Journal of Cancer Survivorship (2022) 16:1504–1507
https://doi.org/10.1007/s11764-021-01116-5

CORRECTION

Correction to: Implementation barriers to integrating exercise as medicine in oncology: an ecological scoping review

Mary A. Kennedy[1,2] · Sara Bayes[3,4] · Robert U. Newton[1,2] · Yvonne Zissiadis[1,5] · Nigel A. Spry[1,2,5] · Dennis R. Taaffe[1,2] · Nicolas H. Hart[1,2,6] · Daniel A. Galvão[1,2]

Published online: 14 March 2022

Correction to: Journal of Cancer Survivorship
https://doi.org/10.1007/s11764-021-01080-0

In the original publication of the article, the reference numbers are incorrectly cited in the text and there are places where the same reference is listed multiple times. The errors occurred during the production process. This has been corrected with this erratum.

In Organisational Context section, the first sentence should contain the following reference citation, "Ninety-three barriers were described in 38 studies [18, 24, 32–67]".

In subsection, "Capacity", the paragraph has been updated with correct citation:

In Capacity subsection, the paragraph should read, "Capacity issues were expressed in 22 barriers across 19 studies [18, 24 36, 38, 40, 42–44, 46–50, 53, 54, 57–59, 61]". The inability of HCPs to counsel, prescribe and refer patients to exercise in the time allotted for patient visits as highlighted. In a survey of oncology providers, 66 percent (n = 540) of respondents either strongly agreed or agreed that lack of time for counselling or to set up a referral was a barrier to providing lifestyle interventions to patients, including exercise [47]. One nurse made the point by saying simply, "the issue is just more time" [61] (p. 61). Workload pressures [61], concerns about the extra work [exercise counselling] would entail [43], and concern for the extra time necessary to complete in-clinic counselling would disrupt clinic flow [24] were raised as related issues.

In subsection, "Staff and Resources", the paragraph has been updated with correct citations:

"Thirty-four barriers described challenges with staffing and resources related to exercise. Limited resources to build exercise into care was described as a barrier in 20 studies [24, 33, 34, 36–38, 40, 42, 43, 47, 48, 51, 52, 54, 55, 58, 61–63, 66]. Resources included staff, funding and referral networks. A lack of staff with expertise in exercise programming was noted in five studies [37, 38, 40, 52, 62]. Funding to support qualified staff or purchase exercise equipment was noted in eight studies [24, 33, 34, 51, 52, 54, 62, 63], and a lack of exercise resources to refer to was described in four studies [36–38, 47]. A nurse summed up the consequence of inadequate exercise resourcing by saying: "It's not worth bringing it up. You don't plant the seed unless you can water it" (nurse) [37]."

In subsection, "Structures and Organisation of Care Processes", the paragraphs have been updated with correct citations:

Absence of an established pathway or structure to support the inclusion of exercise into care was raised 37 times in 24 studies [32, 34, 35, 37–39, 41, 43, 45, 46, 48, 50, 52–54, 56–58, 60, 62, 64–67]. Inadequate infrastructure to support a standard referral to exercise was described, including a lack of

The original article can be found online at https://doi.org/10.1007/s11764-021-01080-0.

✉ Mary A. Kennedy
m.kennedy@ecu.edu.au

1 Exercise Medicine Research Institute, Edith Cowan University, 270 Joondalup Drive, Joondalup, Perth, WA 6027, Australia

2 School of Medical and Health Sciences, Edith Cowan University, 270 Joondalup Drive, Joondalup, Perth, WA 6027, Australia

3 School of Nursing, Midwifery and Paramedicine, Australian Catholic University, Fitzroy, VIC, Australia

4 School of Nursing and Midwifery, Edith Cowan University, Perth, WA, Australia

5 GenesisCare, Perth, WA, Australia

6 Cancer and Palliative Care Outcomes Centre, Queensland University of Technology, Brisbane, QLD, Australia

standard or effective referral pathway [35, 38, 45, 62] and the lack of an exercise expert as part of the core care team [34, 38, 39, 52, 62]. One study, which explored a state run non-profit exercise program designed for people with cancer, found that none of the participants were referred to the program by their treating oncology team [39]. Other structural issues noted were the challenge of managing referrals between separate locations [35, 45] and the absence of a system to collect physical activity information about patients [53].

Standard model of care processes were deemed "fragmented" [38] with HCPs describing processes as "reactive" rather than "preventative" [43], leaving no room for development of an exercise service. Physicians felt that it was impractical for them to advise on exercise, as they typically do not engage in long-term follow-up for patients [38]. Patients recognised this issue as well, describing follow-up care regarding exercise as inadequate [64, 67] representing a "gap in the cancer care pathway" [67].

In Individual Professional section, the first sentence should contain the following reference citations, "Forty-seven barriers were described in 23 studies [18, 34, 37, 38, 43, 44, 46–57, 62, 63, 68, 69]."

In Knowledge subsection, the paragraph has been updated with correct citations:

Twenty-three barriers were highlighted in 16 studies [18, 34, 37, 38, 43, 48, 50, 52–57, 62, 63, 68]. A lack of knowledge was the most common barrier reported at the individual professional level with HCPs reporting insufficient knowledge to advise patients about exercise [18, 34, 37, 38, 43, 48, 50, 52–57, 62, 63, 68] or refer them to an appropriate resource [18, 37, 38, 43, 52]. A survey of 120 oncology care providers revealed that at least 77% (n = 85) rated their knowledge as "poor" regarding how to counsel based on exercise guidelines and knowing when, how and which patients to refer to a supervised exercise program [18], with only 13% (n = 16) providing specific information to patients. An oncologist described how their lack of knowledge resulted in vague advice for patients: "When patients ask me what they can do I say well just do whatever you want…" [37]. Specifically, a lack of understanding of appropriate guidelines [18, 57] or how to safely prescribe during treatment [48] were highlighted, as well as a lack of skill around behaviour change techniques [47, 55–57]. Patients reinforced this barrier, noting their doctors' inability to provide meaningful exercise information (described in patient level barrier).

Subsection, "Attitude" has been updated with correct reference citations:

Twenty-four barriers related to the attitude of HCPs incorporating exercise into care for people with cancer were described. There were three distinct concerns that emerged in this category. First, HCPs reported a perception of patients being uninterested or resistant to receiving exercise information in nine barriers across eight studies [24, 38, 44, 47, 48, 51, 52, 56] with some HCPs noting that patient characteristics influenced a willingness to offer exercise. For example, HCPs described hesitation referring patients to exercise who were previously inactive, elderly or undergoing treatment [24, 51, 56]. One general practitioner (GP) described this by saying: "I mean for some people, the idea to put 80-year old people on treadmills is close to torture…" [38].

Second, HCPs reported uncertainty about the safety and quality of exercise as a barrier eight times across eight studies [18, 24, 43, 46, 49, 51, 56, 57]. For example, within a sample of 167 oncologists, only ~ 40% agreed "exercise is safe" for patients [49]. A patient's overall health and their ability to exercise during treatment were common concerns, with worries that exercise would cause "overexertion" or make a patient "even more weak" [56]. These safety concerns were reinforced by cancer exercise program coordinators who noted "a reluctance [of physicians] to refer patients because of safety concerns" as a barrier to their program's success [51] (p. 380). Physicians also expressed a reluctance to refer to exercise programs because they could not be assured of their quality [24, 43].

Third, exercise was not deemed a priority during time constrained office visits for HCPs in seven barriers across five studies [52–54, 56, 69]. It was described as an "auxiliary" issue [69] (p. 35) that did not take precedence over other components of care [52, 53, 69], was overlooked because it is not a "thing of priority" for physicians [56] or was seen as someone else's responsibility [69]. A medical oncologist made this point clearly, stating "…I feel that there are other people who can actually address [exercise], because the patient comes to see me for the expert opinion for the management of their cancer. The other auxiliary issues can be dealt with by other health professionals. No one else is going to give them the advice I can give as a medical oncologist" [69] (p. 35).

In "Innovation" section, first sentence should contain the following reference citations, "Forty-six barriers were described in 25 studies [24, 34, 36–39, 42, 43, 45, 51–57, 61–63, 65, 70–74]."

Subsection Advantages in Practice has been updated with correct reference citations:

"There was an indication that confidence about the advantage of exercise in clinical care is low for some HCPs; 10 barriers suggesting that clinicians were not aware of or did not believe in the benefits of exercise for patients were described in eight studies [34, 38, 43, 51, 52, 55, 56, 62]. Specifically, physicians deemed exercise not beneficial for specific groups of patients, such as those who are "already fit" [38], "elderly" [55] or undergoing chemotherapy [56]. These concerns were underpinned by HCPs' view that the evidence to demonstrate the benefits of exercise for people with cancer was inadequate [38, 43, 62].

In the Accessibility subsection, the paragraphs have been updated with the corrected reference citations:

Thirty-six accessibility barriers related to cost, location and availability were identified across 21 studies. Eighty-one percent of HCPs (n = 48) in one study indicated that they either strongly agreed or agreed that patients "experienced or could experience poor access to programs (e.g. in terms of transport, cost, location, waiting lists)" [36].

The direct cost of an exercise program was highlighted as a barrier to participation by patients and to referral by HCPs, as described in 11 barriers across 11 studies [36, 38, 39, 43, 53, 54, 62, 71–74]. For patients, direct participation costs were a concern for unsubsidised programs such as fitness centres [39, 71, 73]. One recently diagnosed patient stated simply "I couldn't afford to join a gym…" [71] (p.1142).

Indirect patient cost issues, such as those associated with transportation, were also raised as concerns [39, 53, 57] and are related to the accessibility barrier of program location described in 14 barriers across 12 studies [36, 37, 39, 42, 45, 51, 53, 54, 57, 61, 63, 73]. Patients, HCPs and organizational stakeholders highlighted the location of a program as a deterrent to participation. Specific concerns included locations that required long travel times [39] or involved convenience issues such as a lack of parking [37, 45]. A breast cancer nurse specialist explained the challenge by saying: "it's alright bringing up this about exercising, but how they're going to get there, what's the cost of it, err, I live on my own, you know, all these sorts of barriers that are put up" [57] (p. 822). A program coordinator expressed a similar challenge in recruiting for their program: "They can't make it here…it's transportation or that type of thing" [51] (p. 379).

Availability was the final accessibility barrier described in 11 barriers across 10 studies [24, 37, 39, 43, 45, 63, 65, 70, 71, 73]. Incompatibility of patient schedules with exercise program offerings was the most common concern, especially when programs offered fixed schedules [39, 42, 63, 65, 73], and this was important for patients receiving treatment [39, 71]. For instance, one patient aged 51 commented: "There were two exercise sessions per week…one of them was my treatment day so I had to rule it out altogether" [39] (p. 1291). The inability to attend because programs were "fully booked" [39] (p. 1291) was also noted.

In Patient section, first sentence should contain the following reference citations, "Twenty-five barriers were described in 15 studies [37, 41, 42, 45, 50, 53, 67, 70, 72, 74–79]."

In subsection, "Knowledge", the paragraphs have been updated with the correct reference citations:

All studies at the patient level illustrated a lack of understanding about exercise [37, 41, 42, 45, 50, 53, 67, 70, 72, 74–79]. Patients described not knowing they should [70, 76] or could [50] exercise, not knowing how to exercise [41] or not being made aware of available programs [39, 45, 76].

Patients reported wanting specific advice from a medical professional [53, 77], yet in eight studies [37, 39, 42, 53, 74, 75, 78, 79], concerns were raised about the utility of the advice received from HCPs 13 times, describing it as "not specific" or "vague": "…they say to keep active in doing what you're doing, and so that's what I do" (65 + patient) and "[the oncologist] didn't really talk to me [about exercise]. He said it's best and I took it upon myself" (younger than the 65-year-old patient) [75] (p. 90). One study [41] reported that 20 percent of the 834 included patients (n = 167) that indicated contradictory information about exercise made them unsure how to be physically active and another study [53] reported patients being instructed to reduce or "not worry" about exercise when asking their doctor.

In section, "Economic and political context", first sentence should contain the following reference citations, "Seventeen barriers were described in 11 studies [34, 35, 40, 42, 43, 48, 49, 57, 58, 62, 63]."

In Policies and financial arrangements subsection, the paragraph has been updated with corrected reference citations:

A lack of standard policies directing the inclusion of exercise into care was reported as a barrier (n = 11) in seven studies [34, 48, 49, 56–58, 63] and the lack of structured reimbursement policies for exercise (n = 6) across four [40, 42, 43, 62]. As described by Rogers and colleagues, these gaps impacted the care offered to patients because the majority of inactive patients are not "complex" enough to meet the medical requirements for a referral to physiotherapists or occupational therapists [57] (p.822).

In section, "Social context", first sentence should contain the following reference citations, "Fifteen barriers were described in 10 studies [24, 34, 38, 43, 48, 51, 52, 55, 57, 58]."

In subsection, "Collaboration and leadership", the paragraphs have been updated with the corrected reference citations:

Thirteen collaboration barriers were identified in eight studies [34, 38, 42, 43, 48, 51, 57, 58]. Poor interprofessional communication and collaboration, specifically between the oncology teams and other HCPs (including GPs and allied health professionals), was a concern [42, 43, 48, 51, 58]. Poor communication was also noted between HCPs and exercise program coordinators [51]. Nevertheless, there was a recognition that more collaboration was required to ensure that exercise was incorporated into care [57]. The quote below illustrates the challenge of collaboration expressed across the studies.

> *I do think it probably is part of our role to be doing that but I don't think it's solely our role…we don't always get to clinics to see patients for a follow-up, so consultants have to…take some of that responsibility as well…*
> (colorectal cancer nurse specialist) [57] (p. 819).

Two studies [24, 52] specified lack of leadership support as an issue impeding the integration of exercise into oncology care, noting pushback because exercise initiatives were perceived as "unsafe" and "expensive to coordinate" [24] (p. 3120).

> *You have to have support from the upper end, the decision makers in order for any of this to even happen, you know minus all the barriers with health professionals and the actual participants themselves and what not. If you do not have funding and the support, then it's not going to happen* [52].

In Discussion section, the text citations have been corrected in the following sentences:

Second paragraph, the last sentence should read, "Our findings support the literature describing HCPs acceptance of the therapeutic benefits of exercise [2, 18, 47], but note challenges to its implementation across all six levels of healthcare.

Third paragraph, the second sentence should read, "Given the general acceptance of exercise as a therapy in cancer care [2, 18, 47], this finding suggests that a specific focus on overcoming organisational level barriers is needed to close the research to practice gap in exercise oncology."

Fifth paragraph, the second sentence should read, "These concerns created hesitation among HCPs to offer exercise and among patients to participate in available programs [39, 53, 57, 71, 73]".

Seventh paragraph should read, the While relatively few barriers (n = 10) were identified that questioned the advantage of utilising exercise in practice, the concerns that were raised highlight a fundamental issue regarding the research to practice gap in exercise oncology: Despite their recognition of the potential benefits of exercise, HCPs remain sceptical of the need to integrate exercise into patient care [38, 43, 62]. A disconnect between how oncology clinicians and researchers perceive the role for exercise in care was illustrated by Fitzpatrick and colleagues [62] in their survey showing, on average, that oncologists' (n = 38) level of agreement was much lower than that of researchers (n = 20) with the concept that exercise should be part of standard care. Recognition of this mismatch of opinions, combined with the barriers noted regarding HCPs' lack of awareness about the exercise guidelines [18, 57], suggests that researchers and HCPs should aim for more interdisciplinary approaches in both research and practice. It is critical to ensure that everyone is on the same page about the role of exercise during treatment, as it differs from the role of exercise during other phases of the cancer continuum. Exercise during active therapy should be targeted to meet a patient's specific challenges. A qualified exercise professional with expertise in oncology is generally required to provide these detailed prescriptions. A level of trust and recognition between researchers, exercise professionals, and clinicians needs to be established to move the field forward, as clinicians have a duty of care to their patients. Moreover, the perception that exercise research is inadequate [39] reinforces the need to explore implementation issues hindering the potential of exercise oncology programs. Effective programs can underperform if they are not implemented well [87].

The references in Table 3 have been updated to accurately correspond with the in-text citations.

The original article has been corrected.