

# Enablers and barriers to referral and delivery of multidisciplinary prehabilitation in the Autologous Stem Cell Transplant population: A theory-based interview study

Jessica Crowe (✉ [Jess.crowe@petermac.org](mailto:Jess.crowe@petermac.org))

Peter MacCallum Cancer Centre

Lara Edbrooke

Peter MacCallum Cancer Centre

Amit Khot

Peter MacCallum Cancer Centre and Royal Melbourne Hospital

Linda Denehy

The University of Melbourne

Jill J Francis

The University of Melbourne

---

## Research Article

**Keywords:** Prehabilitation, Autologous stem-cell transplant, Theoretical Domains Framework of behaviour change, enablers and barriers, health service delivery

**Posted Date:** August 16th, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-1952346/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

**Additional Declarations:** No competing interests reported.

---

**Version of Record:** A version of this preprint was published at Supportive Care in Cancer on December 14th, 2023. See the published version at <https://doi.org/10.1007/s00520-023-08234-z>.

# 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.

## Structured Abstract

Health care professionals play a vital role in the success of a prehabilitation program, but established evidence about effective service delivery is limited.

Important findings from this study include the predominance of reported enablers in comparison to barriers. Furthermore, this is one of few studies to document enablers to prehabilitation delivery. Enablers should be harnessed to leverage practice change and to create sustainable services. Findings from this study can be used to support implementation and delivery of prehabilitation programs in hospital settings where uptake remains low.

## 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 diarrhea [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 (24). 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 [18] (Supplementary file 1).

Table 1  
Explanation of the 14 Theoretical Domains

Domain [16]	Explanation (adapted from [19])
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 pre-established 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, 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.

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 (JC and AK), two researchers with experience in prehabilitation (LD and LE) and an implementation scientist with expertise in the TDF (JF), 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 [20] 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 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 (JF) 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 (JC: Physiotherapist and MPhil student) via video conference call using Zoom [21] 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 pre-existing professional relationship with the interviewer.

The researcher (JC) 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 (JF).

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

Stage 3: Data were analysed by content analysis [22] using NVivo[23]. 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 (JC, LE), with codes then analysed by the senior researcher (JF). 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 (JC, LE), followed by discussion of discrepancies and further coding guideline refinements (JC, JF). The remaining 12 interviews were coded by one researcher (JC) using the finalised coding strategy, with uncertainties resolved by a second researcher (JF).

Stage 4: Utterances within each domain were further analysed to identify themes about performing the behaviours (JC), and where necessary themes were noted as discipline specific. All themes were classified as 'enablers' or 'barriers' [24]. 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 [24].

## 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 minutes, whilst interviews that examined two behaviours ranged between 24 and 62 minutes.

### 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; Environmental context and resources as detailed in Fig. 1.

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]
		88% (7)	
	If one of us forgets to refer our colleagues will prompt us	75% (3)	
		71% (5)	
	Our nurse consultants help us refer	71% (9)	
	Nurse 1 does the referrals for us or in collaboration with us		
	Referring or delivery of prehabilitation is our role and responsibility.		'[nurse1] does the referrals to be honest, which is pretty unique'. [HE3]
			It's just something that we do'. [NC1]

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

Footnote:

HE: haematologist participant

NC: nurse consultant participant

AH: Allied health participant

Domain	Theme	Percentage of participants (n)*	Quote [participant]
Beliefs about Consequences	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)	
	Assessment is essential	75% (3)	'if they're malnourished and they continue to be malnourished.. potentially they're gonna delay getting their stem cell transplant'. [AH1]
	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)	'So we try and make that decision early so the patients get the best bang for buck out of the process'. [HE4]
	Decision about intervention, follow up appointments (if any), and mode of follow up is based on assessment.	83% (5)	
	I would never forget to provide assessment.	75% (3)	'would have a different level of follow up based upon how patients go on their initial testing'. [AH3]
			'No, very structured and regimented into my routine [laughs]'. [AH4]

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

Footnote:

HE: haematologist participant

NC: nurse consultant participant

AH: Allied health participant

Domain	Theme	Percentage of participants (n)*	Quote [participant]
Environmental context and resources	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)	
	Enablers for exercise intervention:	100% (2)	'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]
	• exercise class	100% (6)	
	• working in a gym		
• exercise prescription software		'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		'if you can get an initial assessment done face to face then it gives you so much more information about the patient'. [AH4]
*Percentage of relevant participants who discussed the theme; (n) number of relevant participants who discussed theme			
Footnote:			
HE: haematologist participant			
NC: nurse consultant participant			
AH: Allied health participant			

Figure 1. Number of enabler themes in each domain.

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

Table 2. High priority enablers

**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 profession 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'* [Heamatologist2] 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/s 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 pre- and post-transplant, 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) 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 and 11 were specific to prehabilitation delivery, 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; Emotions as detailed in Fig. 2.

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]	
		CB		
	I sometimes (or never) forget to refer	CB		'All patients going to transplant will be offered the prehab program'. [NC3]
	There is no objective tool to advise who should be referred to service			'I'm sure I forget all the time. [laughs]'. [HE2]
			'I don't think I've ever missed referring on early'. [NC1]	
			'We have to have some sort of basic objective tool saying if patients fit these criteria, they automatically should be referred to prehab'. [HE1]	

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

Footnote:

HE: haematologist participant

NC: nurse consultant participant

AH: Allied health participant

Domain	Theme	Percentage of participants (n)* or conflicting belief (CB)	Quote [participant]
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]
		100% (4)	
	Not having reliable room accessibility (nutrition and psychology)	100% (6)	'I guess staffing and time would be an issue...I just don't have the capacity' [AH4]
		100% (6)	'Having reliable access to a room and a computer.... it can be challenging'[AH2]
			'You've got a better audience if it's face to face over telehealth or in person as opposed to over the phone'. [AH1]
Phone appointments are a barrier:		'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]	
	• Not a good audience		
	Videoconferencing can be a barrier:		
	• Assessments are not validated		
	• Harder to connect with patient		
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]

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

Footnote:

HE: haematologist participant

NC: nurse consultant participant

AH: Allied health participant

Domain	Theme	Percentage of participants (n)* or conflicting belief (CB)	Quote [participant]
Emotion	Patients' emotions may: <ul style="list-style-type: none"> <li>• delay referral or discussion about prehabilitation</li> <li>• affect delivery</li> </ul>	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]
*Percentage of relevant participants who discussed the theme; (n) number of relevant participants who discussed theme			
Footnote:			
HE: haematologist participant			
NC: nurse consultant participant			
AH: Allied health participant			

Figure 2. Number of barrier themes in each domain

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

Table 3. High priority barriers

**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; 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 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 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 (30). 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 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 [26].

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, 27]. 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 [28]. 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 [28]. 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, 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 [29], 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 [30]. 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, 27]. 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.

#### **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
- Don't 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.

#### 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, participants

diversity was evident in the range of years working at the institution and the range of disciplines interviewed.

## **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.

## **Declarations**

## **Funding Support**

Partial funding was provided by the Allied Health Department at the Peter MacCallum Cancer Centre for external transcription of the interviews. The funders played no role in the design, conduct, or reporting of this study.

## **Conflicts of interest/ Competing interests**

The authors declare that they have no competing financial interests or conflicts of interest that are relevant to the content of this article

## **Authors' contributions**

JF, LD, LE, AK and JC contributed to the design of the study, ethics application, development and refinement of topic guides, data analysis, and the structure of the manuscript. JF, 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. JC completed this manuscript as part of her postgraduate research through the University of Melbourne and completed all data collection. JC is supervised by LD, JF, LE and AK. All authors contributed to the manuscript writing and had final approval of the manuscript.

## 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 3rd 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.

## Availability of data and codes

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

## Consent for publication

Not Applicable

## References

1. Cook G, Ashcroft AJ, Cairns DA, Williams CD, Brown JM, Cavenagh JD, et al. The effect of salvage autologous stem-cell transplantation on overall survival in patients with relapsed multiple myeloma (final results from BSBMT/UKMF Myeloma X Relapse [Intensive]): a randomised, open-label, phase 3 trial. *Lancet Haematol*. 2016;3(7):e340-51.
2. Lenhoff S, Hjorth M, Holmberg E, Turesson I, Westin J, Nielsen JL, et al. Impact on survival of high-dose therapy with autologous stem cell support in patients younger than 60 years with newly diagnosed multiple myeloma: a population-based study. Nordic Myeloma Study Group. *Blood*. 2000;95(1):7–11.
3. Attal M, Harousseau J-L, Stoppa A-M, Sotto J-J, Fuzibet J-G, Rossi J-F, et al. A Prospective, Randomized Trial of Autologous Bone Marrow Transplantation and Chemotherapy in Multiple Myeloma. *New England Journal of Medicine*. 1996;335(2):91–7.
4. Campagnaro E, Saliba R, Giralt S, Roden L, Mendoza F, Aleman A, et al. Symptom burden after autologous stem cell transplantation for multiple myeloma. *Cancer*. 2008;112(7):1617–24.
5. Chakraborty R, Hamilton BK, Hashmi SK, Kumar SK, Majhail NS. Health-Related Quality of Life after Autologous Stem Cell Transplantation for Multiple Myeloma. *Biol Blood Marrow Transplant*. 2018;24(8):1546–53.

6. Wiskemann J, Huber G. Physical exercise as adjuvant therapy for patients undergoing hematopoietic stem cell transplantation. *Bone Marrow Transplant*. 2008;41(4):321–9.
7. Macmillan Cancer Support. Prehabilitation for people with cancer 2019.
8. Wood WA, Phillips B, Smith-Ryan AE, Wilson D, Deal AM, Bailey C, et al. Personalized home-based interval exercise training may improve cardiorespiratory fitness in cancer patients preparing to undergo hematopoietic cell transplantation. *Bone Marrow Transplantation*. 2016;51(7):967–72.
9. van Haren I, Staal JB, Potting CM, Atsma F, Hoogeboom TJ, Blijlevens NMA, et al. Physical exercise prior to hematopoietic stem cell transplantation: A feasibility study. *Physiother Theory Pract*. 2018;34(10):747–56.
10. Rupnik E, Skerget M, Sever M, Zupan IP, Ogrinec M, Ursic B, et al. Feasibility and safety of exercise training and nutritional support prior to haematopoietic stem cell transplantation in patients with haematologic malignancies. *BMC Cancer*. 2020;20(1):1142.
11. Mawson S, Keen C, Skilbeck J, Ross H, Smith L, Dixey J, et al. Feasibility and benefits of a structured prehabilitation programme prior to autologous stem cell transplantation (ASCT) in patients with myeloma; a prospective feasibility study. *Physiotherapy*. 2021;113:88–99.
12. Crowe J, Francis JJ, Edbrooke L, Loeliger J, Joyce T, Prickett C, et al. Impact of an allied health prehabilitation service for haematologic patients receiving high-dose chemotherapy in a large cancer centre. *Support Care Cancer*. 2022;30(2):1841–52.
13. van der Zanden V, van der Zaag-Loonen HJ, Paarlberg KM, Meijer WJ, Mourits MJE, van Munster BC. PREsurgery thoughts - thoughts on prehabilitation in oncologic gynecologic surgery, a qualitative template analysis in older adults and their healthcare professionals. *Disabil Rehabil*. 2021:1–11.
14. Waterland JL, Ismail H, Amin B, Granger CL, Denehy L, Riedel B. Patient acceptance of prehabilitation for major surgery: an exploratory survey. *Support Care Cancer*. 2021;29(2):779–85.
15. Provan D, McLean G, Moug SJ, Phillips I, Anderson AS. Prehabilitation services for people diagnosed with cancer in Scotland - Current practice, barriers and challenges to implementation. *Surgeon*. 2021.
16. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci*. 2017;12(1):77.
17. Duncan EM, Francis JJ, Johnston M, Davey P, Maxwell S, McKay GA, et al. Learning curves, taking instructions, and patient safety: using a theoretical domains framework in an interview study to investigate prescribing errors among trainee doctors. *Implement Sci*. 2012;7:86.
18. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349–57.
19. Cuthbertson BH, Campbell MK, MacLennan G, Duncan EM, Marshall AP, Wells EC, et al. Clinical stakeholders' opinions on the use of selective decontamination of the digestive tract in critically ill patients in intensive care units: an international Delphi study. *Critical Care*. 2013;17(6):R266.
20. Pesseau J, McCleary N, Lorencatto F, Patey AM, Grimshaw JM, Francis JJ. Action, actor, context, target, time (AACTT): a framework for specifying behaviour. *Implement Sci*. 2019;14(1):102.

21. Zoom Video Communications I. Zoom Video Communications, Inc. 5.0.1 [computer software] ed2022.
22. Krippendorff K. Content analysis: An introduction to its methodology: SAGE publications 2018.
23. QSR International Pty Ltd. NVivo. 2020.
24. Patey AM, Islam R, Francis JJ, Bryson GL, Grimshaw JM, Canada PPT. Anesthesiologists' and surgeons' perceptions about routine pre-operative testing in low-risk patients: application of the Theoretical Domains Framework (TDF) to identify factors that influence physicians' decisions to order pre-operative tests. *Implement Sci.* 2012;7:52.
25. Chapman O, Taylor RM. Barriers and facilitators for healthcare professionals to implementing a prehabilitation programme: Review of the literature *Journal of Cancer Rehabilitation* 2021;4:86–90.
26. Mohammadi S, Reid H, Watson W, Crocker M, Robillard JM, Westby M, et al. A Qualitative Study on Prehabilitation before Total Hip and Knee Arthroplasties: Integration of Patients' and Clinicians' Perspectives. *Disabilities.* 2021;1(4):361–76.
27. Chapman O, Taylor RM. Exploring the barriers and facilitators for an upper gastrointestinal prehabilitation service *Journal of Cancer Rehabilitation.* 2022;5:56–61.
28. Michie S, Johnston M, Francis J, Hardeman W, Eccles M. From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology.* 2008;57(4):660–80.
29. Agasi-Idenburg CS, Zuilen MK, Westerman MJ, Punt CJA, Aaronson NK, Stuiver MM. "I am busy surviving" - Views about physical exercise in older adults scheduled for colorectal cancer surgery. *J Geriatr Oncol.* 2020;11(3):444–50.
30. Newton RU, Taaffe DR, Chambers SK, Spry N, Galvao DA. Effective Exercise Interventions for Patients and Survivors of Cancer Should be Supervised, Targeted, and Prescribed With Referrals From Oncologists and General Physicians. *J Clin Oncol.* 2018;36(9):927–8.
31. Miller DT, Ross M. Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin.* 1975;82(2):213–25.
32. Zuckerman M. Attribution of success and failure revisited, or: The motivational bias is alive and well in attribution theory. *Journal of Personality.* 1979;47(2):245–87.

## Supplementary Files

Supplementary Files 1-6 are not available with this version

## Figures

## Enablers

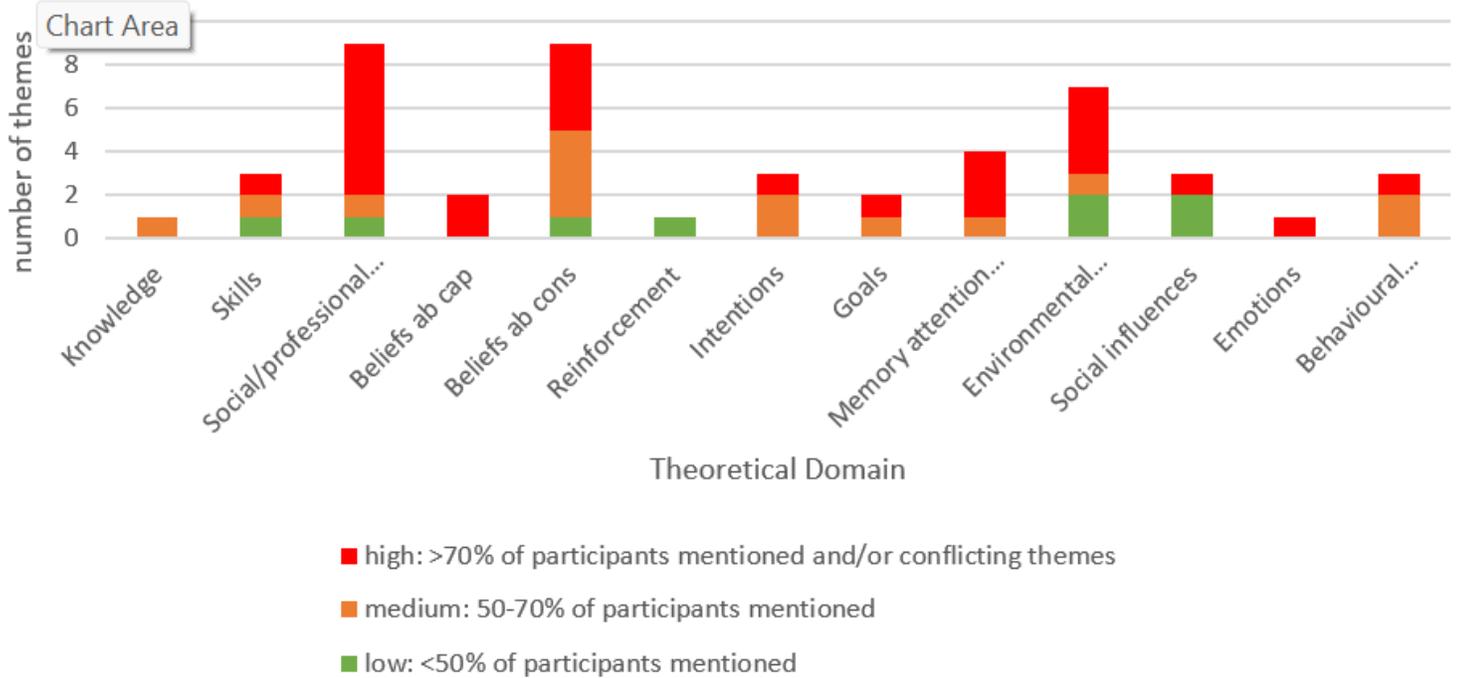
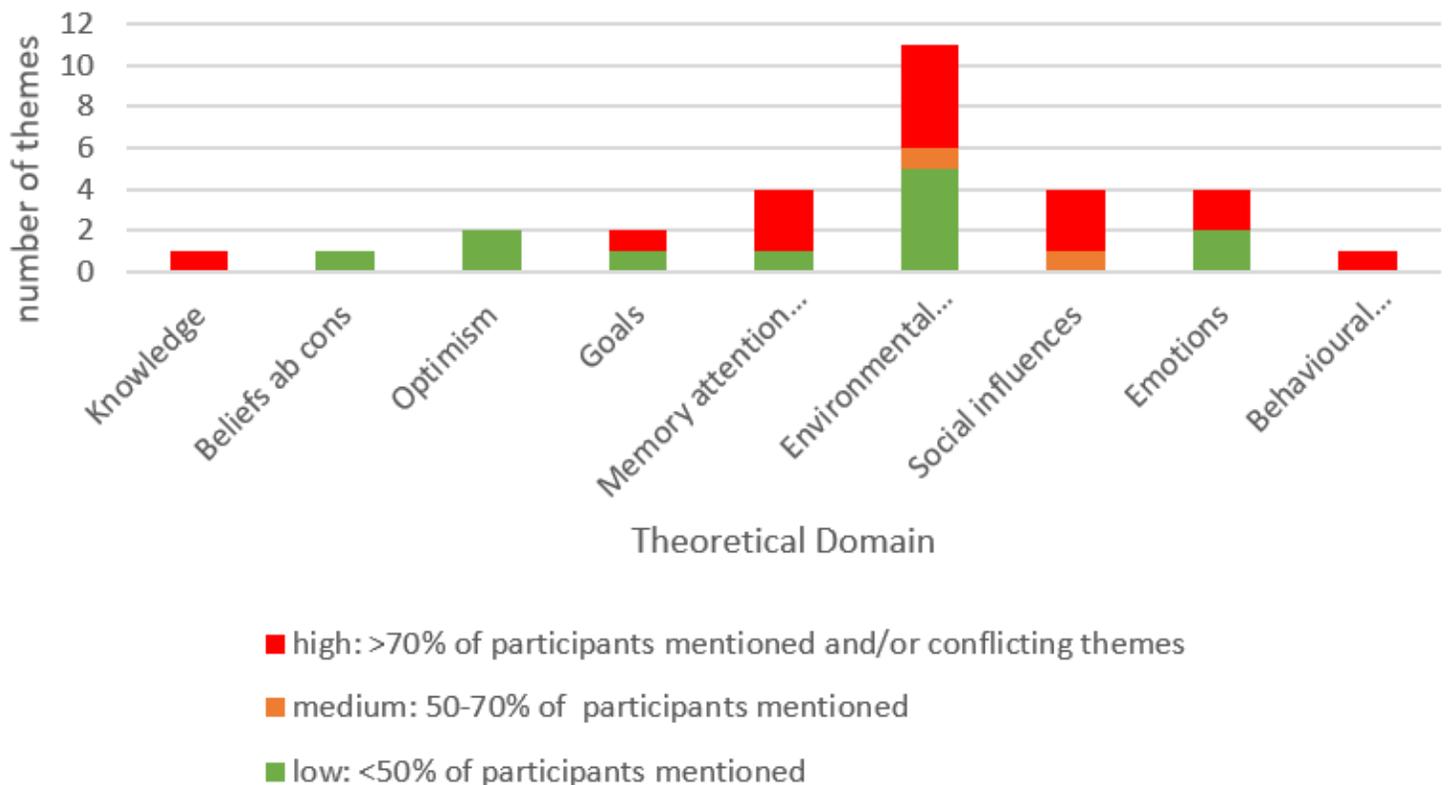


Figure 1

Number of enabler themes in each domain.

## Barriers



## Figure 2

Number of barrier themes in each domain.