


# Utilization of telehealth by surgeons during the COVID 19 pandemic in Australia: lessons learnt

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## Abstract

**Background:** The COVID-19 pandemic has led to the rapid and widespread adoption of telehealth. There is a need for more evidence regarding the appropriateness of telehealth, as well as greater understanding of barriers to its sustained use within surgery in Australia.

**Methods:** A survey weblink was sent via email to 5558 Australian Fellows of the Royal Australasian College of Surgeons in August 2020. A single reminder email followed this 2 weeks later. Mixed methods analysis was performed of the survey data.

**Results:** There were 683 (12.3%) complete responses. Telehealth (telephone or video-link) consultations were undertaken by 638 (85%) respondents as a result of the pandemic, with 583 (85%) of these expressing a desire for continued access to telehealth. Seventy-seven percent of respondents felt that a satisfactory level of care could be delivered via telehealth in half or more consultations. However, only 38% of respondents felt that quality of care was equivalent comparing telehealth and face-to-face consultations, with the inability to perform a clinical examination a frequent concern. The majority agreed that telehealth was appropriate for clinical meetings and arranging investigations (91% each), whereas only 22% and 17%, respectively, felt telehealth was an appropriate means to break bad news and manage conflict. Medicolegal, technical and financial concerns were raised as prominent barriers to the sustained use of telehealth.

**Conclusion:** Surgeons show good insight into the clinical appropriateness and limitations of telehealth. Medicolegal, technical and financial barriers need to be addressed in order to fully utilize the benefits of telehealth into the future.

## Introduction

Telehealth has the potential to improve access to care for many patients, particularly those in remote locations and those in residential care. This is particularly relevant in Australia with our vast geography and recent improved access to telecommunications. The COVID-19 pandemic has led to a significant rise in telehealth consultations.<sup>1</sup> However, there remain significant concerns regarding the quality of care associated with telehealth consultations. In addition, multiple barriers to the widespread implementation of telehealth have been identified across a range of medical, nursing and allied health settings.<sup>2-4</sup>

There has been little research into the uptake of telehealth in surgical settings. The majority of studies have described or evaluated telehealth models specifically designed to improve access to care for rural and remote patients,<sup>5,6</sup> or have focussed on care during the post-operative period.<sup>7,8</sup> A recent national cross-sectional survey of Australian surgeons and obstetricians/gynaecologists was completed in late 2019 and 2020 (prior to the pandemic). Preliminary results from a sub-sample of Australian states and territories indicated that the majority of surgeons (73%) had not used telehealth for any post-operative patient consultations.<sup>9</sup> Telehealth appointments were perceived to be more labour intensive. Furthermore, a large proportion of participating clinicians in this and other

studies have expressed concerns about the limitations of their ability to examine patients and hence the quality of care delivered via telehealth.<sup>10</sup> There is a need for data describing current uptake, and barriers and facilitators to telehealth utilization across all types of surgical consultations.

Telehealth services for specialists have been available in Australia since 2011 (via the Medicare Benefits Schedule, MBS item number 99).<sup>11</sup> The use of this item number was restricted to video-link attendance by patients with difficulty accessing care (remote or rural patients, residential care residents, those engaging an Aboriginal medical service).<sup>12</sup> In response to the COVID-19 pandemic, on 13 March 2020, the Australian Government introduced new temporary MBS item numbers for telehealth, with item numbers for both video-link and telephone consultations. Although initially these item numbers were restricted to those self-isolating due to COVID-19 risk, on 30 March 2020 the telehealth item numbers were expanded to all Australians. At the time of this study, these item numbers remain temporary with ongoing uncertainty surrounding the extension of funding for telehealth services.

The primary aim of this study was to describe the uptake of telehealth throughout Australia by surgeons as a result of the COVID-19 pandemic. In addition, we evaluated surgeons' perceptions of the acceptability and feasibility of telehealth and sought to identify facilitators and barriers to the sustained use of telehealth in surgical practice in Australia beyond this pandemic.

## Methods

A survey of practice was developed and piloted by surgeons from a variety of subspecialties and geographical locations. Survey items included basic demographics, measures of telehealth use (telephone and video-link) and an assessment of barriers to telehealth use across a variety of domains including quality of care and clinical appropriateness, technical issues, legal and liability issues (Table S1). These domains were based on those used in a recent survey of surgeons use of post-operative telehealth consultations.<sup>9</sup> Mixed methods were used to assess facilitators and barriers to the sustained uptake of telehealth.

The survey was distributed via a weblink to all Australian members of the Royal Australasian College of Surgeons (RACS) on 10 August 2020. A reminder email was sent 2 weeks later. The survey closed on 30 August 2020. Survey responses were captured utilizing the Research Electronic Data Capture (REDCap) database.<sup>13</sup> Surgeons could also opt in to distribute a survey to their patients who had participated in a telehealth consultation. This consumer survey aimed to capture patient perceptions of telehealth and was designed to replicate the themes of the surgeons' survey. The consumer survey closed 1 month after the surgeons' survey and results will be reported in due course.

The study was approved by the Hunter New England Human Research Ethics Committee (2020/ETH01270) and the University of Newcastle Human Research Ethics Committee (H-2020-0327). Statistical analyses were performed using SAS v9.4 (SAS Institute, Cary, NC, USA). Descriptive statistics were reported for all relevant variables. Thematic content analysis was undertaken of

qualitative data with the assistance of NVivo v12 (QSR International, Victoria, Australia).

## Results

The survey weblink was sent to 5558 Australian Fellows of the RACS via email. There were 698 responses to the survey prior to the closure date; however, 15 participants were excluded due to incomplete responses leaving 683 (12.3%) completed surveys for evaluation. The demographics of the respondents are shown in Table 1. Thirteen surgeons did not nominate one of the available subspecialties and six nominated two subspecialties.

Amongst the 683 respondents, 56% ( $n = 372$ ) reported that they had utilized telehealth in their practice prior to the COVID-19 pandemic. However, only 11% ( $n = 74$ ) had utilized telehealth on a regular basis. This number increased dramatically to 96% ( $n = 638$ ) during the COVID-19 pandemic, with 74% ( $n = 508$ ) using telehealth for initial consultations, 82% ( $n = 561$ ) for post-operative follow-up and 89% (607) for subsequent reviews. Most surgical specialities described having utilized telehealth for all consultation types as a result of social distancing restrictions, with little difference between subspecialties (Table 2).

Overall, 85% ( $n = 583$ ) of respondents expressed that they would continue telehealth use after COVID-19 restrictions are lifted. Of these, only 51% and 50%, respectively, reported that they would use telehealth for new consultations and pre-operative reviews; while 88%, 89% and 77%, respectively, would continue using telehealth for routine follow up, distance or frail patients, or post-operative reviews. It is noteworthy that there were differences in future intended use of telehealth between surgical subspecialties with paediatric surgeons in particular indicating an intention to utilize telehealth in the future across all major consultation types (Table 3).

Despite the rapid uptake of telehealth into surgical care delivery during the COVID-19 crisis, there remain a number of perceived barriers to its continued use beyond the pandemic. Only 38% of all respondents agreed that in most cases they could provide the same level of care via a telehealth consultation as during a face-to-face consultation, and 73% indicated that clinical examination is essential in more than half of all consultations. This is even more marked in certain subspecialties such as otolaryngology, head and neck surgery where 82% felt that clinical examination was essential to most consultations and only 29% felt that telehealth provided the same level of care as face-to-face review in half or more consultations (Table 4).

Survey respondents were also asked to consider the appropriateness of telehealth use for several aspects of surgical care. The majority of participants agreed that telehealth is an inappropriate means of communication to break bad news or manage conflict with patients (78% and 83%, respectively). However, most accepted telehealth as an appropriate means to hold clinical meetings (91%), initiate contact with new patients (57%), arrange investigations for patients (91%) and communicate new diagnoses to patients (51%). There was little difference between subspecialties in these responses.

**Table 1** Demographics, by surgical subspecialty

Demographic variables	Specialty	Cardiothoracic (n = 15), n (%)	General surgery (n = 249), n (%)	Orthopaedic (n = 143), n (%)	Otolaryngology (n = 72), n (%)	Plastic surgery (n = 37), n (%)	Urology (n = 74), n (%)	Neurosurgery (n = 33), n (%)	Paediatric surgery (n = 17), n (%)	Vascular surgery (n = 24), n (%)	Total (n = 683), n (%)
Gender											
Male	13 (93)	187 (76)	132 (93)	51 (71)	33 (89)	57 (77)	27 (82)	12 (71)	19 (79)	547 (81)	
Female	1 (7.1)	55 (22)	9 (6.3)	19 (26)	4 (11)	16 (22)	5 (15)	5 (29)	5 (21)	121 (18)	
Prefer not to say	0	4 (1.6)	1 (0.7)	2 (2.8)	0	1 (1.4)	1 (3.0)	0	0	9 (1.3)	
Age											
25–35	2 (13)	8 (3.2)	3 (2.1)	1 (1.4)	0	2 (2.7)	0	0	0	16 (2.3)	
36–45	3 (20)	65 (26)	19 (13)	21 (29)	8 (22)	18 (24)	7 (21)	2 (12)	4 (17)	148 (22)	
46–55	1 (6.7)	89 (36)	48 (34)	26 (36)	16 (43)	33 (45)	13 (39)	5 (29)	9 (38)	245 (36)	
56–65	6 (40)	57 (23)	44 (31)	17 (24)	8 (22)	13 (18)	6 (18)	7 (41)	9 (38)	175 (26)	
Over 65	3 (20)	29 (12)	29 (20)	7 (9.7)	5 (14)	8 (11)	7 (21)	3 (18)	2 (8.3)	97 (14)	
Main work location											
Metropolitan hospital	14 (93)	174 (71)	98 (71)	53 (78)	31 (84)	51 (72)	26 (81)	16 (94)	19 (79)	496 (75)	
Regional hospital	1 (6.7)	52 (21)	35 (25)	13 (19)	6 (16)	19 (27)	6 (19)	1 (5.9)	5 (21)	141 (21)	
Rural hospital	0	19 (7.8)	5 (3.6)	2 (2.9)	0	1 (1.4)	0	0	0	27 (4.1)	
Public and/or private sector											
Public	3 (21)	39 (16)	11 (7.7)	2 (2.8)	1 (2.7)	1 (1.4)	2 (6.3)	7 (41)	2 (8.3)	69 (10)	
Private	2 (14)	31 (13)	53 (37)	16 (22)	10 (27)	12 (17)	12 (38)	0	7 (29)	146 (22)	
Both public and private sector	9 (64)	178 (72)	79 (55)	54 (75)	26 (70)	59 (82)	18 (56)	10 (59)	15 (63)	460 (68)	
State											
ACT	1 (7.7)	0	2 (1.5)	0	0	0	1 (3.2)	0	0	4 (0.6)	
NSW	2 (15)	64 (28)	34 (25)	20 (30)	14 (40)	15 (21)	8 (26)	3 (19)	5 (21)	171 (27)	
NT	0	4 (1.8)	0	0	0	0	0	0	0	4 (0.6)	
QLD	1 (7.7)	36 (16)	24 (18)	15 (23)	5 (14)	11 (15)	7 (23)	3 (19)	3 (13)	107 (17)	
SA	0	27 (12)	15 (11)	6 (9.1)	3 (8.6)	7 (9.7)	1 (3.2)	1 (6.3)	0	60 (9.4)	
TAS	0	4 (1.8)	2 (1.5)	1 (1.5)	0	2 (2.8)	2 (6.5)	1 (6.3)	0	12 (1.9)	
VIC	8 (62)	73 (32)	52 (39)	19 (29)	11 (31)	29 (40)	11 (36)	5 (31)	14 (58)	228 (36)	
WA	1 (7.7)	18 (8.0)	6 (4.4)	5 (7.6)	2 (5.7)	8 (11)	1 (3.2)	3 (19)	2 (8.3)	49 (7.7)	

†n = 19 not included in specialty columns.

**Table 2** Utilization of telehealth by consultation type, during the COVID-19 pandemic

Specialty	New consult, <i>n</i> (%)	Subsequent review, <i>n</i> (%)	Post-operative follow up, <i>n</i> (%)
Cardiothoracic	11 (73)	12 (80)	13 (87)
General surgery	177 (71)	222 (89)	209 (84)
Neurosurgery	25 (76)	31 (94)	27 (82)
Orthopaedic surgery	98 (69)	121 (85)	113 (79)
Otolaryngology head and neck surgery	60 (83)	67 (93)	53 (74)
Paediatric surgery	13 (76)	16 (94)	16 (94)
Plastic and reconstructive surgery	32 (86)	29 (78)	31 (84)
Urology	66 (89)	72 (97)	65 (88)
Vascular surgery	16 (67)	23 (96)	22 (92)
Total	508 (74)	607 (89)	561 (82)

**Table 3** Future (post-pandemic) intended use of telehealth consultation types, by subspecialty

Specialty	Initial consult, <i>n</i> (%)	Pre-operative review, <i>n</i> (%)	Routine follow up, <i>n</i> (%)	Distance, frail, aged or disabled patients, <i>n</i> (%)	Post-operative review, <i>n</i> (%)
Cardiothoracic	7 (58)	4 (33)	11 (92)	11 (92)	12 (100)
General surgery	111 (52)	109 (51)	192 (90)	194 (91)	168 (79)
Neurosurgery	15 (56)	15 (56)	26 (96)	26 (96)	21 (78)
Orthopaedic surgery	52 (43)	51 (42)	100 (83)	109 (90)	80 (66)
Otolaryngology head and neck surgery	26 (46)	28 (50)	47 (84)	46 (82)	41 (73)
Paediatric surgery	13 (81)	10 (63)	15 (94)	9 (56)	16 (100)
Plastic and reconstructive surgery	20 (59)	17 (50)	24 (71)	27 (79)	21 (62)
Urology	44 (65)	45 (66)	65 (96)	65 (96)	61 (90)
Vascular surgery	4 (18)	10 (45)	20 (91)	21 (95)	17 (77)
Total	296 (51)	292 (50)	511 (88)	520 (89)	446 (77)

Telephone consultations were undertaken by 85% of surgeons, while 60% have utilized telehealth via video-link. (Table 5) General surgeons represented the smallest proportion of surgeons that reported utilizing video-link telehealth (47% video versus 87% telephone) whereas plastic and reconstructive surgeons reported higher usage of video-link (84% video versus 73% telephone). When asked about the technical aspects of telehealth, the majority of surgeons stated that they would be more inclined to integrate telehealth into their practice if appropriate software and access to information technology (IT) support was available to both themselves (69%) and their patients (79%). In addition, more reliable internet access or telephone connection services were desired by 58% and 47% of surgeons respectively for themselves and by 76% and 54% of surgeons, respectively, for their patients. There were no differences between surgical subspecialties in reporting technical issues. There was also no difference in technical concerns when surgeons in metropolitan and regional or rural locations were compared.

Medical liability concerns were cited by 464 (73%) of respondents. More moderate levels of concern were reported regarding data security (*n* = 313, 48%) and patient privacy issues (*n* = 271, 42%). The majority of surgeons (*n* = 543, 84%) have utilized the MBS rebate for telehealth consultations with 276 (51%) bulk-billing all telehealth consultations. Financial and medicolegal concerns featured prominently in thematic analysis of free-text responses. In particular, there was concern that high bulk billing rates of telehealth consultations were not sustainable.

Other issues that were raised by qualitative analysis of free-text responses are illustrated in Table 6. In particular, issues were raised by regional and rural surgeons that increasing access to telehealth

post-pandemic may adversely affect the long-term sustainability of rural surgical practice in Australia.

## Discussion

This survey sought to assess the uptake of telehealth in surgical practice in Australia during the COVID-19 pandemic. At the time of this survey, Melbourne and regional Victoria were under significant lockdown restrictions. In NSW, there were moderate social distancing restrictions and very low levels of COVID-19 community transmission. Across the rest of Australia, there were very few COVID-19 cases and hence a variety of lesser levels of restrictions. It is within this context that these survey results should be interpreted; it also potentially explains the higher response rates from Victorian and NSW based surgeons.

The results of this survey confirm that only a minority of surgeons had utilized telehealth on a regular basis prior to the COVID-19 pandemic. The rapid introduction of telehealth likely contributed to the technical issues and administrative burden encountered by many. The majority of respondents have utilized both telephone and video-link telehealth consultations although there was marked variation between subspecialties. A large number of surgeons have reported inadequate IT support for both themselves and their patients. In addition, despite the reported improvement in internet services with the national broadband network many surgeons reported unreliable telephone and internet connections. A more in-depth exploration of these issues is beyond the scope of this survey but it is likely that technical issues will need to be addressed in order to support sustained telehealth use into the future.

**Table 4** Quality of care concerns, by surgical speciality

	Cardiothoracic (n = 15), n (%)	General Surgery (n = 249), n (%)	Orthopaedic (n = 143), n (%)	Otolaryngology (n = 72), n (%)	Plastic Surgery (n = 37), n (%)	Urology (n = 74), n (%)	Neurosurgery (n = 33), n (%)	Paediatric Surgery (n = 17), n (%)	Vascular Surgery (n = 24), n (%)	Total (n = 683), n (%)
Able to provide the same level of care as during a face-to-face consultation		65 (27.9)	56 (41)	50 (71)	14 (38)	8 (10.8)	5 (16)	4 (25)	8 (33)	221 (33.4)
In a minority of consultations	2 (15.4)									
In approximately half of consultations	2 (15)	69 (30)	38 (28)	12 (17)	12 (32)	14 (19)	5 (16)	7 (44)	11 (46)	173 (27)
In most consultations	9 (69)	98 (42.2)	43 (31.7)	9 (13)	11 (29.7)	55 (74.1)	21 (68)	5 (31)	5 (21)	258 (39.5)
Clinical examination is essential										
In a minority of consultations	7 (54)	73 (31.7)	24 (17.5)	4 (5.8)	5 (14)	39 (52.4)	11 (35.2)	5 (31)	4 (17)	175 (26.7)
In approximately half of consultations	4 (31)	90 (39)	41 (30)	9 (13)	7 (19)	26 (35)	14 (45)	6 (38)	10 (42)	210 (32)
In most consultations	2 (15)	70 (30)	72 (52)	56 (82)	25 (67)	9 (12)	6 (19.2)	5 (31)	10 (42)	266
Able to monitor a patient's wellbeing to the same extent as during a face-to-face consultation										
In a minority of consultations	3 (23)	57 (24.7)	53 (39)	41 (58)	23 (32.1)	11 (14.7)	8 (28)	1 (6.3)	7 (29.2)	199 (30.4)
In approximately half of consultations	2 (15)	55 (24)	32 (23)	19 (27)	9 (24)	15 (20)	5 (17)	5 (31)	5 (21)	153 (24)
In most consultations	8 (61)	120 (51)	52 (38.2)	11 (15.8)	16 (43.7)	48 (65.1)	16 (54.9)	10 (63)	12 (50)	298 (46.2)
Able to deliver satisfactory care to a patient via telehealth										
In a minority of consultations	2 (15)	47 (20)	39 (28.9)	32 (44.6)	9 (24.1)	4 (5.6)	4 (13)	1 (6.3)	5 (21)	148 (22.4)
In approximately half of consultations	3 (23)	51 (22)	32 (24)	19 (27)	15 (41)	15 (21)	5 (17)	5 (31)	10 (42)	160 (25)
In most consultations	8 (61)	133 (57.5)	65 (47.4)	20 (28.4)	13 (35.4)	53 (74)	21 (69.7)	10 (63)	9 (38)	339 (52.3)

**Table 5** Use of telephone and video-link for any consultations, by subspecialty

Specialty	Phone, n (%)	Video-conference, n (%)
Cardiothoracic	12 (80)	10 (67)
General surgery	216 (87)	116 (47)
Neurosurgery	29 (88)	22 (67)
Orthopaedic surgery	109 (76)	95 (66)
Otolaryngology head and neck surgery	66 (92)	45 (63)
Paediatric surgery	12 (71)	14 (82)
Plastic and reconstructive surgery	27 (73)	31 (84)
Urology	72 (97)	50 (68)
Vascular surgery	22 (92)	16 (67)
Total	580 (85)	409 (60)

Quality of care issues in telehealth are paramount but can be difficult to quantify.<sup>14</sup> This survey highlights that social distancing has led to the use of telehealth in situations where it is not entirely appropriate leaving surgeons with significant concerns. Most felt that some consultations were suitable for telehealth, usually in the

context of an ongoing (already existing or intended) episode of care for that patient. The results of this survey suggest that most surgeons have good insight into the limitations of telehealth and the ability to integrate it appropriately into patient care.

The inability to perform clinical examination is repeatedly raised as a concern regarding telehealth. Non-surgical subspecialties have addressed this issue via developing symptoms scores and smartphone applications. Published studies report reliable performance of neurological and respiratory examinations via audio-visual link.<sup>15,16</sup> There is little evidence however of satisfactory clinical examination in surgical patients particularly in respect to the nuances of clinical examination that are relevant to surgical planning for a procedure. This survey also highlighted that the need for clinical examination varies between subspecialties and between clinical conditions. It is probable that in some clinical situations, the examination could be performed remotely to a satisfactory level, but this will need to be adapted to the individual clinical context.<sup>17</sup> Further evidence is required to establish the safety of remote clinical examination in surgery.

Medicolegal concerns with telehealth were reported by 73% of respondents. Qualitative analysis suggested this might relate to

**Table 6** Thematic qualitative analysis of free-text responses

Themes	Illustrative quotes
Rapid introduction, issues with IT and administrative burden	My biggest issue with Telehealth is access of the 'older' patient to technology and their lack of confidence or experience. Also, the quality of the internet connection has a huge influence on the consultation. It can be extremely frustrating when the connection constantly drops out The time spent and difficulty in getting to patient at times (is a challenge). There is still a lot more administrative work in arranging telehealth than meets the eyes Some patient's attitude towards Telehealth is sometimes way too casual such as they are in their car or often cannot get them -usually public patients
Clinical appropriateness – physical examination, consent, complex situation (e.g. breaking bad news/ managing conflict/ English not first language)	For many initial consultation patients I think telehealth can only be a form of advanced triage; it will not replace the need to do a face to face plus physical examination and I do not think patients and some referrers understand this I think it is good in combination with face to face meetings, so the patient is examined at some time point during the cluster of appointments that make up that episode of care Cases are very individual and surgeons need to use their judgement as to which cases and patients telehealth will work for – in person always best, video then telephone, but depends on how much inconvenience for patients Patients who require an interpreter can be difficult for phone consults, especially when a consent form needs to be signed Need special training regarding how to deliver new diagnoses and bad news in careful empathetic manner; will never suit everyone and makes it difficult to engage partners, other family members, consenting for major surgery especially cancer surgery
Medicolegal/missed diagnosis/standards of care	(Not suitable for) dealing with medicolegal complaints or accusations (Not suitable for) consent for procedures unless legislation and RACS/Department of Health have clear guidelines to protect surgeons and patients I found it difficult to gauge the level of understanding and comprehension of the surgical decisions they were undertaking and thus my concerns re-informed consent
Remuneration/MBS rebates	Bulk billing of service does not meet cost of running a private surgical practice therefore this is not sustainable The cost issue is a major concern. Telehealth can take up the same amount of time for significantly less remuneration The ability to be reimbursed for phone consultations has been a massive change in my practice. Where I used to phone patients to save them a trip to the surgery (often many hours) I am now able to be paid for my time on the phone and so can dedicate more time to doing this properly (rather than a quick call between patients in a theatre list) You have not touched on how complicated Medicare made the telehealth numbers. Cost and remuneration. I'm currently absorbing all the losses due to only bulk billing the patients, which is unsustainable Need a reliable platform that includes billing
Geography (rural/ remote)	I am a rural surgeon. Why bother? (It makes it) just as easy for people to see a 'metro' surgeon so it will destroy rural medical It is useful only for country patients who are unable to travel to be followed up and appreciate they are getting substandard care but it is simply more convenient for them You will kill country medical practice Telehealth has opened up regional and distance referrals and follow-up

issues with missed diagnoses and standards of care. Concerns about the appropriateness of telehealth consultations for obtaining consent, breaking bad news and managing difficult patient interactions were described. Previous Australian publications have echoed these concerns but given the long lead-time of medicolegal claims it remains to be seen whether medicolegal issues graduate from a perceived issue to an actual increase in complaints.<sup>18–20</sup>

The availability of MBS rebates has facilitated the use of telehealth. Although during the COVID-19 pandemic the majority of surgeons have bulk-billed patients for telehealth consultations, the ongoing feasibility of this practice is in doubt.<sup>21</sup> Many respondents commented on the additional clerical burden of telehealth with additional time spent by administrative staff setting up appointments, billing, mailing (email or post) investigations and prescriptions, following up investigations and arranging subsequent reviews. This burden was one of a number of reasons cited by surgeons who suggested telehealth was not sustainable from a financial perspective. It is beyond the scope of this survey to understand if these administrative and technical issues will be ameliorated over time. The issue of billing practices will also be explored further in the patient survey.

Although it would be intuitive to think that rural and remote patients might have the most to gain for the sustained use of telehealth, some rural surgeons felt that telehealth threatened the viability of their practices, as patients could easily seek the services of a surgeon at a distance for conditions treatable by their local surgeon. Many rural surgeons felt that the understanding of the local geographical context enhanced treatment of their local patients.<sup>22</sup> They expressed concern that the loss of patient volume to larger centres would contribute to deskilling and threaten the viability of their local practice. These themes are similar to those in prior publications.<sup>22–24</sup> Further research is required to establish to what degree this has actually occurred, and to ensure that telehealth enhances and does not undermine the viability of surgical care in regional and remote Australia.

This survey has some limitations. It was distributed via email, with only one reminder over a brief period. No additional methods of survey recruitment were employed and this may have contributed to the comparatively low response rate. However, allowing for differences in response rates and methodology, the demographics of respondents to this survey are similar to those captured by the 2019 RACS Workforce Census<sup>25</sup> We made little distinction in survey responses between telephone and video-link consultations and the results should be interpreted in this context. Thematic qualitative analysis was undertaken of the free-text responses but we cannot ensure this is representative of all respondents or of the wider surgical community.

Nevertheless, this survey captures the opinions of telehealth from almost 700 surgeons across a range of subspecialties and geographical locations. Responses are consistent with data on telehealth prior to and during the pandemic and suggest that surgeons have good insight into how to adapt telehealth into an individualized episode of care for each patient.

## Conclusion

The COVID-19 pandemic has led to the rapid uptake of telehealth consultations by Australian surgeons. Most are committed to the

sustained integration of telehealth within the appropriate clinical context. Medicolegal, technical and financial reimbursement issues will need to be addressed to ensure that Australian surgeons and patients can continue to access the advantages of telehealth.

## Author contributions

**Elvina Wiadji:** Conceptualization; data curation; formal analysis; investigation; methodology; writing-original draft. **Lisa Mackenzie:** Conceptualization; data curation; formal analysis; investigation; methodology; supervision; writing-review and editing. **Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; supervision; validation; writing-original draft; writing-review and editing.** **Patrick Reeder:** Data curation; funding acquisition; investigation; methodology; project administration; resources; writing-review and editing. **Rosemary Carroll:** Data curation; investigation; methodology; project administration; resources; supervision; validation; writing-review and editing. **Stephen Smith:** Conceptualization; investigation; methodology; project administration; resources; supervision; writing-review and editing. **Mark Frydenberg:** Conceptualization; funding acquisition; investigation; methodology; resources; validation; writing-review and editing. **Christine O'Neill:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; supervision; validation; visualization; writing-original draft; writing-review and editing.

## Conflicts of interest

None declared.

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## Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

**Table S1** Surgeons survey.