed it to at least one person outside the team before making changes; each new cycle leads to a version of the tool that has been revised in some small or large way	Yes
7. Were changes between iterative cycles explicitly reported in any way?	For example, the team might have explicitly reported them in a peer-reviewed paper or in a technical report. In the case of rapid prototyping, such reporting could be, for example, a list of design decisions made and the rationale for the decisions	No
8. Were health professionals asked their opinion of the tool at any point?	Health professionals could be any relevant professionals, including physicians, nurses, allied health providers, etc. These professionals are not members of the research team. They provide care to people who are likely users of the tool. Asking for their opinion means simply asking for feedback, in contrast to, for example, observing their interaction with the tool or assessing the impact of the tool on health professionals' behavior	Yes

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4	9. Were health professionals	Consulting before the first prototype means	Yes
5	consulted before the first	consulting prior to developing anything. This	
6	prototype was developed?	may include a variety of consultation methods	
7	10. Were health	Consulting between initial and final prototypes	Yes
8	professionals consulted	means some initial design of the tool was	
9	between initial and final	already created when consulting with health	
10	prototypes?	professionals	
11	11. Was an expert panel	An expert panel is typically an advisory panel	Yes
12	involved?	composed of experts in areas relevant to the	
13		tool if such experts are not already present on	
14		the research team (eg, plain language experts,	
15		accessibility experts, designers, engineers,	
16		industrial designers, digital security experts,	
17		etc). These experts may be health professionals	
18		but not health professionals would provide	
19		<u>direct care to end users</u>	
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For peer review only

Supplementary file 12: Reasons for not implementing feedback for each section of the decision aid.

Themes	Sub themes	Feedback	Reason for not implementing feedback
Negative feedback on the decision aid	Negative feedback on the content	Health Professionals:	Health Professionals:
		A decision aid cannot be made for adolescents and children due to poor supporting evidence. [OS]	We believe that it is still possible to create a decision aid using the best available evidence.
		It was suggested that pictures were not necessary in the decision aid. [PT]	We had a large amount of opposing feedback that participants liked the inclusion of some pictures.
Outline how the decision aid should be used	Improve clarity on the target population	Health Professionals:	Health Professionals:
		Add who does well with each option. For example, how many episodes of giving way is acceptable. [PT]	We couldn't do this as there is no evidence on who does well with each outcome.
	Clarify that choices should be made based on individual circumstances	Adults:	Adults:
		Provide definitions of what a successful or unsuccessful outcome.	Treatment success is individualised.
		Health Professionals:	Health Professionals:
		Add that decisions should be made based on skeletal maturity rather than age. [OS]	We decided to specify a recommended age limit for use of the decision aid and did not mention skeletal maturity directly due to feedback it was too complex for children and adolescents to understand.
More information about specific considerations	Highlight the importance of social and psychological support, and whole-body health	Parents:	Parents:
		Some parents suggested including information about alternative medicine.	There is a lack of supporting evidence for alternative medicine in both adults and children.
		Health Professionals:	Health Professionals:

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following ACL rupture		Add information on methods of pain management. For example, the need for massage. [PT]	There is a lack of supporting evidence for pain management using massage in both adults and children.
Revise the management options to include evidence on ACL healing, bracing and ‘prehabilitation’	Children and adolescents:	Children and adolescents:	Children and adolescents:
	Include non-operative bracing as another option. Give an estimation of the percentage of people that can have ACL healing.		There is currently no evidence comparing non-operative bracing to rehab only and ACL reconstruction. There is currently no strong link between ACL healing and outcomes so we did not want to overload children and adolescents with more statistics.
	Adults:	Adults:	Adults:
	Include that it can take time to book ACL reconstruction, depending on if you have surgery privately or publicly.		This information was decided to be unnecessary as both rehabilitation timeframes mention the need to see a health professional.
	Health Professionals:	Health Professionals:	Health Professionals:
	Include recommendations of prehabilitation and checking if the ACL has healed after three months. [PT]		There is no evidence that prehabilitation is beneficial and there is currently no strong link between ACL healing and outcomes, so we did not want to overload children and adolescents with more statistics.
Include more information on practical factors influencing management choices	Children and adolescents:	Children and adolescents:	Children and adolescents:
	Include that COVID 19 may have influenced having an ACL rupture.		There is no evidence to support this claim, so we decide to exclude.
	Adults:	Adults:	Adults:
	Add consider the time it can take to book surgery.		This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.

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		Parents:	Parents:
		Add the consideration of scar size following ACL reconstruction surgery.	Scars are mentioned in the description of ACL reconstruction, but we do not expand beyond this as there is a lack of high-quality evidence on the importance of scar size following ACL reconstruction.
		Health Professionals:	Health Professionals:
		Add a statement that meniscus is a secondary restraint in pivoting without an ACL. [OS] Include the injury risk related to graft type. [PT]	We did not include this statement as it was beyond the scope of this decision aid. We included a question about graft choices which provides an opportunity to discuss graft choice with a health professional.
	Add or remove questions	Parents:	Parents:
		The decision aid could prompt children and adolescents to ask about other previous injuries not just the ACL.	We included a question about previous injuries, but this was otherwise beyond the scope of this decision aid.
		Health Professionals:	Health Professionals:
		Add 'what factors have been shown to make a bigger difference' in achieving outcomes. [PT] Add 'if I don't have surgery how would my knee function be in the future? [OS]	We did not include this statement directly as there is no evidence on who does well with each outcome. We did not include this question as it could be considered a leading question.
Change or add information on rehabilitation, exercises and return to sport	Include more detail on return to sport following ACL rupture	Health Professionals:	Health Professionals:
		Include a statistic that participation in change of direction sports in children following ACL rupture may mean a higher risk of meniscus damage. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
		Children and adolescents:	Children and adolescents:

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Refine rehabilitation progression timeframes	Add remember to also focus on the uninjured leg during rehabilitation.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
	Adults:	Adults:
	Add to settle the knee with bed exercises to avoid confusion that you start harder exercise straight away.	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
	Health Professionals:	Health Professionals:
	Add patient milestones or goals of each rehabilitation phase. [PT] Include when activities can be done. [OS]	This information was decided to be unnecessary as both rehabilitation timeframes recommend seeing a health professional.
Clarify the importance of testing rehabilitation progress and return to training or competition sport	Health Professionals:	Health Professionals:
	Add more detail on the classification of the individual’s current level of sport and their desired level of sport. [PT]	We did not include this statement as it was beyond the scope of this decision aid.
Expand on the type of exercises involved in management	Children and adolescents:	Children and adolescents:
	Include the need to get a gym membership.	We did not include this statement as it was beyond the scope of this decision aid.
	Adult:	Adult:
	Include the importance of hard work on quadriceps muscle at the gym.	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.
	Health Professionals:	Health Professionals:
	It was suggested to provide more detail on muscle strengthening programs and how exercise can help to stabilise the knee. [PT]	Providing specific rehabilitation guidelines were beyond the scope of the decision aid.

	Consider the long-term need for ongoing “hard work” and injury prevention	Health Professionals: Note that if meniscus and cartilage injuries happen, this can have major impact on the future osteoarthritis. [PT]	Health Professionals: We noted the link between meniscus damage and risk of osteoarthritis damage. The risk of cartilage damage can be discussed with a health professional.
Modify language and formatting used	Use simple language	Health Professionals:	Health Professionals:
		Reduce the number of words used in the headings to describe each option. [PT]	We decided to keep ‘or delayed ACL surgery’ and ‘early ACL surgery’ in brackets following the headings of each option throughout to keep consistency.
	Make the section more concise	Health Professionals:	Health Professionals:
		Remove the statement about quality of evidence. [PT] Soften the language around return to sport as people can return sooner and be ok [PT]	We did not remove the statement about the quality of evidence as we believe this is important in showing the uncertainty of evidence and feedback frequently reported this as important to convey. We used evidence-based ranges of times for an expected for return to sport.
	Modify presentation of harms, formatting, graphics, or statistics	Children and adolescents:	Children and adolescents:
Add more pictures to the decision aid.		We received opposing feedback that too many visuals may take away from key information.	
Adult:		Adult:	
Highlight the statistics that were ‘better’.		We did not apply highlighting around statistics to avoid bias.	
Parents:		Parents:	

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		Present statistics as percentages as it is easier to understand.	We received opposing feedback that ‘x amount of people per 100’ was preferable.
		Health Professionals:	Health Professionals:
		Include if there is a clinically significant difference in function scores between groups when presenting statistics. [PT] Use more visuals, pictures and make more like an infographic. [PT] Use a bar graph rather than an icon array. [PT] Suggestion to include definitions of a complication. [PT]	We included a statement about the quality of evidence and presented statistics without significance values to avoid making the decision aid too complex. We received opposing feedback that too many visuals may take away from key information. We received opposing feedback that using icon array was preferable than a bar graph to represent statistics. The decision aid is designed to be used with a health professional who can clarify this information.
	Use positive messaging	Parents:	Parents:
		Include a statement that research is only presenting the average outcomes.	We used evidence-based statistics, but avoided using statements that may give unrealistic expectations.
		Health Professionals:	Health Professionals:
		Add a positive message in the form of a sentence at the end of the decision aid [PT]	It was decided that key points were more appropriate.
Understanding the translation of research	Usability of the decision aid	Health Professionals:	Health Professionals:
		Move the summary page to be the first page of the decision aid. [PT]	We received opposing feedback that it was appropriate to present the summary page on the last page of the decision aid.
	Children and Adolescents:	Children and Adolescents:	

1 2 3 4 5 6 7 8 9 10 11 12	Clarify the uncertainty of evidence and outcomes of each option	Add statistics that females can be at a higher risk of ACL rupture.	We did not include this statement as it was beyond the scope of this decision aid.
		Health Professionals:	Health Professionals:
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33	Keep or remove statistics using adult data	It was suggested to include that the position of the graft in ACL reconstruction can influence outcomes. [OS]	The inclusion of graft position as a variable is beyond the scope of our decision aid.
		Children and Adolescents:	Children and Adolescents:
		Adult statistics could be included as they may be more relevant for older skeletally mature adolescents.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
		Adults:	Adults:
		Include adult data because if someone was 19 years old and they wanted to look at adult data then it could be relevant for them.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.
		Parents:	Parents:
	Include adult data as it was clear enough that it was data using adults.	We decided not to include adult statistics as we did not want to overload children and adolescents with more statistics.	

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For peer review only

Supplementary file 15: Themes, sub-themes, and example quotes

Themes	Sub themes	Feedback
1. Positive feedback on the decision aid	1.1. Positive feedback on the content	Adolescents:
		Female, 15-17 yrs old - "I like the page and it makes sense to me everything that it's saying."
		Adults:
		Female, 18-20 yrs old - "So I guess informing people that have torn ACL and the benefits and limitations of each graph. And what they do would be good."
		Male, 21-30 yrs old - "I wish I had something like this for either of my ACL ruptures as following the first one I may have tried not having surgery as I was already back running."
		Male, 31-40 yrs old - "Giving them more information on what rehab they could be doing in the meantime, might lead to better outcomes until the surgery, there was for me, there was nothing in between in terms of exercise or rehab or anything. Yeah, and I didn't even know that, you know, that would have been something I should have been doing."
		Male, 21-30 yrs old - "Like it's giving you the clear picture but also showing you the downside simultaneously."
		Male, 21-30 yrs old - "Yeah, I like those, the data points there. That's pretty good. I like it as it shows you how many people out of 100. Nice. I also liked on the other page, you had the little infographic with the people bicolored."
		Parents:
		Female, 41-50 yrs old - "I like all the information, the statistics are really good."
		Female, 41-50 yrs old - "I think that's perfect." and "I think it's really good."
		Health Professionals:
OS, Male, 31-40 yrs old - "Well thought out, nice and balanced."		
PT, Male, 31-40 yrs old - "I like this. I like the summary. I think it's a good, I think is where you get a lot of information, which is really, really nice."		

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1.2. Positive feedback on design	Adolescents:
	Female, 15-17 yrs old - "I think it will be really valuable. It doesn't look boring as I get bored really quickly with medical brochures but this is engaging."
	Female, 15-17 yrs old - "I like reading it and I would go highlight it. I also like the cute little numbers and like percentage size. So I feel like this is like really good. So this is engaging."
	Female, 15-17 yrs old - "I think it's really good. I like the pictures"
	Adults:
	Male, 21-30 yrs old - "I like that flowchart, it's pretty straight forward."
	Female, 21-30 yrs old - "I think the pictures are good."
	Female, 21-30 yrs old - "I do like that it kind of has a timeline shows you the differences and similarities and each timeline."
	Female, 21-30 yrs old - "I do like that they are like side by side. It's easy to look from one to the other."
	Female, 21-30 yrs old - "I think that I don't think that's too long or too short. I think it gives enough information without necessarily overloading someone with it. It gives you the information you need to know without being overwhelming."
Parents:	
Female, 41-50 yrs old - "I love the little pictures. Great. Easy to read. Logical. Succinct."	
Female, 41-50 yrs old - "I like it. I like how the benefits and harms are highlighted. And the numbers really pop out."	
Female, 41-50 yrs old - "Remember, choose what is best for your situation. Think of whole-body health. See family, friends and health professionals for support and stay positive. Love that."	
Health professionals:	
OS, Male, 31-40 yrs old - "That's really good, the pictures there are great and it's really good to compare"	

		OS, Male, 31-40 yrs old - "It's really nicely displayed. So it's very easy to understand."
	1.3. Positive feedback on usability	Adults:
		Female, 21-30 yrs old - "I think this is probably something that would have been nice to have."
		Male, 31-40 yrs old - "It's easy to follow."
		Parents:
		Female, 41-50 yrs old - "Easy to follow."
		Female, 41-50 yrs old - "I like to timeframe because it sort of shows a comparison, especially what I've been reading a lot. So it kind of brings it together. So I can see, I like how it's broken down. Because most of the time when you go to the doctor, they don't discuss anything into this, this much detail"
		Female, 41-50 yrs old - "I actually had had a study in my hand and he didn't even look at it."
		Health professionals:
		PT, Female, 41-50 yrs old - "I really liked the first page, I think it makes it really clear that there are two options, it makes it clear that you know that if you try exercise, you still got the option for surgery, I think that's good. And that if you have successful rehab from either of them, then they return to sport or other activities. So I really liked that first page and I like the questions underneath."
2. Negative feedback on the decision aid	2.1. Negative feedback on the content	Adolescents:
		Male, 15-17 yrs old - "The pictures. I mean, it might make it look a little nicer, but it's not really giving you information. I think take the pictures away."
		Adults:
		Male, 21-30 yrs old - "Formatting could just be a no having pictures on both sides and having the legend somewhere else, but I think that was overkill with pictures."
		Health Professionals:
		OS, Male, 31-40 yrs old - "This language is too academic. Provide some more simple options."

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		PT, Male, 31-40 yrs old - "Could have it more infographic style." OS, Male, 51-60 yrs old - "What you're doing is intrinsically incorrect."
3. Outline how the decision aid should be used	3.1. Improve clarity on the target population	Children and adolescents:
		Female, 15-17 yrs old - "It makes sense to me."
		Parents:
		Female, 41-50 yrs old - "Have you thought about doing separate ones of these for boys versus girls being those girls have such a higher reinjury rate?"
		Female, 41-50 yrs old - "Females may be at a greater risk of re injury or something like along those lines."
		Health Professionals:
	PT, Female, 21-30 yrs old - "Because the well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic."	
	PT, Male, 31-40 yrs old - "So I think, obviously, there are patients that are going to do better with a reconstruction, particularly if they have a knee that for them feels unstable or is objectively unstable, either passively with bedside ligament testing, or in weight bearing their knee gives up or has given way."	
	PT, Male, 41-50 yrs old - "I believe that as a sports physical therapist, there's a certain population of athletes and younger athletes that could be fine without an ACL reconstruction surgery. I don't know exactly in my mind what that percentage is, I do think it's a smaller number. And then those who will need a reconstruction surgery to get back to all functional activity and high level of sport, especially playing catch pivot activities."	
3.2. Highlight that patients need to discuss the decision	Adolescents:	
	Female, 15-17 yrs old - "So just knowing the fact that they've had some someone go in there, like a professional and fix everything up. I feel like that helps."	

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	aid with health professionals	<p>Adults:</p> <p>Male, 21-30 yrs old - “It was for children and adolescents. But should be used with a parent and guardian with health professional. So I thought that was good.”</p> <p>Male, 21-30 yrs old - “But if that disclaimers at the top, and it's you know, in bigger writing, you say like, okay, if I'm going to do this option, I should still speak to a professional rather than making this decision on my own.”</p> <p>Male, 21-30 yrs old - “Your final step should be going to see a healthcare professional like a physio before you go back.”</p> <p>Female, 18-20 yrs old - “Added on to the second one. Like should be used with guardians and health professionals. And then like in brackets, it's not made to replace advice from health question or something.”</p> <p>Male, 21-30 yrs old - “I think that when I got mine down, I didn't really know what they were doing. And you wake up and your knees so sore. And you're like, “Why was my knee so swollen? But they've drilled through your tibia to attach this new data graph there?”</p> <p>Parents:</p> <p>Female, 41-50 yrs old - “Discharge procedures is that they do the medications, etc. And again, for myself, as a mother, none of it was discussed with myself.”</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "And it's also getting parents to understand what that is going to mean through the health professional. In terms of giving way – swelling, locking, hints of an unhappy knee is indicative of chondral damage, or meniscal tears."</p>
	3.3. Clarify that choices should be made based on individual circumstances	<p>Adolescents:</p> <p>Female, 15-17 yrs old - “Like the psychological issue, like it depends on like your circumstance, but I feel like it should still be talked about with your professional.”</p> <p>Female, 15-17 yrs old - “You gotta listen to your own body, because someone could be telling you something, and you could not feel the same.”</p>

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		<p>Male, 15-17 yrs old - "You know you might get clearance from your health professional but you don't feel confident in your knee yet, for example."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "I do like to this says Not everyone will return to pre injury sport. Because lots of things can happen. And all of the recoveries can be different."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Delayed ACL surgery doesn't sound that bad. But also I feel like it is very circumstantial."</p> <p>Female, 41-50 yrs old - "It should be an individual choice. And I think what you're saying there is sort of reflecting that, you know, you make this decision."</p> <p>Female, 41-50 yrs old - "Remembers that everybody's gonna have different results."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "Yeah, I so I like it. And I what I really like about it, is the questions to consider, you know, particularly around, you know, individual factors, age, sporting participation cost, all those kinds of things."</p>
<p>4. More information about specific considerations following ACL rupture</p>	<p>4.1. Highlight the importance of social and psychological support, and whole-body health</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Only thing I think about is how long will I sort of be limited in my sort of getting around and being able to socialise or how long have you crutches for. like you're saying you to how long to kind of walk around and go see your friends that sort of thing. That's important."</p> <p>Female, 15-17 yrs old - "Yeah, I feel like the immobility that you have. I feel like that's really important. Because for like that first month, you're completely reliant on like, whoever you haven't house with you. Yeah, and you just can't do anything. Really."</p> <p>Female, 15-17 yrs old - "I wasn't really offered any psychological help."</p>

		<p>Female, 15-17 yrs old - "I noticed that because I had put most of my weight on my right leg instead of my left like white bear in it. I my hip my like lowered discs in my back have like never really been the same."</p> <p>Female, 15-17 yrs old - "I didn't see any of my friends for like, two months, I barely saw my family. Like, I was literally in my house for like, two months, I didn't see anyone, so it was like, very isolating."</p> <p>Female, 15-17 yrs old - "But I think there should be a lot more psychological support. Yeah. I think mentally, it's just as hard or harder than the actual physical injury. And often, that's missed as well, like, it's not even talked about how hard it is."</p> <p>Female, 15-17 yrs old - "Fear of and it wouldn't be whether you have ACL surgery or not afraid of re injuring and I think that that's a really big psychological step to get over whether you have surgery or not."</p> <p>Female, 15-17 yrs old - "So, with weightlifting, I kind of I don't even back off, but like, I can feel that my legs are a lot weaker that certain time of the month. But then two days later, it'll be completely fine."</p> <p>Male, 15-17 yrs old - "It was hard. But the mental part of it the hardest part, like getting past that."</p> <p>Male, 15-17 yrs old - "Like mental health that you're looking after, as well. Yeah. Because it's such a mental battle for you to get back and feel ready to play and be confident. Or as well, because you're consistent with the rehab."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "Psychological support is also important, that's something that I didn't really think about. Yeah, was like, how tough it would be mentally. So that would definitely be a good thing to have."</p> <p>Male, 21-30 yrs old - "For example, my glutes not switching on because of the knee and then like not focusing enough on them, which then puts more pressure on the knee that puts more pressure on my back can lead to complications elsewhere? Like it's not just a knee problem?"</p>
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		<p>Male, 21-30 yrs old - "So definitely highlighting the whole psychological impact of if you're not ready, you don't have to go back."</p> <p>Female, 18-20 yrs old - "Remember when I was disappointed people told me that, like, you're not a full-time athlete. You're not getting paid to rehab. Yeah. And yeah, so it's like, to me, it's, it's like, important that kids know that that like when they say nine to 12 months, like that's what professional athletes are coming back in."</p> <p>Female, 18-20 yrs old - "Um, the psychological health. I think that's good. And really important that it stays there."</p> <p>Male, 31-40 yrs old - "That's a big component as well. I think just anything with any injury, really just a psychological rehab."</p>
Parents:		
<p>Female, 41-50 yrs old - "Not just about that what sport she can play but about the effect of the slow recovery on their social life. Being able to go and like walk."</p> <p>Female, 41-50 yrs old - "It doesn't incorporate any alternative things."</p> <p>Female, 41-50 yrs old - "Especially the psychological support or something. I figured it would kick in eventually, when finally realising how severe I guess the injury was. But no one ever talks to us about that."</p> <p>Female, 41-50 yrs old - "If you don't feel like doing your exercises, things like that, to know that, you know, that's normal that, that, you know, a lot of people experience the same thing, which is why those groups are good. That you can see what other people are doing as well."</p> <p>Female, 41-50 yrs old - "The big thing with the ACL with them and actually speaking to people who have returned the ACLs, because we do know, quite a few people that have"</p>		
Health Professionals:		
<p>PT, Male, 41-50 yrs old - "I think one of the factors that needs to be considered is your psychological support. That's probably the biggest one of the biggest issues that I think is coming more and more to the forefront."</p>		

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		<p>PT, Male, 21-30 yrs old - "Whether a patient needs surgery or not, is highly dependent on the person and what their needs and goals are."</p>
	<p>4.2. Revise the management options to include evidence on ACL healing, bracing and 'prehabilitation'</p>	<p>Adults:</p> <p>Male, 21-30 yrs old - "I feel like besides those three routes, like you either, we could have option four do nothing."</p> <p>Male, 21-30 yrs old - "There's only like exercise and delayed and earlier ACL surgery – had you just thought about doing the other options like the brace protocol? If you've seen that the doctor cross brace one?"</p> <p>Male, 21-30 yrs old - "Like prehab like before you have surgery. It can take a long time to get an ACL surgery appointment. Even like, mine was two weeks. But like, in those two weeks, I was like, rehabbing my knee to the best I could before my surgery."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "So for us option one, we didn't really consider option one we considered our option one was bracing protocol option two surgery, and we decided we'd go first and bracing protocol."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "At the time, [ACL surgery] was what we thought was the only option. We thought that that was important to do. And then honestly, then I had a few people who, like, they weren't actually great surgical candidates, but they still went and had it because we thought that's what you had to do. And it really made me question like the necessity of it."</p> <p>PT, Male, 31-40 yrs old - "Yeah, so obviously, there is a few treatment options that are available in the sense of early reconstruction prehabilitation, or delayed reconstruction with a set date. So you can do prehab and then reconstruction, or rehabilitation exercise therapy/physiotherapy on its own with the option of surgery later if you need it."</p>
	<p>4.3. Include more information on practical factors</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "It would have been good to know what like where the incisions would be, yeah, just so that you could have been prepared."</p>

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	<p>influencing management choices</p>	<p>Adults:</p> <p>Female, 18-20 yrs old - "As someone who did it in high school, you've got school, you've got a job, or at a job, you've got, like, you got to go to the gym, like four or five times a week, and then go for it again, as well, whilst you're going to the gym."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "The length of time on crutches and sort of you know, those length of time using sort of walking aids or with braces those sorts of things? I think that'd be something that a kid wants to know about."</p> <p>Female, 41-50 yrs old - "The options of quad, the quad graft, the patella graft, the hamstring graft, the donor graft. I mean, those are all the things that we've looked at."</p> <p>Female, 41-50 yrs old - "Is there anything about the requirement to have it immobilised? With a teenager, it was very hard to get them to wear a big, ugly, chunky brace."</p> <p>Health Professionals:</p> <p>PT, Female, 41-50 yrs old - "I treated someone years ago, who was the donor site for their child. And so I don't know if they're still doing that"</p> <p>PT, Female, 21-30 yrs old - "Add in something around 'Maybe even if I do have surgery quickly, what should I be doing until then?'"</p>
	<p>4.4. Add or remove questions</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "I think they're good questions. I guess the main thing that you want to know is like, how long does it take to get back? If I don't have surgery?"</p> <p>Adults:</p> <p>Male, 21-30 yrs old - "That's pretty good. Like that first one, because that's like, good, roundabout way of saying that you might not get back to pivoting sports, which is good."</p> <p>Female, 21-30 yrs old - "But a lot of people, well, they can be pretty clueless about these things. So I think that's a really good thing to have."</p> <p>Female, 18-20 yrs old - "I think the questions down the bottom are super good."</p>

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		<p>Parents:</p> <p>Female, 41-50 yrs old - "Considering the cost Yeah and even a child is gonna be aware of those stresses and a family's, economics. so maybe having a question about the cost as well."</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "What happens in the surgery? You know, like, because we've paid, you've obviously got a few graft choices. So I think they should know whether they're going to have it taken from themselves, or whether they're going to have a donor, or whether they're going to get a cadaver for. And then what that entails, like, you know, so they kind of have an explanation of it. And so they need to ask about that would be my something that, I would say, just as a side point"</p> <p>OS, Male, 41-50 yrs old - "Yeah, basically, what happens if I don't have surgery? The benefits of surgery, basically, are the two main things. Well, I need to change if I don't have surgery. Well, I need to change what sport I play but also if I don't have surgery, what will happen in the future? Like, what if my knee function without the ACL? They want to know if there's any long-term problems."</p>
<p>5. Change or add information on rehabilitation, exercises and return to sport</p>	<p>5.1. Include more detail on return to sport following ACL rupture</p>	<p>Adolescents:</p> <p>Female 15-17 yrs old - "I don't have the desire to go into a club anymore. Because I'm so scared that it will happen again, because I know that they still like a huge chance that will happen."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I was all for surgery, because my goal was to get back to sport, and I just didn't think I trusted the process of having gone through rehab without having the surgery."</p> <p>Male, 21- 30 yrs old - "The takeaway you'd get from that page. Like it's possible. But it's, you know, a little bit of a risk. You know, yeah, you get through or not, but I guess you're doing it, knowing that's the case."</p> <p>Male, 21- 30 yrs old - "If you don't feel comfortable going back to sport, once fully recovered, you don't have to go straight back to sport."</p> <p>Female, 18-20 yrs old - "Feel like, yeah, you got a lot of false hope from people. Yeah. So I think that, like the tie, like giving a timeline is good. But it can also be like, really dangerous, because</p>

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		<p>then people get to that 12. Like, I mean, I was at 12 months being like, I'm still not playing sport like.”</p>
		<p>Parents:</p>
		<p>Female, 41-50 yrs old - “I read statistics like that. Something very, similar, in my little delving down little rabbit holes, to find out outcomes. And when there was talk about returning to play soccer, I wasn't supportive of that. Yeah, for that very reason.”</p>
		<p>Health Professionals:</p>
		<p>OS, Male, 31-40 yrs old - "I think patients might read that like running, cycling, swimming, and they might go, I can't do anything for three months. Yeah, rather than I can do some of this stuff, but I can't do it in the same fashion."</p>
		<p>OS, Male, 41-50 yrs old - "I would be very hesitant to recommend a return to pivoting sports with no ACL for the younger people, because they are already a little bit lax in their joints."</p>
	<p>5.2. Refine rehabilitation progression timeframes</p>	<p>Adults:</p>
		<p>Male, 21-30 yrs old - “Well, for my second one, where I did conservative I was, I was cycling within a couple of weeks. I'm running after about a month.”</p>
		<p>Male, 31-40 yrs old - “All those timeframes that seem pretty accurate.”</p>
		<p>Female, 18-20 yrs old - “These timelines are a guide. Like, and like aren't certain. Yeah, but yeah, I think the other thing that's hard with it as well is like adolescence.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “Rehabilitation for two to three months is not enough. Like it's just not enough. You know, we need at least three to six months like there's, it's hard because as we've said, it's like the research and guideline evidence is very thin on the ground, particularly for paediatric populations. But the Swedish guidelines for adults would be three to six months.”</p>
		<p>PT, Female, 41-50 yrs old - "Nine months, nine to 12 months with surgery. And without surgery, I don't see a reason why it should be shorter. Without of course, the [duration of] swelling may be shorter, because you don't have an operation. But it isn't always faster. It can be really the same. It depends on if it's only the ACL or there are also other structures which are injured."</p>

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		<p>PT, Male, 31-40 yrs old - "It's rare that I see anyone get back to sport at nine months, then maybe that's me holding them back a little bit. It's not almost always 12 plus. I, but I don't know, maybe that's a confidence thing, or not a confidence, but a motivational thing for patients to if you say to them talk, it's gonna be 12 months. Sometimes that can be a bit confronting early on No, nine sounds a little bit better. You know? I think they think, you know, we definitely know it's possible, right? "</p>
	<p>5.3. Clarify the importance of testing rehabilitation progress and return to training or competition sport</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "So because I know this is return to sport. But to me is returning to sport. Unrestricted."</p> <p>Male, 15-17 yrs old - "Physio was really good. So he'd basically tell us every week yeah, okay, you can do this. And then he'd give us a letter to say, okay, she's allowed to do, you know, this part of that in her training, she's not allowed to do directionals she was only allowed to run straight lines or whatever."</p> <p>Male, 15-17 yrs old - "I do think to add in the just for the general person a clearance for return to sport that then must do a proper documented return to play protocol and "when cleared by medical professional."</p> <p>Adults:</p> <p>Male, 31-40 yrs old - "In that middle section here could have like, you know, clearance or passing test or something."</p> <p>Male, 21-30 yrs old - "Like a clearance to return to sport with testing or like something like that."</p> <p>Female, 18-20 yrs old - "I don't know, maybe you could do like a staggered return to sport and other activities or like something."</p> <p>Female, 18-20 yrs old - "Even adding the word gradual into the return to sport."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "Like with that clearance with a health professional. It's the what do you call it? like the return to sport criteria? I think that's really important."</p>

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		<p>Female, 41-50 yrs old - "Return to sport, they do a psychological assessment, as well. And it's sort of not just physical, it's a psychological test, as well. And I think that's pretty important."</p> <p>Female, 41-50 yrs old - "You know, they look for, you know, strength testing of at least 90% of your other side. So, you know, on your leg press or knee extensions, or you know, isometric testing."</p> <p>Health Professionals:</p> <p>PT, Male, 21-30 yrs old - "So you have a lot of people who come out of surgery if they're not like physically active in general did struggle or like physically active prior to surgery would find it much harder. Yeah, it would be a good way to like, have that looked at as for so like, objectively measuring whether your injured limb is at least at a certain percentage of your non injured limb prior to surgery."</p> <p>PT, Female, 41-50 yrs old - "I would rather say "If your knee is giving way, please talk to your health professional" because if you write it like that it's kind of already the decision if it's more giving where you need to do the operation and I find it it's more individual and it's makes sense maybe to talk to a health professional to really decide if this is a reason to opt for the surgery or not."</p> <p>PT, Male, 31-40 yrs old - "Mention that the body can or the muscle system can learn to take over the role of an injured ACL to restabilise the knee something like that."</p>
	<p>5.4. Expand on the type of exercises involved in management</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "And that's why I said we need to get your gym membership."</p> <p>Adults:</p> <p>Female, 21-30 yrs old - "One could be a little more than what someone should be doing right after surgery. So it could be the exercises that your doctor or physical therapist, like prescribes you as to not do something too fast."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "You're not sure what kind of muscles are talking about the kind of description of the treatment is unclear."</p>

		<p>Female, 41-50 yrs old - “Was just thinking is the range of movement and the flexion so there was so much emphasis with flexion and he needed to get it.”</p>
		<p>Health Professionals:</p>
		<p>PT, Male, 31-40 yrs old - “I primarily sort of focused on the types of exercises, I just focus on giving them information about exercises. Giving them that and then sort of telling them that they need, like, probably adjunct therapies, like, hands on physiotherapy as well to go to go with the exercise as well.”</p>
<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46</p>	<p>5.5. Consider the long-term need for ongoing “hard work” and injury prevention</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - “This is a requirement to think about the longevity of it. And obviously staying light and life is going to support that structure better.”</p> <p>Female, 15-17 yrs old - “Without Surgery, you still put a lot of effort into your exercises, which is not easy to do and be consistent.”</p> <p>Female, 15-17 yrs old - “I wouldn't say like missing school, but I would just say time consuming.”</p> <p>Adults:</p> <p>Male, 21-30 yrs old - “Just emphasis on either option, you need to continuously keep it up. Something like both options, have uncertainty with the standard of recovery and require hard work. Yeah. With exercises now and continuously going forwards.”</p> <p>Male, 31-40 yrs old - “More emphasis on how on the hard work on exercises to get better. I guess a lot of people don't know that that's going to happen. So even like just that image of like, you know, someone doing the knee extension machine or something. Or like just an image of their quad and saying like it takes hard work.”</p> <p>Female, 18-20 yrs old - “I did mine four years ago, and like, I still have to go to the gym, otherwise, my knee feels weak. And like that was four. So I think some people assume that once you're back, you're back”</p> <p>Female, 18-20 yrs old - “Mean, to me now long term is like my whole life. whether we say like, you know, like, lifelong exercise or something like that to make them consider that.”</p>

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		<p>Parents:</p> <p>Female, 51-60 yrs old “Unfortunately, there's so much pressure on these kids to get back to sport. And, you know, they feel the need that they're missing out and stuff like that. There's, you know, and it's hard trying to tell someone not to rush not to rush it back.”</p> <p>Female, 41-50 yrs old - “I think it would say need a certain level of dedication or something like that. Yeah. Because I think that's what made her successful is that she was dedicated to doing it.”</p> <p>Female, 41-50 yrs old - “Because it's that consistency, as you probably saw, you know, you have to keep going with it.”</p> <p>Female, 41-50 yrs old - “Some people may think once I finished my nine months of therapy, I'm done. But it's like, it's a lifelong journey, if you will.”</p> <p>Female, 41-50 yrs old - “I've been reading a lot about them. And later on down the road, like a lot of people look at right now. And I want to look at how's the knee gonna be when they are 25 or 30.”</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - “But the recovery and the rehab is actually the hardest bit. And most surgeons will tell you, or at least most of the surgeons are as actually more and more don't really matter what sort of version of the surgery we do. As indeed, we do the hard work afterwards. We are the ones that have to. I think probably in terms of decision making, whichever one you choose, you need to do a boatload of hard work.”</p> <p>PT, Male, 41-50 yrs old - “So I stress immediately that the hard work begins on the moment you wake up from surgery and will not stop, you will have a year of rehab. And after that, you will still have to maintain the strength and do spend a lot of time focusing on your knee control. It becomes it needs to become a lifestyle change rather than just yeah, I'll turn up for physio every so often. And I don't think surgeons because they haven't got the time they stress it enough.”</p> <p>PT, Male, 31-40 yrs old - “But I liked that closing, you know, use, you know, require ongoing hard work and exercises and use the people around you for support and choose whatever option is best for your situation. I think that's nice as a closing statement.”</p>
	6.1. Use simple language	Adolescents http://www.bmjopen.bmj.com/site/about/guidelines.xhtml

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6. Modify language and formatting used		Female, 15-17 yrs old - "Irreparable was that a bit hard to understand"	
		Adults:	
		Male, 31-40 yrs old - "You're not using any technical, like overly technical terms, not using any jargon that people can't understand. It's simple language."	
		Male, 31-40 yrs old - "Think it's all sort of worded. Like, easy to understand. it's all it's all pretty clear to me how its worded."	
		Health Professionals:	
		PT, Male, 31-40 yrs old - "Adult comprehension and health literacy isn't so good, but in kids, it may not be even as good."	
		PT, Male, 31-40 yrs old - "We're assuming that the patients who go to weigh all this information up will have the health literacy, the time to do so and the interest in doing so."	
	6.2. Make the section more concise		Adults:
			Male, 21-30 yrs old - "I like now it's nice and simple."
			Male, 21-30 yrs old - "No more stuff in the graph, I think we'll clutter it too much."
		Health Professionals:	
		PT, Female, 41-50 yrs old - "Yeah, I find this whole page quite confusing. I would say I would remove the issues of the knee not necessarily caused by the treatment choice." OS, Male, 41-50 yrs old - "I found this whole thing very wordy. wordy. Yeah. Yeah. So unless the parents are completely involved, right, they don't really would read all of it. They would not read all of it. Unless they're that sort of parents like very much. Totally involved. When he comes to see me, they just want to know, the very simple stuff."	
6.3. Modify presentation of harms, formatting, graphics, or statistics		Adolescents:	
		Female, 15-17 yrs old - "I think the little people, I just think it'd be better set. If like 10 of those people were purple, and it was just on the one graph than the rest of them were blue."	
		Adults: <small>For peer review only: http://bmjopen.bmj.com/site/about/guidelines.xhtml</small>	

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		<p>Male, 21-30 yrs old - "I liked on the other page, you had the little infographic with the people."</p> <p>Female, 18-20 yrs old - "If it does give way, pretty heavily, then it could definitely injure something else."</p> <p>Male, 31-40 yrs old - "If someone's got an unstable knee that keeps giving away and causing other injuries, is that not going to increase their risk? Of having osteoarthritis?"</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "It might be worth keeping the left-hand side as sort of a shaded blue, and then the right hand side, a shaded purple."</p> <p>Female, 41-50 yrs old - "It probably would be more clear, having the two distinct colours."</p> <p>Female, 41-50 yrs old - "My brain went straight to I want to know whether there's early onset arthritis, and you see that more in people who have had knee surgery than those who haven't for example, like that, that was a real question in my head."</p> <p>Female, 41-50 yrs old - "Visually the difference between the two actually jumps out at you. So what I would do is so these, this two to four weeks, move it up slightly"</p> <p>Health Professionals:</p> <p>PT, Male, 31-40 yrs old - "The pictures could have more impact for a kid"</p> <p>PT, Male, 31-40 yrs old - "I think that's a better representation for the patient than two scores that they have to then interpret, you know, filter through another level, and which they're not necessarily have the skills to do. So if it turns out that yeah, the clinically, minimal clinically important difference isn't there, then I would just say that you think that even maybe remove the graph and just have that summary. And it could even simplify it further?"</p> <p>PT, Male, 41-50 yrs old - "Yeah, I think the next one looks too busy. I know what you've kind of tried to do. But if you're a parent or a kid that's going to look at that that one doesn't. You know, you've got the coloured in people, and then you've got a bar graph. And then I think the first one works better. Just in terms of how it looks. This one is just statistics. Yeah, it's just a statistic box on the right where one person returning to pre injury sports."</p>
	<p>For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>	<p>Adolescents.</p>

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	<p>6.4. Use positive messaging</p>	<p>Female, 15-17 yrs old - "It's hard because every injury is an individual injury and pending on how much you put into it, how active you are. You know, like, just because one person can do it doesn't mean the next person can't do it"</p> <p>Female, 15-17 yrs old - "When you've got a tough journey to get through, at least, you know, everyone else was stuck at home (COVID 19) as well, in some respects."</p> <p>Parents:</p> <p>Female, 51-60 yrs old - "Your knee you know might be stronger if you need surgery later or delay something like that"</p> <p>Female, 41-50 yrs old - "These are just averages of research. And, you know, that doesn't mean this is what you have Yeah, something like that, just so that they always like to look at things from a more optimistic lens."</p> <p>Female, 41-50 yrs old - "Making sure you've got people around you for support, you know, whole body health. Like we've mentioned before, taking care of like their mindset, some days, you're not going to feel like doing your exercises, and other days, you'll be more motivated. So being aware of that as well. And then staying positive, as you said, trying to be optimistic with how you're looking at it."</p> <p>Health Professionals:</p> <p>PT, Male, 41-50 yrs old - "But we all when you when you talk to a patient, just to say, if it's unsuccessful, it's not your fault, it just happens. Sure, you know, and we need the time and from time to time we have just to change the process. Yeah. Because in my experience, people just react very self-criticism, like, 'Oh, if it's not working, it's my fault because I didn't do enough training or I was too lazy.'"</p> <p>PT, Male, 21-30 yrs old - "Yeah, and I really liked that last bit down the bottom, like, it's quite obvious that whatever works best for you, in your situation, at the best at your time with your sport, remain positive is one of the main things because like, we know, obviously, there's a big psychological problem following ACL stuff. So use the people around you for support. So I like that."</p>
		<p>Adults: For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml</p>

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<p>7. Understanding the translation of research</p>	<p>7.1. Improve the usability of the decision aid</p>	<p>Male, 21-30 yrs old - "If I had something like this I probably would have tried conservative but I didn't really have a there wasn't another option back then you're a young soccer player if you do your ACL you get surgery done."</p> <p>Male, 21-30 yrs old - "You have a list of healthcare professionals or the route you should take, like being a physio prior to going straight to surgery. Even before Doctor."</p> <p>Parents:</p> <p>Female, 41-50 yrs old - "I think it's better it's better to use as an aid for someone explaining it rather than just handing it to someone to kind of decipher."</p> <p>Female, 51-60 yrs old - "Will this be like a document that people can look at? Or is it going to be like that, how's it going to be presented to people."</p> <p>Health professionals:</p> <p>PT, Male, 31-40 yrs old - "I would be a bit overwhelmed by this, I think it was a patient to be like, can't make this simple in my own head, like, I don't know, just my experience with patients. Not that it is a simple decision. But I find when patients are overwhelmed, they tend to just kind of they grasp for certainty. And I always get that from surgeons, because they make it so black and white. And so that's a priority is to make sure that the information isn't overwhelming. And I think it's just a bit too much content. Maybe more could be presented graphically."</p>
	<p>7.2. Clarify the uncertainty of evidence and outcomes of each option</p>	<p>Adolescents:</p> <p>Female, 15-17 yrs old - "Even if you have surgery, I guess it's not a guarantee to get back to sport, even, you know, at school and that as well."</p> <p>Adults:</p> <p>Female, 18-20 yrs old - "I didn't want to take the chance of trying something new if it was, yeah, if it was less researched on or if it was less used."</p> <p>Female, 18-20 yrs old - "I think maybe just something about like, both, like both options have uncertainty."</p> <p>Female, 18-20 yrs old - "I really liked the preface about not everyone will return to pre injury sport with either option."</p>

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		<p>Parents:</p>
		<p>Female, 41-50 yrs old - "The first thing he said was, her ACL is torn, she needs to have surgery. And he wasn't open to telling me anything else."</p>
		<p>Health professionals:</p>
		<p>PT, Male, 31-40 yrs old - "I always find it challenging when they're a little bit younger or elite level athletes, because obviously, they're not catered for in or looked at with the some of the research. So I think that's when it's really challenging, because you're already dealing with uncertainty. And I think it's always a difficult one, because they're looking for, I think they're kind of almost leaning on you for direct guidance. I think when you've got another operator, say, as a surgeon coming in and saying, This is what you need to do, it's much easier for them to take route, if that makes sense. I think, yeah, presenting uncertainty in itself, is a challenge to parents and adolescents, because I think they're looking at that stage in a, you know, what's probably a bit of a traumatic time for them for a clear answer and what they need to do."</p>
	<p>7.3. Keep or remove statistics using adult data</p>	<p>Adolescents:</p>
		<p>Female, 15-17 yrs old - "Even if you are younger athlete, to see what the outcome is later on."</p>
		<p>Adults:</p>
		<p>Female 18-20 yrs old - "I feel like I have like, mixed feelings, because those could be this good. Adult is pretty much anyone over the age of 18. So I feel like you could do young adults, like let's say less than 25. Because I feel like the stats, if you can get that specific, wouldn't change the decision process behind let's say, the 17 year old if they work to re rupture in their early 20s."</p>
		<p>Male, 21-30 yrs old - "But I assume that if you were 19, and you had just done your ACL, then you'd want some data."</p>
		<p>Female, 18-20 yrs old - "What if someone was 17? Yeah. And they may want to look at both. If they're right on that edge, and not really knowing like, Okay, well, should I be considered an adolescent? Or should I be considered an adult, they may want to look at both."</p>
		<p>Male, 21-30 yrs old - "It's obviously adult data. I was just confused jumping between the two."</p>
		<p>Female, 18-20 yrs old - "Because well, if yeah, if this depends where you're putting it, but I assume that if you were 19, and you had just done your ACL, then you'd want some data on that</p>

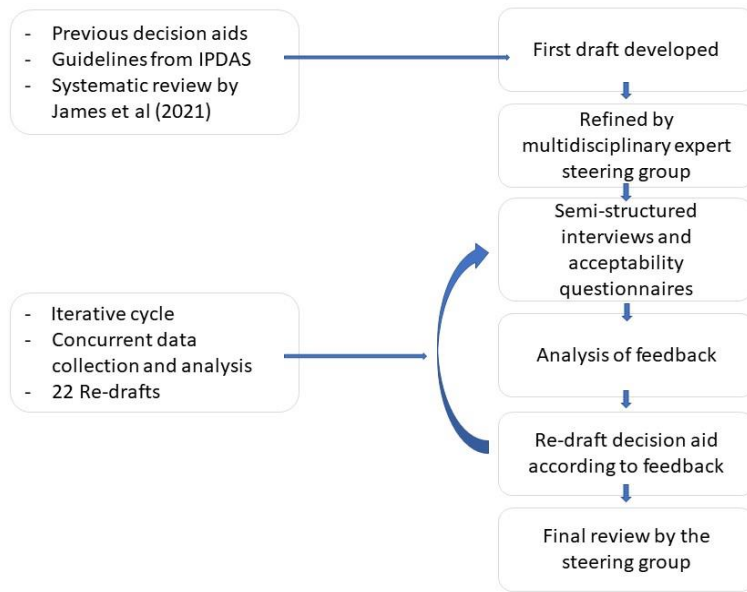
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		<p>as well, because you wouldn't really fit into the other category. I feel like this is a bit more like it gets into like function and, and stuff. And more into like complications, which is a bit more of a adult topic."</p>
		<p>Parents:</p>
		<p>Female, 41-50 yrs old - "I thought that I thought the whole study was the under 18. So I didn't realise you had both over and under 18. I think that was my I just assumed everything could be under 18."</p>
		<p>Female, 41-50 yrs old - "I think you should give someone all the information."</p>
		<p>Female, 41-50 yrs old - "Good to know that, you know, say if you were 17 or closer 18. You know, maybe you could pay more attention to these numbers."</p>
		<p>Health professionals:</p>
		<p>PT, Female, 41-50 yrs old - "If I was explaining this to someone, I'd say, Look, we don't have lots and lots of research on someone your age. But we have research on people who are 20 and 30. And they're weekend warriors. They're not elite athletes. This is this is the information we have."</p>
		<p>OS, Male, 31-40 yrs old - "So these are two different populations. And I stress that to patients, I treat my adolescent patients, and my young adults very differently to my adults, or my degenerative ACLs that are in their 40s or 50s, they get treated very differently, and more often non operative managed for that reason. But I think I treat them as three different categories of patients, in my mind, it's probably because we have poor data and understanding of them. But very poorly, we have higher risk factors in patients under the age of depends on how you classify them, but maybe under the age of 18, or maybe under the age of 25. These factors are very different. So yeah, I don't think this data is appropriate to use in that setting."</p>
		<p>OS, Male, 31-40 yrs old - "And if this was an adult one, sure I think but highlighting some of the drawbacks of the data is important. But yes, this is kind of what that research says. I think to use in adolescence is not appropriate."</p>
		<p>OS, Male, 51-60 yrs old - "You're using adult data to aid in decisions for children, and you can't do that. So the whole thing is terrible. I really would suggest that you reconsider what you're doing."</p>

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For peer review only

Supplementary file 17: Flow chart of the development process



IPDAS, International Patient Decision Aid Standards.