



# Enablers and barriers to referral and delivery of multidisciplinary prehabilitation in the autologous stem cell transplant population: a theory-based interview study

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## Abstract

**Purpose** Health care professionals (HCP) play a vital role in effectiveness of prehabilitation programs, but information is limited about what assists HCP deliver an effective service. This study evaluated HCP perceptions of enablers and barriers to two behaviours: referral for, and delivery of, multidisciplinary prehabilitation prior to autologous stem cell transplant.

**Methods** Based on the Theoretical Domains Framework (TDF) of behaviour change, we conducted semi-structured interviews, purposively sampling 14 participants (from various healthcare disciplines) at a tertiary cancer centre. Discipline-specific topic guides were created based on the TDF and the behaviours appropriate to each discipline. Interviews were audio-recorded, transcribed verbatim, anonymised, content analysed (grouping, then labelling, thematically similar responses), and classified into theoretical domains. Structured decision rules were used to classify themes as high, medium, or low priority.

**Results** Fifty enablers and 31 barriers were identified; of these 26 enablers and 16 barriers classified as high priority. Four domains had the most frequent high-priority enablers: Social professional role and identity (e.g. multidisciplinary teamwork); Beliefs about consequences (e.g. patient benefit); Memory, attention, and decision processes (e.g. refer as early as possible); and Environmental context and resources (e.g. electronic medical records are beneficial). High-priority barriers were most frequent in four domains: Memory, attention, and decision processes (e.g. conflicting views about who should be referred); Environmental context and resources (e.g. lack of time); Social influences (e.g. families); and Emotions (e.g. patient distress).

**Conclusion** Participants reported more enablers than barriers. Findings can support delivery of prehabilitation programs in hospital settings where uptake remains low.

**Keywords** Prehabilitation · Autologous stem-cell transplant · Theoretical Domains Framework of behaviour change · Enablers and barriers · Health service delivery

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## Background

High-dose chemotherapy supported by autologous stem cell transplant (AuSCT) is an intensive treatment for many patients with haematological and selected non-haematological cancers, aiming to achieve cure or significantly prolong progression-free and overall survival [1]. Although there have been significant improvements in overall survival for patients receiving high-dose chemotherapy followed by AuSCT [2, 3], there remain significant morbidity and mortality risks associated with the underlying disease as well as the treatment [3, 4]. These adverse effects include reduced physical function and health-related quality of life (HRQoL) and increased fatigue, infection, oral mucositis, nausea, and diarrhoea [5, 6]. Cancer prehabilitation is a process on the care continuum that occurs between the time of cancer diagnosis and major oncological treatment [7]. It supports patients to prepare for treatment by promoting healthy behaviours and needs-based prescribing of exercise, nutrition, and psychological interventions [7]. There is emerging evidence to support cancer prehabilitation prior to AuSCT, with studies reporting that it is safe and feasible [8, 9] and may mitigate the decline in functional exercise capacity, muscle strength, and HRQoL that is experienced prior to and during AuSCT [10–12]. However, feasibility and observational studies reported issues with acceptability, attrition, data collection, and intervention delivery [11, 12]. Qualitative research in cancer prehabilitation primarily focuses on the patient experience or barriers to implementation [13–15]. Although there are reported difficulties delivering prehabilitation prior to AuSCT [11, 12], there is a gap in current literature regarding clinicians' perceptions of enablers and barriers to prehabilitation delivery.

Implementing and sustaining new programs or services into an organisation require a change in individual and group behaviours [16]. It is important to understand what influences behaviour change, particularly the mechanisms that inform successful behaviour change and subsequent effective delivery of clinical services [16]. At the participating centre in this study, a standardised multidisciplinary allied health prehabilitation clinical service for haematologic cancer patients receiving intensive chemotherapy prior to AuSCT was established in March 2019. An evaluation of the impact of this service was published in 2021 [12]. The aim of this study was to evaluate clinicians' perceptions of enablers and barriers to referral and delivery of this multidisciplinary prehabilitation service. Additionally, the study aimed to identify high-priority enablers and barriers that may influence referral to, and delivery of, prehabilitation services.

## Methods

### Study design

This was a semi-structured interview study based on the Theoretical Domains Framework (TDF) of behaviour change [16]. The TDF provides a theoretically informed structure that is used to elicit a wide range of theoretically framed explanations for a behaviour [16, 17]. It was built from 33 behaviour change theories and clustered into 14 'construct' domains that can influence healthcare professionals' behaviours. Table 1 explains all 14 domains. The framework can inform exploratory research across a variety of clinical areas and presents a comprehensive range of potential enablers and barriers to performing specific actions [19]. The TDF was applied in the development of the topic guide and the analysis of the interview data. The consolidated criteria for reporting qualitative research (COREQ) were followed in the reporting of this study [20] (Supplementary file 1).

### Participants

Clinicians were eligible to participate if they were members of the multidisciplinary haematology prehabilitation team at the participating tertiary cancer centre, including allied health professionals (exercise physiologists, dietitians, and psychologists), nurse consultants, and haematologists. Eligible members of staff were invited to participate via email; participation in the study was voluntary. The recruitment email was sent by a member of the research team who may have been known to staff but was not their senior.

### Development of topic guides

Topic guides were drafted collaboratively by two prehabilitation clinicians (J. C. and A. K.), two researchers with experience in prehabilitation (L. D. and L. E.), and an implementation scientist with expertise in the TDF (J. F.), in four steps.

Step 1: Behaviours required for referral and delivery of prehabilitation were specified for each profession using the Action, Actor, Context, Target, Time (AACTT) framework [21] to ensure each behaviour was appropriately identified as described in Supplementary file 2. In this study, target behaviours were tailored for various professions and specified based on the findings of previous research at the tertiary cancer centre [12]. For

**Table 1** Explanation of the 14 Theoretical Domains [16, 18]

Domain [16]	Explanation (adapted from [18])
1. Knowledge	Knowledge of the field (that is, whether there is adequate evidence) and individuals' knowledge of the evidence or of a guideline.
2. Skills	New or preestablished skills may be required by the staff to deliver the investigated behaviours.
3. Social/professional role and Identity	The clinical thinking, behaviours and displayed qualities of a particular profession.
4. Beliefs about capabilities	How confident clinicians are that they can execute the examined behaviour/s.
5. Optimism	The unrealistic confidence that things will happen for the best or that desired goals will be attained
6. Beliefs about Consequences	Often regarded as core to clinical reasoning, this domain covers the perceived benefits and harms of performing the behaviour.
7. Reinforcement	Increasing the likelihood of the behaviour being performed by arranging a dependent relationship between the behaviour and a given stimulus, e.g. increased pay or career progression.
8. Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way.
9. Goals	The relative priority that is given to one clinical task, compared with other demands.
10. Memory, attention, and decision processes	The level of attention that is needed to perform the key behaviour (that is, whether forgetting is likely to be a problem) and the processes by which clinical decisions are made by individuals and teams
11. Environmental context and resources	Includes the physical issues that may encourage or discourage performing the behaviour, including staffing levels and time as well as equipment or space.
12. Social influences	The influence of other individuals or groups on the clinician's ability to perform the behaviour/s, for example patients, patients' families, and pressure groups.
13. Emotion	Includes issues such as work stress, patient anxiety, and other emotional factors that may help or hinder the execution of the behaviour
14. Behavioural regulation	Includes the 'how' of performing the behaviour: what are the practical strategies that would facilitate or hinder uptake of the task.

example, two exercise physiology and nutrition behaviours were identified that encompassed prehabilitation delivery: (1) completing assessments and (2) delivering individualised interventions, whilst the one behaviour identified for nursing was referring patients to the prehabilitation service.

Step 2: Questions about enablers and barriers to performing identified behaviours were developed based on the TDF [16]. These questions formed the template for discipline-specific topic guides. At least one question for each of the 14 domains of the TDF was included in each topic guide.

Step 3: The draft topic guides were pilot tested with two researchers, independent of the study, a physiotherapist and a dietitian, to check comprehensibility and questions were revised.

Step 4: The topic guides were modified further following review of the first interview audio by a senior researcher (J. F.) to check reliability, clarity, and flow of the topic guides. The topic guides for each discipline are presented in Supplementary file 3.

## Data collection and analysis

Stage 1: Interviews were conducted by a single researcher (J. C.: physiotherapist and MPhil student) via video conference

call using Zoom [22] between March and April 2021 (2 years after commencement of the service) and video- and audio-recorded. Verbal consent was obtained at the beginning of each interview and audio-recorded by the researcher after the participant had reviewed the participant information documentation. Most participants had a preexisting professional relationship with the interviewer.

The researcher (J. C.) received formal interview training, during a 3-day course, as well as situation-specific training from one author, an implementation scientist with extensive experience in semi-structured interviewing (J. F.).

Stage 2: All interviews were transcribed verbatim, checked for accuracy, and anonymised. An external company completed transcription and one researcher (J. C.) checked for accuracy and anonymised the transcripts.

Stage 3: Data were analysed by content analysis [23] using NVivo [24]. Participant utterances from each transcript were classified into relevant TDF domains [16], with responses being allocated to more than one domain if appropriate. The first interview analysed was coded by two researchers together (J. C., L. E.), with codes then analysed by the senior researcher (J. F.). The three researchers met to discuss discrepancies and develop coding guidelines (Supplementary file 4). The second interview was coded by two researchers independently using the coding guidelines (J. C., L. E.), followed by discussion of discrepancies and further

coding guideline refinements (J. C., J. F.). The remaining 12 interviews were coded by one researcher (J. C.) using the finalised coding strategy, with uncertainties resolved by a second researcher (J. F.).

Stage 4: Utterances within each domain were further analysed to identify themes about performing the behaviours (J. C.), and where necessary themes were noted as discipline specific. All themes were classified as ‘enablers’ or ‘barriers’ [19]. The research team met to review all coding decisions. Enablers and barriers were classified into high, medium, or low priority based on two criteria, the first being frequency of theme (mentioned by >70% of relevant participants = high, 50–70% = medium, <50% = low). Whilst acknowledging every study is unique, these numerical ranges were chosen to provide a clear set of decision rules for identifying high-priority enablers and barriers. The second criterion was conflicting opinions amongst participants. This automatically classified a theme as high priority. These two methods of prioritisation are based on published guidance on methods for selecting high-priority domains, on the assumption that it is not feasible to address all potential barriers in an implementation strategy [19].

## Results

### Participants

Twenty-two clinicians from the tertiary cancer centre were invited to participate in the research and 14 consented to participate in semi-structured interviews. Eight clinicians did not respond to the invitation. All clinicians who consented were interviewed, including six allied health professionals, four nurse consultants, and four haematologists. There were 10 females and four males with a range of 1–25 years of clinical experience at the institution. Interviews that examined one behaviour ranged in length between 20 and 43 min, whilst interviews that examined two behaviours ranged between 24 and 62 min.

### High-priority themes identified as enablers

A total of 50 enablers related to the behaviours for individual disciplines were identified across 13 domains of the TDF (Supplementary file 5): 23 were related to referring patients to the service and 20 were specific to prehabilitation delivery, 7 enablers related to both. Twenty-six enablers were classified as high priority as highlighted in Table 2. Domains with the largest numbers of high-priority enablers also contained the highest number of enablers: Social professional role and identity; Beliefs about consequences; Memory, attention, and decision processes; and Environmental context and resources as detailed in Fig. 1.

High-priority enablers from within these domains are elaborated below. Table 2 provides a list of these with exemplar quotes.

**Social professional role and identity** A common theme across multiple domains was the importance of the multidisciplinary team as an enabler for referring patients and delivering interventions (domains: Social professional role and identity; Environmental context and resources). This was also highlighted in the Social influences domain with 86% of participants stating that colleagues support them in referring or delivering prehabilitation. Nurses and haematologists also reported that ‘If one of us forgets to refer our colleagues will prompt us’ [Haematologist2] and that having nurse consultants to prompt and complete referrals, especially ‘Nurse 1’ [name withheld] was extremely helpful. Nurse 1 was mentioned by allied health, nurses, and haematologists as a key advocate and facilitator of prehabilitation referrals and discussions. All disciplines reported that the behaviour discussed during the interview was their role and responsibility.

**Beliefs about consequences** The overwhelming belief stated by 93% of participants was that patients will benefit from allied health prehabilitation. Participants reported that prehabilitation would improve patient outcomes pretransplant and posttransplant, optimise psychological and physiological functioning, improve health-related quality of life, and reduce length of stay. Additionally, 83% of allied health participants reported that if the patient did not receive prehabilitation it could negatively impact their ability to proceed to transplant.

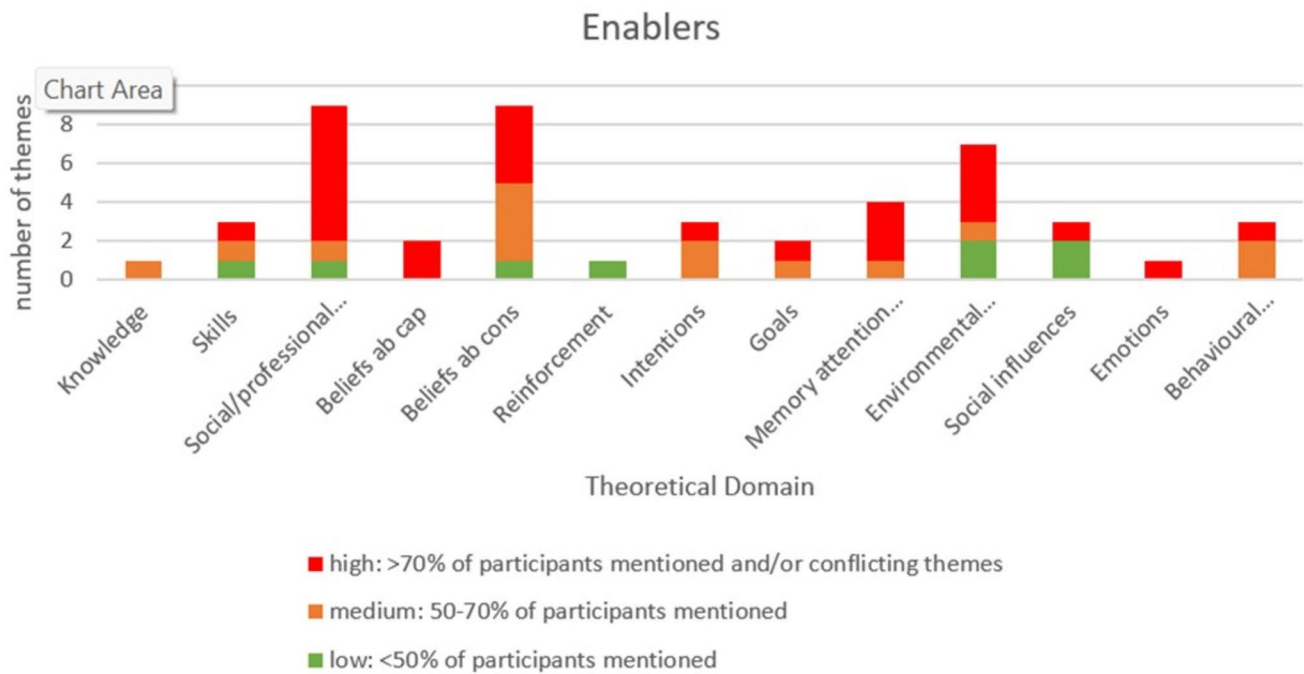
**Memory, attention, and decision processes** Haematology and nursing participants stated that they always try and refer as early as possible ‘so the patients get the best bang for buck out of the process’ [Haematologist4].

**Environmental context and resources** There were consistent views that since the introduction of electronic medical records in August 2020 referrals and providing prehabilitation was easier, more time efficient and improved communication between disciplines (79% of participants). Exercise physiologists reported that supervised exercise class (face to face or virtual) as well as exercise prescription software and easy access to equipment assisted in providing assessments and interventions. The mode of intervention was discussed by all allied health participants with the consensus being that face-to-face appointments were preferred by participants for building rapport, accurate assessments, and individualised intervention. However, it was acknowledged by some clinicians that telehealth (videoconference or phone)

**Table 2** High-priority enablers

Domain	Theme	Percentage of participants (n)*	Quote [participant]
Social/professional role and identity	We work as a multidisciplinary team to action referrals	100% (8)	'We work as a multidisciplinary team, there's quite close involvement between the doctors... and the myeloma nurse consultants'. [HE2]
	If one of us forgets to refer our colleagues will prompt us	88% (7)	'But that's why we have a team 'cause if I forget someone else will remember'. [HE3]
	Our nurse consultants help us refer	75% (3)	'we've got very efficient and very good coordinators [consultants]...they are the main portal of us referring the patients'. [HE1]
	Nurse 1 does the referrals for us or in collaboration with us	71% (5)	'[nurse 1] does the referrals to be honest, which is pretty unique'. [HE3]
	Referring or delivery of prehabilitation is our role and responsibility.	71% (9)	It's just something that we do'. [NC1]
	Patients will benefit from allied health prehabilitation	93% (13)	'The purpose is to get a better outcome for patients from auto transplant... is the main reason we would refer'. [HE4]
	If patients are not referred to prehabilitation it could impact their ability to proceed to transplant	83% (5)	'if they're malnourished and they continue to be malnourished... potentially they're gonna delay getting their stem cell transplant'. [AH1]
	Assessment is essential	75% (3)	'It's essential to get a baseline of the patient's function'. [AH4]
	If patients don't engage well with psychology, they may be less likely to engage with other disciplines	100% (2)	'If some factors aren't addressed as well, they're probably more likely to not engage as well with some of their other goals with other allied health'. [AH6]
	Memory, attention and decision processes	We try and refer as early as possible	75% (6)
Environmental context and resources	Decision about intervention, follow up appointments (if any), and mode of follow up is based on assessment.	83% (5)	'would have a different level of follow up based upon how patients go on their initial testing'. [AH3]
	I would never forget to provide assessment.	75% (3)	'No, very structured and regimented into my routine [laughs]'. [AH4]
	Electronic medical records are an enabler	79% (11)	Oh yeah, I think EPIC's amazing so I'm very happy [laughs], made my life much easier'. [HE3]
	Enabler to referring: Multidisciplinary team	75% (6)	'it's not just me looking after the patients, there are multiple members of the team and if I don't get to the referral somebody else may prompt it'. [HE2]
	Enablers for exercise intervention: <ul style="list-style-type: none"> <li>• exercise class</li> <li>• working in a gym</li> <li>• exercise prescription software</li> </ul>	100% (2)	'We have dedicated supervised class time where we can book in to see multiple patients at once'. [AH3]
	Face to face: best mode of prehabilitation delivery	100% (6)	'if you can get an initial assessment done face to face then it gives you so much more information about the patient'. [AH4]

HE: haematologist participant, NC: nurse consultant participant, AH: allied health participant  
 \*Percentage of relevant participants who discussed the theme; (n) number of relevant participants who discussed theme



**Fig. 1** Number of enabler themes in each domain

appointments were seen to improve accessibility to overwhelmed, fatigued, and rural patients.

### High-priority themes identified as barriers

There were 29 barriers identified across 9 domains of the TDF (Supplementary file 6): 16 were related to referring patients to the service, 11 were specific to prehabilitation delivery, and 2 barriers were related to both. Sixteen of these themes were classified as high priority as highlighted in Table 3. Domains with the largest numbers of high-priority barriers also contained the highest number of barriers identified: Memory, attention, and decision processes; Environmental context and resources; Social influences; and Emotions as detailed in Fig. 2.

High-priority barriers within these domains are elaborated below, and Table 3 provides a list of these with exemplar quotes.

**Memory attention and decision processes** There were conflicting views amongst nursing and haematology participants about which patients should be referred to the prehabilitation service. Seventy-five percent of haematologists reported that ‘There are some patients where you make a judgement call that because of their age or lack of comorbidities... may not require prehab’ [Hematologist2] whilst 75% of nurses reported that ‘all patients going to transplant should be offered the prehab program’ [Nurse3]. This barrier was

reinforced through other related themes reported by nurses and haematologists including no objective tool to advise who should be referred to service (Memory, attention, and decision processes), lack of formalised process for referring (Behavioural regulation), and a lack of understanding about who we can refer (Knowledge). Some nurses and haematologists reported that they might forget to refer a patient, whilst others stated ‘I don’t think I’ve ever missed referring on early’ [Nurse1].

**Environmental context and resources** The most frequent barrier reported by all participants was lack of time to complete referrals, assessments, and individualised interventions. This was stated in various ways by participants including patient load, appointment time not long enough, patients running late creating time pressure, and not enough funding to meet the needs of the service. Phone appointments were widely viewed by allied health participants as ‘not ideal’ [Allied health2] and challenging. Videoconference appointments were considered better than phone appointments, but barriers included assessments not being validated and some patients having technological difficulties and greater difficulty building rapport than face-to-face appointments.

**Social influences** Patients’ views were discussed as a potential barrier to referral by 88% of haematologists and nurses who reported that some patients did not feel they needed the service or were too overwhelmed with their diagnosis or

**Table 3** High-priority barriers

Domain	Theme	Percentage of participants (n)* or conflicting belief (CB)	Quote [participant]
Memory, attention, and decision processes	Not all patients/all patients should be referred	CB	'There are some patients where you make a judgement call that because of their age or lack of comorbidities... that they may not require prehab'. [HE2] 'All patients going to transplant will be offered the prehab program'. [NC3]
	I sometimes (or never) forget to refer	CB	'I'm sure I forget all the time. [laughs]'. [HE2] 'I don't think I've ever missed referring on early'. [NC1]
	There is no objective tool to advise who should be referred to service	CB	'We have to have some sort of basic objective tool saying if patients fit these criteria, they automatically should be referred to prehab'. [HE1]
Environmental context and resources	Barrier to referral and delivery is time and workload pressures.	100% (14)	'I think the main barrier at the moment is probably like time/patient load'. [HE2] 'I guess staffing and time would be an issue...I just don't have the capacity' [AH4]
	Not having reliable room accessibility (nutrition and psychology)	100% (4)	'Having reliable access to a room and a computer... it can be challenging' [AH2]
	Phone appointments are a barrier: • Not a good audience	100% (6)	'You've got a better audience if it's face to face over telehealth or in person as opposed to over the phone'. [AH1]
	Videoconferencing can be a barrier: • Assessments are not validated • Harder to connect with patient	100% (6)	'I think those emotional concerns... are a little bit easier to speak about in person. And I think over telehealth sometimes it feels to them a bit more like a medical appointment'. [AH6]
Social influences	Patients can be barrier to referral	88% (7)	'There have been some people where there's been a little bit of pushback'. [HE2]
	Patient can be a barrier to prehabilitation delivery	83% (5)	'We can't provide psychological treatment to someone if the patient doesn't want that and isn't motivated to engage'. [AH2]
Emotion	Patients' emotions may: • delay referral or discussion about prehabilitation • affect delivery	71% (10)	'So if they're pretty upset with the diagnosis we'll probably not discuss it at that particular moment and defer it to a second appointment'. [HE4] 'There have been occasions where my patients' feelings have affected me completing the assessment'. [AH5]

HE: haematologist participant, NC: nurse consultant participant, AH: allied health participant

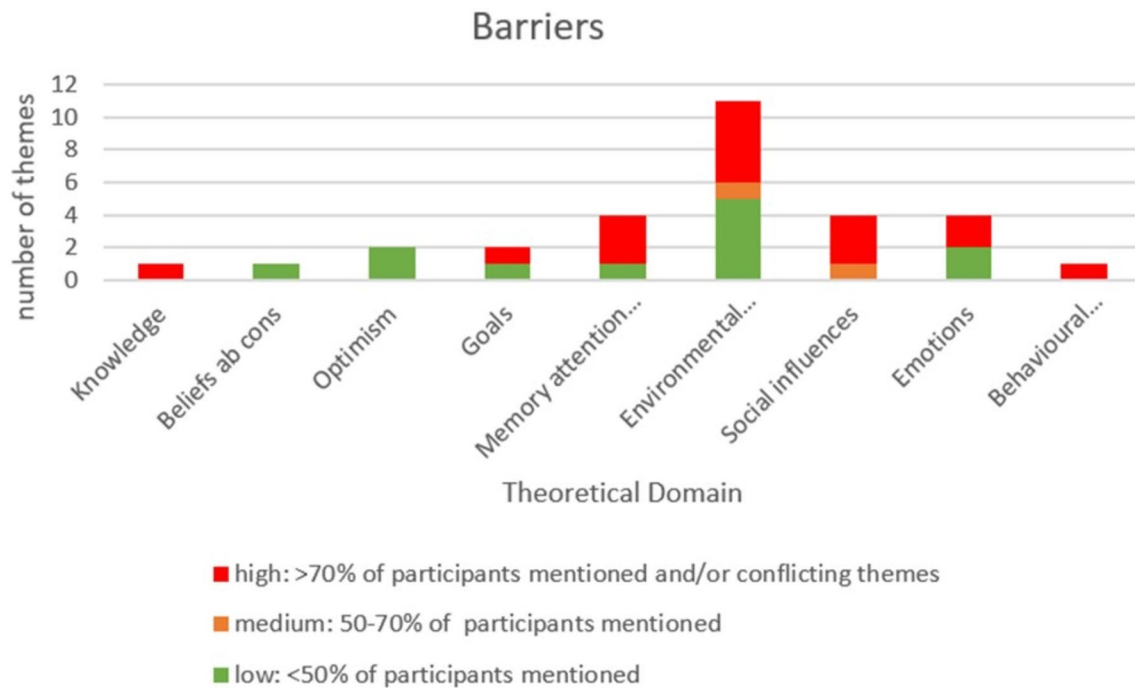
\*Percentage of relevant participants who discussed the theme; (n) number of relevant participants who discussed theme

treatment. Eighty-four percent of allied health participants also discussed patients' responses as a barrier to delivery. They reported that patients may refuse assessment due to 'time, sometimes due to pain, sometimes due to not feeling well' [Allied health3], and that patients' motivation and preferences affect provision of the intervention. Patients who were coping well prior to transplant were reported to be more difficult to engage in the prehabilitation intervention as they 'find it a little bit difficult to conceptualize' [Allied health5] future struggles.

**Emotions** Patients' emotions were a barrier to completing referrals and delivery (stated by 71% of participants). Specifically, nurses and haematologists discussed delaying the prehabilitation referral if the patient was overwhelmed or upset.

### Lower priority domains

Six domains were rated as a lower priority using the developed decision criteria: Knowledge, Skills, Beliefs about



**Fig. 2** Number of barrier themes in each domain

capabilities, Optimism, Reinforcement, and Intentions. Most allied health participants were aware of the evidence supporting multidisciplinary prehabilitation (Knowledge), and reported that assessments were simple, standardised, and that they had received appropriate training to conduct them (Skills). All participants felt confident in their ability to appropriately refer patients or deliver prehabilitation (Beliefs about capabilities). When asked about Optimism, two participants hoped and assumed that their colleagues would submit referrals or be aware of the service. Two participants discussed how rewarding referring or delivering prehabilitation can be (Reinforcement), whilst all other participants reported they did not receive any rewards from completing their prehabilitation behaviour/s. The majority of nursing and haematology participants stated that they were determined to refer and educate patients as early as possible (Intentions).

## Discussion

This study used the TDF [16] to examine allied health clinicians', nurses', and haematologists' perceived enablers and barriers when referring patients to, or delivering, multidisciplinary prehabilitation in the AuSCT population. A 2021 review exploring the barriers and enablers for health care professionals (HCP) when implementing a prehabilitation program highlighted a lack of high-quality evidence

and reported enablers [25]. Enablers should be harnessed to leverage positive behaviour change and to create sustainable services [26]. HCP play a vital role in the effectiveness and success of a prehabilitation program, but little is known about what assists HCP to deliver an effective service [25]. In the current study which sought the views of HCP, participants reported more enablers to prehabilitation referral and delivery than barriers making findings valuable. The reported enablers and high-priority enabler domains should be targeted for future prehabilitation service development and quality improvement strategies.

The most frequent enabler reported by 93% of participants was the belief that patients will benefit from receiving prehabilitation. A previous study assessing the impact of this prehabilitation service found that the service was well adopted by clinicians and clinically relevant improvements in outcomes were demonstrated [12]. These findings could have impacted this reported enabler. Other qualitative prehabilitation studies reported similar results, i.e. that almost all clinicians had a positive view on prehabilitation prior to total hip and knee arthroplasties and considered prehabilitation as a vital and beneficial resource [27].

Another enabler highlighted by participants was the multidisciplinary and interdisciplinary teamwork that facilitated referral and enhanced delivery of targeted interventions. These findings are consistent with other prehabilitation qualitative studies where a positive team environment, 'local champions', and multidisciplinary



teamwork have been reported as enablers for successful prehabilitation implementation [13, 28]. However, this study is unique in its evaluation of an existing prehabilitation service. Hence, we identified experienced, rather than anticipated, enablers and barriers.

A high-priority barrier which intersected several domains was conflicting opinions and knowledge between disciplines (haematologists and nurses) about who should be referred to the prehabilitation service. Michie et al. have mapped behaviour change techniques (intervention components) to theoretical domains to assist with intervention development [29]. Using this tool, useful interventions to improve staff knowledge and decision making about the referral process could include multidisciplinary team discussion and dissemination of referral guidelines and environmental prompts within the clinic room to assist with behaviour change [29]. This intervention strategy is reinforced by existing research where the importance of referral guidelines for cancer prehabilitation delivery was highlighted by HCP [15].

Allied health participants discussed the benefits and challenges of providing prehabilitation intervention via different modes of delivery, e.g. face to face, videoconferencing, and phone (Environmental context and resources). The overwhelming view was that although videoconference and phone appointments have some benefits for the patient, face-to-face appointments are the preference for clinicians to enhance intervention delivery. This challenges other qualitative prehabilitation studies and raises questions about the most effective mode of prehabilitation delivery. Research focusing on the patient experience has found that cancer prehabilitation should be easily accessible [13], that multiple hospital appointments are an environmental barrier to prehabilitation [30], and that patients want to complete prehabilitation close to home [16]. In contrast to this, when providing exercise interventions for cancer patients, several authors report that face-to-face delivery is more efficacious [26]. Further research should be conducted to assess how prehabilitation delivery can be more accessible and less burdensome for patients whilst remaining effective.

As the domain with the highest number of barrier themes, Environmental context and resources is important to consider when initiating and delivering a prehabilitation program. Lack of resources and capacity has been identified as a key barrier for prehabilitation implementation [25, 28]. However, previous studies have shown that participants can be biased in their opinions of what impacts their behaviour, and external factors (e.g. Environmental context and resources) may be more likely attributed to their failures than internal factors (e.g. Memory, attention, and decision processes) [31, 32]. Although Environmental context and resources should be considered when implementing a sustainable prehabilitation service, other high-priority barrier

domains (Memory, attention, and decision processes; Social influences; and Emotions) should also be targeted.

Based on the findings from this study, the authors synthesised eight recommendations for multidisciplinary prehabilitation referral and delivery are provided in Box 1.

Box 1 Eight recommendations for multidisciplinary prehabilitation referral and delivery

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#### Referrals

- Ensure clear guidelines are available and provided to referring staff about prehabilitation service eligibility
- Refer and discuss with the patient as early as possible
- Do not overload an overwhelmed patient at initial assessment with prehabilitation education and referral, defer until a future appointment.
- Enlist 'local champions' to promote the service and prompt referral

#### Delivery (assessment and intervention)

- Ensure exercise supports are in place: outpatient exercise class, accessible equipment, exercise prescription software.
  - Enlist family members to assist and encourage patient to complete assessment and intervention
  - Where practical ensure initial assessment is face to face
  - Have regular multidisciplinary prehabilitation team meetings to enable communication and discuss complex patients.
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#### Limitations

There were several limitations to this study. Firstly, interviewees were aware the interviewer had a favourable opinion of prehabilitation, and many had a professional relationship with the interviewer. Although this may also be a strength as the interviewer had a clear understanding of the context of care, it could have led to social desirability bias and thus over-reporting of enablers. Furthermore, the aim of the research was to interview all members of the multidisciplinary haematology prehabilitation team; however, only 14 of 22 (64%) of invited participants consented to be interviewed. Despite this, participant's diversity was evident in the range of years working at the institution and the range of disciplines interviewed. Finally, all participants were recruited from a tertiary cancer centre (single site); thus, findings may not be generalisable to all oncology populations and settings, in particular, organisations in which prehabilitation is not already included in hospital policy.

#### Conclusion

This study is the first to examine HCPs' perceptions of enablers and barriers to prehabilitation referral and delivery prior to AuSCT using a theoretically driven approach. An important and novel finding was the predominance of reported enablers in comparison to barriers, which can lead directly to suggestions for enhancing uptake at other sites.

The benefits of prehabilitation for patients, and a supportive and dedicated multidisciplinary team, were discussed at length by participants and highlight the importance of a motivated, engaged team with 'local champions' for service delivery. Enablers should be utilised to foster positive clinical change. Future delivery of prehabilitation services should include interventions targeted at high-priority enabler domains: Social professional role and identity; Beliefs about consequences; Memory, attention, and decision processes; and Environmental context and resources. Further research should be conducted to better understand how to target interventions to harness enablers in service implementation and delivery to optimise patient care and create sustainable and effective services.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00520-023-08234-z>.

**Data and code availability** The data used and/or analysed during the current study are available from the corresponding author on reasonable request.

**Author contributions** J. F., L. D., L. E., A. K., and J. C. contributed to the design of the study, ethics application, development and refinement of topic guides, data analysis, and the structure of the manuscript. J. F., a health psychologist with extensive experience in semi-structured interviewing and the TDF, provided advice and guidance on topic guide development, training in TDF methods, and data analysis. J. C. completed this manuscript as part of her postgraduate research through the University of Melbourne and completed all data collection. J. C. is supervised by L. D., J. F., L. E., and A. K. All authors contributed to the manuscript writing and had final approval of the manuscript.

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## Declarations

**Ethics approval** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Human Research Ethics Committee on 3 March 2021: REC/73444/PMCC.

**Consent to participate** Verbal consent was obtained prior to the interview and audio-recorded by the researcher after the participant had reviewed the participant information documentation.

**Consent for publication** Not applicable.

**Conflict of interest** The authors declare no competing interests.

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