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REVIEW

Barriers to Implementation of Prehabilitation

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Abstract

As the demographics of global and European countries change, the healthcare systems need to review existing pathways and service models. An ageing population is being offered more complex and invasive surgical procedures. Furthermore, there is an additional risk with this changing population profile, especially due to increasing frailty, sarcopenia, the incidence of cancer is high, and complex co-morbidities. An emerging challenge for the surgical population is the higher prevalence of obesity. These patients, with complex co-morbidities and needs, form the so-defined "high-risk" surgical patients—who account for 12.5% of surgical procedures but 80% of deaths. Prehabilitation is emerging as an important intervention to address the risk to functional capacity and quality of life. Trials have shown reductions of complications, length of stay and readmissions postoperatively. The best impact is arguably when prehabilitation is multimodal (exercise, nutrition, psychological, and lifestyle) and personalised. This article aims to explore the barriers to the availability of prehabilitation in the UK. The authors found the three most significant barriers were cost-effectiveness, workforce shortage and lack of national policy at the time of publication.

Key words: prehabilitation; pre-operative exercise; cost-effectiveness; policy; implementation science; digital health technology

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Introduction

We aim to explore the evolving demographics of our population with a focus on three specific areas: an ageing society, the rising incidence of cancer, and the prevalence of obesity.

There is a global trend toward increasing life expectancy (United Nations, 2017). This demographic shift is particularly pronounced in European populations, where there is a notable increase in the proportion of individuals over the age of 65 (Vollset et al, 2020), partially attributed to declining fertility rates. These changes are likely to present new challenges that will necessitate a reassessment of current healthcare models by leaders and policymakers.

Moreover, the incidence of cancer within the population is on the rise. Cancer and the associated interventions often accelerate ageing and adversely affect functional capacity, immunity, and nutritional status (Wang et al, 2021). Surgery remains a cornerstone of many cancer treatments and, as previously discussed, presents its own set of challenges. In addition to ageing and cancer, the increasing

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prevalence of obesity is a critical factor. Recent data indicates that approximately 64% of adults in England are classified as overweight or living with obesity. Specifically, in the 2022–2023 period, 26.2% of adults were living with obesity (Office for Health Improvement & Disparities, 2024).

Population ageing, rising cancer rates, and the growing prevalence of obesity pose significant challenges to healthcare systems worldwide. These factors not only increase the overall burden of disease but also compromise patients' physical and functional resilience, especially before undergoing medical interventions such as surgery or cancer therapy (Turrentine et al, 2006; Shpata et al, 2024). Consequently, a significant portion of healthcare budgets may be allocated to managing complications, loss of functional capacity, and increased social care needs in high-risk surgical patients (Ludbrook, 2022).

Prehabilitation—strategic, targeted, personalised preparation aimed at enhancing patients' physical and psychological readiness—offers a targeted solution to these issues. By addressing the specific vulnerabilities of these populations, prehabilitation improves treatment outcomes and reduces complications, establishing itself as a critical component in modern healthcare.

Prehabilitation has been defined by Silver and Baima (2013) as "a process on the continuum of care that occurs between the time of cancer diagnosis and the beginning of acute treatment, includes physical and psychological assessments that establish a baseline functional level, identifies impairments, and provides targeted interventions that improve a patient's health to reduce the incidence and severity of current and future impairments".

The scope of prehabilitation care pathways has evolved to be a part of surgical and non-surgical oncology management along with non-cancer surgery. Encouraging reports have been published in the fields of colorectal (Molenaar et al, 2023), breast (Wu et al, 2021), orthopaedic (Punnoose et al, 2023) and cardiac surgery (Steinmetz et al, 2023). Reviews have often highlighted that the impact of prehabilitation may be most beneficial in the patient population often referred to as "high risk", which may comprise older people undergoing surgery for cancer (van der Zanden et al, 2021; Shpata et al, 2024). This is a particularly notable finding as a patient population defined as "high risk" those with comorbidities such as obesity or multi-morbidity driven by frailty (Daniels et al, 2020). This benefit has the potential to positively impact high-risk patients who account for around 13% of people undergoing surgery but comprise more than 80% of deaths (Pearse et al, 2006).

The aim of prehabilitation is to elevate patients' functional capacity, address modifiable risk factors and decrease surgical complications. There is excitement in the clinical community for the role prehabilitation may play as a cost-efficient intervention for long-term behaviour change and sustained improvements in quality-adjusted life years (Gkaintatzi et al, 2022). Prehabilitation programmes are referred to as unimodal or multimodal within the literature as they can include only one component (e.g., nutritional advice and dietetic input) or more than one (e.g., physical exercise/physiotherapy and psychosocial support). Current evidence suggests multimodal prehabilitation may provide the strongest benefit (van Rooijen et al, 2019). The term multimodal and multidisciplinary is used interchangeably in the articles

found as part of this rapid review and therefore assumed that to provide a multimodal intervention, a trained multidisciplinary team is required (Crowe et al, 2024; Fuchs et al, 2024). Furthermore, prehabilitation can be designed and delivered in various formats: in person or digitally; one-to-one and in groups; supervised and non-supervised; in the community, the hospital, or at home; and as a combination of all the above.

While prehabilitation has been in clinical settings for over 15 years, it has yet to become a standard part of all major surgical and cancer care pathways. A recent survey in the UK using the Freedom of Information Act looked at the state of play of prehabilitation within the National Health Service as of 2024. 54% of Trusts/Boards offered prehabilitation but only 63% of them included a multimodal offering (physical activity/exercise, nutrition, and psychological support) (Pufulete et al, 2024).

Methods

This rapid review aims to explore the possible explanations for barriers and challenges in the implementation of prehabilitation services across the UK and other developed countries. It has been reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al, 2018). A Population, Intervention, Comparison, Outcome (PICO) framework was used to guide the inclusion criteria (see Table 1) and the identification of applicable articles. The review protocol has not been registered. Ethical approval was not required for this review.

Search Strategy

The rapid review conducted a search within Medline/Ovid (https://www.wolterskluwer.com/en/solutions/ovid/ovid-medline-901) and Embase (https://www.embase.com/landing?status=grey) for all articles between 1946 and 16 July 2024. The keywords utilised for the search strategy were as follows: prehabilitation, barrier, challenge, and obstacle. The search term "cost" was added to the initial search strategy to extrapolate further articles looking at prehabilitation cost-effectiveness as the initial search did not yield economic analysis studies, which the authors chose to investigate as a possible challenge to the development of prehabilitation services. Both search strategies and limits are available in Appendix A. Filters were used to identify publications conducted in English only. Additional articles were identified by utilising the search terms in the National Health Service (NHS) Knowledge Library Hub and searching reference lists of included articles.

Eligibility Criteria

Articles identified via the search strategy, as well as those included in the citation search and NHS Knowledge Library Hub, were included in this rapid review if the following criteria were met:

(1) Reporting one or more of the outcomes of interest: barriers, obstacles or limitations to prehabilitation in adults preparing for cancer, non-cancer, and orthopaedic surgery. Prehabilitation was defined as having to offer two or more of the

Table 1. PICO Framework for inclusion criteria.

PICO			
Population	Intervention	Comparison	Outcome
Adults preparing for cancer, non-cancer, and orthopaedic surgery	multidisciplinary/multimodal prehabilitation	Control group receiving no prehabilitation (if available)	Identifying barrier, obstacle or limitation to prehab Cost of prehabilitation

Note: PICO, Population, Intervention, Comparison, Outcome.

following pillars of prehabilitation: physical exercise/physiotherapy; psychosocial support; nutritional support; and lifestyle interventions. For this review, physical activity did not include specific interventions alone such as pelvic floor, breathing exercises, eye and swallowing exercises or activities of daily living.

(2) Interventional and non-interventional studies of quantitative, mixed methods or qualitative design evaluating multi-modal prehabilitation with published results. Protocols were not included. Articles that focused solely on patient prehabilitation acceptance, which was not the focus of this review and therefore were excluded. A 2024 published systematic review has already examined the acceptance of and adherence to cancer prehabilitation to increase understanding of access to these services and its findings were included in this rapid review (Watts et al, 2024).

(3) Full-text, original articles published in peer-reviewed journals. Conference abstracts, letters to the editor, or commentary pieces were not included.

(4) Scoping reviews and strategic insight reviews of prehabilitation were included as they were identified to be of value to map the breadth of evidence available on barriers and obstacles to prehabilitation in addition to identifying key factors related to methodological research or the absence of research within the evidence base (Munn et al, 2022).

(5) Participants were ≥18 years old at the time of the study, and children were not included.

(6) Studies in English and conducted in Organization for Economic Cooperation and Development (OECD) countries.

Screening Process

The searches were conducted by an independent and experienced reviewer who applied the key search terms and inclusion criteria. The results from the database searches were then exported to Microsoft Excel format. Duplicates were removed prior to the screening process. The two authors (TR and ST) of this review independently reviewed titles and abstracts to apply the inclusion criteria. Full-text screening was completed by ST with any articles that focused on non-multidisciplinary or prehab acceptance only reviewed by both authors prior to data extraction.

Table 2. Summary of key results of prehabilitation studies identifying barriers.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Purdy et al, 2024, Canada	To explore the hematopoietic stem cell transplantation (HSCT) patient experience	Mixed-methods study	Hematopoietic stem cell transplantation (HSCT) patients	Barriers exercise related Prioritise education Personalised prehabilitation HSCT patients need mixed telehealth and face-to-face model
Harada et al, 2024, Japan	Prehabilitation during neoadjuvant chemotherapy implementation	Qualitative survey	155 Japanese hospitals, oesophageal cancer	Barriers included: Staffing issues affecting the provision of multidisciplinary prehab Reimbursement of medical costs Continuity of care from inpatient to outpatient care Physical symptom management
Earasi and Kappus, 2024, USA	Healthcare system obstacles to prehabilitation for transplant centres	Narrative review	Solid organ transplant centres	Prehabilitation barriers: Workforce development challenges, resource allocation, securing financial support, proving cost-effectiveness, ensuring patient engagement, diverse patient needs (health literacy), integration with existing processes, and consistent methods for data collection and outcome measurement are vital for sustainability
d'Agate et al, 2024, France	Patient compliance with a digital platform	Feasibility study	26 patients, uro-oncological surgery	A mobile app is feasible with adequate patient compliance

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Watts et al, 2024, USA	Systematic review to increase understanding of access to, acceptance of and adherence to cancer prehabilitation	Systematic review	56 studies: 32 quantitative, 15 qualitative, 9 mixed-methods	Limited research facilitators and barriers at individual and structural levels Importance of interpersonal relationships for prehab access, acceptance and adherence No studies related to ethnic minority communities Health literacy stated as a barrier for socioeconomically deprived areas
Fuchs et al, 2024, Germany	Barriers and facilitators for healthcare professionals implementing and delivering of the multimodal prehab (PRAEP-GO)	Descriptive qualitative study	14 interviews with clinical and non-clinical staff involved in the project for pre-frail adults ≥70 years	Issues with organisation and cooperation identified Staff resource issues Patient pathway optimisation issues Improvement is needed in communication and cooperation between professionals and patients
Shen et al, 2024, China	Synthesize qualitative evidence and explore the barriers and facilitators to prehabilitation implementation	Systematic review	26 studies were included, involving 377 patients, 51 caregivers, and 156 healthcare providers	Patients and healthcare providers identified a lack of reflective motivation and physical opportunities as the most significant barriers to engagement in prehabilitation. Personalised approaches, social support, and healthcare providers' engagement are key factors
Renouf et al, 2024, UK	Barriers and facilitators for clinical nurse specialists and advanced nurse practitioners	Qualitative study	415 survey responses, staff in oncology	Lack of guidance Poor referral processes Reduced clinician Staff time poor Lack of patient interest and perceived relevance to their treatment plan

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Ke et al, 2023, Singapore	Economic evaluations of prehabilitation interventions	Systematic review	12 studies included	Lack of evidence for the economics of prehabilitation programs More research needed
Crowe et al, 2024, Australia	Healthcare professional's perceptions of enablers and barriers in the delivery of multidisciplinary prehabilitation	Qualitative study	14 healthcare professionals working in autologous stem cell transplant	Lack of time and patient distress/emotions Conflict in decision-making for appropriate referrals
Voorn et al, 2023, Netherlands	Study to evaluate beliefs, facilitators, and barriers from the view of patients informal caregivers and professionals	Qualitative study	12 healthcare professionals, 17 patients, 16 informal caregivers, non-small cell lung cancer surgical pathway	Themes include: Organisational factors Personal factors for participation Environmental factors Pathways for referral from multiple professionals in both primary and secondary healthcare
Steffens et al, 2023, Australia	Patients' perspectives on the prehabilitation multimodal online program	Qualitative study	30 patients undergoing gastrointestinal cancer surgery	Barriers: Poor health and reduced motivation Facilitators: Benefits of prehab and the simplicity of the programme
Lippi et al, 2023, Italy	Review of current prehabilitation and rehabilitation strategies for thyroid cancer survivors	Narrative review	Thyroid cancer patients	Barries common in clinical practice Need for Digital innovation and patient-centred programmes integrated into the rehab framework

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Saggu et al, 2022, UK	Multimodal prehabilitation barriers and facilitators to engagement and delivery related to the design of intervention	Scoping review	24 studies related to gynaecological cancer	Key themes: Prioritisation, access, role of professionals and organisations, patient perceptions and motivations Well evidence prehab for women gynae-oncology tumour groups does not exist in evidence base as yet
Lobo et al, 2023, UK	Evaluate the potential benefits and limitations of and barriers to prehabilitation in surgical patients	Narrative review	Reviews randomized controlled trials (RCTs) and meta-analyses on prehabilitation in surgical patients	Prehabilitation shows wide raging results and weak evidence-based
Heil et al, 2022, Netherlands	To explore perspectives of professionals involved in prehabilitation service implementation and to identify strategies to successful delivery	Qualitative study	13 interviews with prehabilitation professionals	Barriers include: Lack of scientific evidence on cost-effectiveness Challenges to offering a personalised prehabilitation program Logistics of delivery Awareness of the benefits of prehabilitation among patients and professionals
Schierbeck, 2022, Canada	Review of prehabilitation for patients with cancer	Narrative review	Not applicable (NA)	Importance of the multidisciplinary team approach Making the patient an active participant in identifying their health issues
Provan et al, 2022, UK	Identifying the prehabilitation challenges and status of implementation in Scotland	Mixed-methods study	295 survey responses were obtained and 11 interviews completed	Barriers include: Short time frames between referral and treatment, patient engagement Lack of evidence-based business case success and long-term funding

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
van der Zanden et al, 2021, Netherlands	Qualitative study to inform the design of a prehabilitation program	Thematic analysis, semi-structured interviews	16 gynaecologic oncological patients aged ≥60 years and 20 healthcare professionals were interviewed	Themes for prehabilitation were defined as motivation, patient-related factors and practical issues
Ng et al, 2022, Singapore	NA	Scoping review	NA	Multimodal prehabilitation delivered by a multidisciplinary team improves functional outcomes following surgery Future services need to address frailty and barriers with personalised programme design
Shelton et al, 2021, USA	Study to establish whether existing health beliefs are associated with engagement and adherence (home-based online prehab program)	Feasibility study	227 patients, with abdominal colorectal surgery	App-based prehabilitation program showed moderate acceptability, engagement, and adherence An online platform offers more personalisation and engagement as well as a cost-effective scalable solution
Waterland et al, 2021, Australia	Acceptability of prehabilitation	Qualitative exploratory survey	103 patients, gastrointestinal and urological cancer surgeries	Patients want to exercise at home as the facilitator Medical teams recommending prehab seen as a facilitator Barriers included potential programme costs
Doiron-Cadrin et al, 2019, Canada	Feasibility and the potential impact on pain and disability of a telerehabilitation prehabilitation program, compared to in-person prehabilitation or usual care	Study-single blinded randomised controlled trial	34 patients, with total hip or knee arthroplasty	Barriers include Facilitator tele-prehabilitation using mobile technology which is safe, feasible and shows good satisfaction

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Shukla et al, 2020, Australia	Acceptability and perceived benefit of prehabilitation among thoracic surgeons	Qualitative survey	198 cardiothoracic surgeons, in Australia and New Zealand	Barriers to prehabilitation reported were patient comorbidities and access to allied health professionals
Ferreira et al, 2018, Canada	To increase understanding of patients' perspectives of prehabilitation and to identify adherence factors	Qualitative descriptive study	52 cancer patients	Need to make prehabilitation programs more patient-centred Therapeutic strategies tailored to meet patients' specific needs will overcome program non-adherence
Nunns et al, 2019, UK	Evaluation of the effectiveness and cost-effectiveness of hospital-led multicomponent interventions to reduce hospital stay in elective inpatient pathways	Systematic review	Studies including elective inpatients with a mean or median age of ≥60 years, 218 studies included	Enhanced recovery and prehabilitation interventions do show a reduced hospital stay (colorectal surgery, lower limb arthroplasty or upper abdominal surgery) Barriers include lack of reported impact on patient-reported outcomes, health-care costs or additional service utilisation
Blumenau Pedersen et al, 2023, Denmark	Effects and feasibility of technologies for remotely supporting home-based prehabilitation compared to standard care on pre- and postoperative outcomes in adults undergoing elective major surgery	Systematic review	6 RCTs, 20 pilot/feasibility studies Adult cancer various tumour groups and one bariatric study	Use of technology is feasibly and has a high acceptability Digital technology and innovative solutions to increase healthcare resources it needed

Table 2. Continued.

Study, Author, Year, Country	Aim/Purpose	Study design	Population/Study participants	Key results
Bloom, 2017, UK	Prehabilitation evidence and insight review aim to develop the centralised synthesis of prehab sources and support potential organisational developments related to prehabilitation	Strategic insight paper	62 subject matter experts (internal and external stakeholders) Macmillan staff, academics, allied health professionals	Wales only country to explicitly mention prehab in cancer or health policies
Shaw et al, 2023, UK	To identify factors that influence maximising uptake of prehabilitation interventions	Scoping review	Colorectal, lung, gynaecological, various cancer surgery, 5 reviews include	Common components acting as barriers to patient uptake and engagement with prehabilitation included: Time, accessibility, setting of intervention, and health Search identified a lack of secondary evidence relating to how ethnicity and age may influence uptake and participation in addition to a lack of secondary evidence relating to how digital technology may influence uptake and participation

Data Extraction

Full data extraction was entered into an original Microsoft Excel data form by one reviewer (ST). The data selected for Table 2 was related to study characteristics, including country of origin, sample size, study design/methods, and cancer or surgical populations. Due to the heterogeneity of the study designs, a pragmatic approach was taken to highlight the key results, which were briefly related to the search terms of the rapid review. The second reviewer (TR) conducted a random sample review of 10% of the included studies to review the descriptive summary within Table 2 for accuracy.

Results

The initial search resulted in 387 studies, and an additional 39 studies were identified when the search term "cost" was added. There were a large number of duplications and conference abstracts removed. The Ovid Medline and Embase searches were supplemented by a similar search within the NHS Knowledge Library Hub, which identified two additional results as well as a basic web search which sourced a review published by Macmillan Cancer Support (Bloom, 2017) and a white paper by published by Public Health Wales (Shaw et al, 2023). These are detailed in the adapted PRISMA 2020 flow diagram (Fig. 1) (Page et al, 2021) and the description of the final studies included is reported in Table 2.

Study Characteristics and Population

The 29 papers included were from 11 different OECD countries and covered a wide range of study designs. This includes strategic insight paper (n = 1), scoping review (n = 3), systematic review (n = 5), narrative review (n = 4), qualitative studies of varying approaches (n = 11), mixed methods study (n = 2), randomised control trial (n = 1) and feasibility studies (n = 2).

The population of patients and health care professionals surveyed ranged from non-solid tumours (hematopoietic stem cell transplantation), solid tumour cancer populations, solid organ transplantation and orthopaedic elective procedures.

Key Barriers Identified

Many of the articles included examining prehabilitation from the patient, healthcare professional, and healthcare service perspective. Key barriers to the implementation of prehabilitation from the patient's perspective included: time for prehab, accessibility (time, transportation and distance taken to travel) and the setting of the intervention was predominantly favoured as home-based (Ferreira et al, 2018; Saggu et al, 2022; Shaw et al, 2023; van der Zanden et al, 2021; Waterland et al, 2021).

For the wider healthcare system or service implementation, it was identified that there is a gap in the evidence base around cost-effectiveness. At the time of publishing Wales is the only devolved nation in the UK to explicitly mention prehabilitation in cancer or health policies (Bloom, 2017). The key outcome of cost-effectiveness of prehabilitation or enhanced recovery after surgery programmes has often been cited as a reduction in length of stay. This has been evaluated in upper

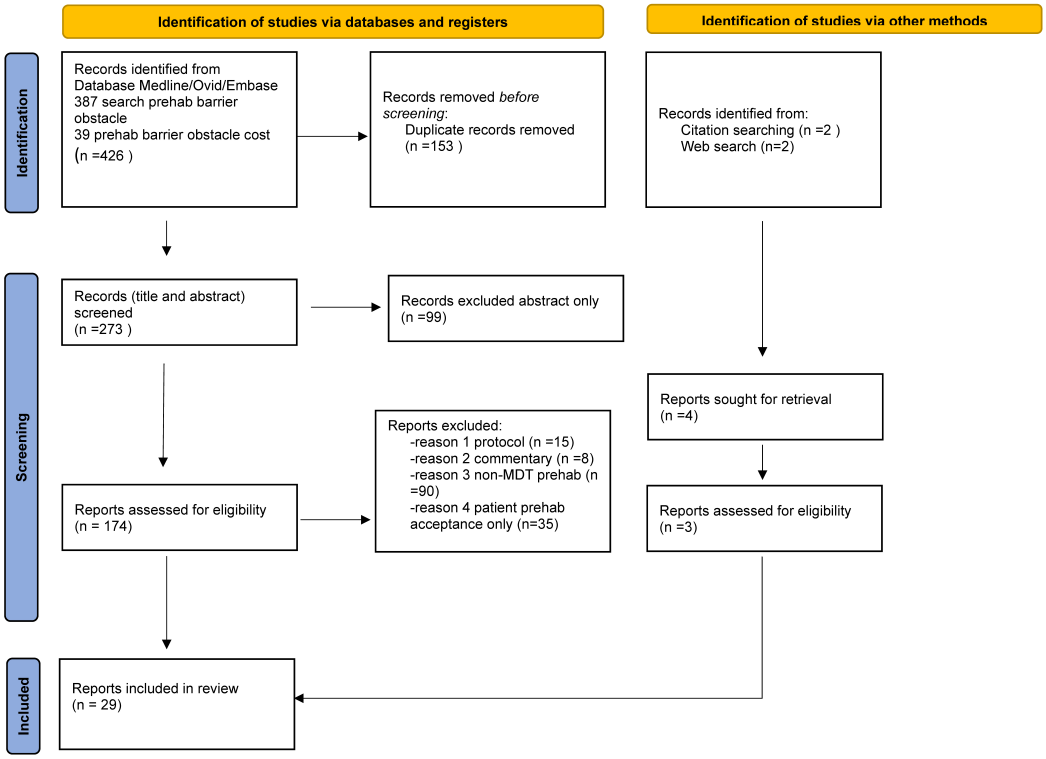

Fig. 1. PRISMA flow diagram of identification of reports included in rapid review.

abdominal or colorectal surgery as well as lower limb arthroplasty but further research is required to evaluate the implementation of these programmes to reduce service variation as well as assess longer-term patient-reported outcomes and secondary services use (Nunns et al, 2019). Many clinicians and researchers highlight the lack of or conflicting evidence around cost-effectiveness and prehabilitation (Heil et al, 2022; Ke et al, 2023; Lobo et al, 2023).

Clinicians identified a lack of access to trained prehabilitation professionals and complex patient comorbidities (Fuchs et al, 2024; Provan et al, 2022; Shukla et al, 2020). The targeting of prehabilitation services and resources at high-risk, frail patients need to be personalised and value to the healthcare service quantified (Shelton et al, 2021; Lobo et al, 2023; Shen et al, 2024).

Both patients and clinicians identified time for prehabilitation from the date of diagnosis to the date of a patient's surgery as a significant barrier for an effective programme in addition to lack of clinician time (van der Zanden et al, 2021; Provan et al, 2022; Saggu et al, 2022; Voorn et al, 2023; Crowe et al, 2024; Renouf et al, 2024).

Tertiary centres would need to prioritise the development of a prehabilitation workforce that is able to integrate prehabilitation into existing pathways with robust data collection for proving ongoing cost-effectiveness (Earasi and Kappus, 2024; Harada et al, 2024). The lack of insurance or reimbursement for the costs of prehabilitation was mentioned in only one qualitative survey (Harada et al, 2024) but patients in Australia also reported programme costs as a barrier to participation (Waterland et al, 2021).

Digital Technology

It was identified that digital technology to support home-based prehabilitation was feasible, acceptable and would be a key solution to support resource-stretched healthcare services and time-poor clinicians (Doiron-Cadrin et al, 2019; Lippi et al, 2023; Blumenau Pedersen et al, 2023; d'Agate et al, 2024; Purdy et al, 2024). However, there is a need for further patient and public involvement in the customisation of the user experience and design to maximise long-term health behaviour change and assessment of long-term patient-reported outcomes (Shelton et al, 2021), and lack of evidence relating to implementation in ethnic minority groups, age or health literacy (Shaw et al, 2023; Steffens et al, 2023; Earasi and Kappus, 2024; Watts et al, 2024).

Discussion

There is increasing awareness and acceptance of prehabilitation and its utility in Perioperative and Cancer care. Yet, prehabilitation is not available to all patients who would benefit from this multimodal, personalised intervention.

While there are many factors that contribute to the lack of availability of prehabilitation, we have chosen to focus on three major themes—lack of robust evidence of the cost-effectiveness of prehabilitation, dedicated workforce and national policy. We believe addressing these fundamental factors would help overcome barriers that currently prevent the implementation of prehabilitation nationwide in the UK.

The cost-effectiveness of the intervention is one of the most significant barriers in the implementation of prehabilitation. Prehabilitation services require a significant number of resources and organisational support. This ranges from dedicated clinician and allied health professional workforce, logistics of development of a multidisciplinary team and education of colleagues to support the services. Infrastructure and capital support from the estates and information technology departments may place additional strain on already stretched NHS Trust budgets. Convincing evidence for cost-effectiveness, robust to ensure the commissioning of sustainable services may be helped by following models developed by the National Institute of Clinical Excellence (NICE).

While resource allocation challenges are often cited as a barrier to implementing prehabilitation, it is important to pause and reflect that emerging evidence demonstrating significant long-term benefits for patient outcomes—including reduced postoperative complications and hospital readmissions—highlights the potential for substantial cost savings over time.

Despite the acceptance of the benefits of prehabilitation, the financial implications of setting up and running a service is a significant barrier. The challenge is particularly unique as not only there are "set-up" and "running costs", but additional differences in hospitals vs digital programmes.

Setting up a hospital-based program requires substantial initial investments. These include creating specialised physical spaces, purchasing exercise and monitoring equipment, and training dedicated multidisciplinary staff to provide coordinated care. Digital prehabilitation programmes have their own not-so-insignificant

setup costs but prove to be cost-effective in comparison to face-to-face programmes (Gkaintatzi et al, 2022). The development of user-friendly apps, telehealth systems, and platforms for virtual coaching and group sessions can cost substantial sums for an impactful intervention. Additional financial and time pressures may come from the need for integration of these platforms with pre-existing electronic medical record systems.

The recurring costs of an in-person hospital-based programme include staff salary, infrastructure and space maintenance, consumables like resistance bands, etc. Digital prehabilitation programmes eliminate many physical overheads. However, they have other recurring costs, such as server maintenance, software updates, cybersecurity, and IT support.

An interesting parallel to establishing cost-effectiveness for healthcare providers is decreasing the alternative costs to patients. This includes travel, days off work and possible rearrangement of caring responsibilities amongst others. This may disproportionally affect patients with the most need. Prehabilitation is still developing, and digital and telehealth prehabilitation services may provide a solution by incorporating technology such as mobile applications and video/audio calls to decrease the need for physical infrastructure and travel costs (Seery et al, 2022; Watts et al, 2024).

Current literature suggests that physical activity and exercise are the most common component of hospital/community-based prehabilitation services (Pufulete et al, 2024). There is increasing evidence to support that prehabilitation is most beneficial as a multimodal intervention, comprising all four pillars, exercise, nutrition, psychological and lifestyle support. The lack of available, dedicated and trained workforce, especially within the field of dietetics and psychology, is another barrier to the implementation of a complete prehabilitation service. Appropriately urgent attention must be given to this gap whilst planning the national workforce strategy (van Rooijen et al, 2019; NHS England, 2023a; Pufulete et al, 2024). It is the belief of authors based on their experience within the field and the accepted opinion, that the implementation of prehabilitation programs requires a multidisciplinary team of healthcare professionals, each bringing their expertise to address the diverse needs of patients preparing for surgery or cancer treatment. These include exercise specialists or physiotherapists to design, implement and monitor tailored exercise programs to improve patients' physical fitness. Dietitians or nutritionists are required to assess and optimise patients' nutritional status, address deficiencies and ensure adequate caloric and protein intake to support recovery. Mental health professionals are vital to provide interventions to manage anxiety, depression, or stress related to upcoming treatment and clinicians to oversee medical optimisation, particularly for patients with chronic conditions like diabetes or cardiovascular disease. Cohesive care achieved through clear communication and interdisciplinary training, ensures a holistic approach to prehabilitation, addressing physical, nutritional, psychological, and functional aspects to optimise patient outcomes.

Lastly, there is a lack of national policy recommendations and funding allocation to promote the incorporation of prehabilitation in clinical pathways. The NHS is a fragmented body with 42 integrated care boards and over 180 Trusts. Most

of these healthcare providers make budgeting decisions aligned with the funding allocation and guidance of national organisations like NICE and National Health Service England (NHS England, 2023b) with competing demands on limited resources and finances. It is a challenge to commission services that may not have any direct funding or recommendations allocated to them.

National policymaking is pivotal to the successful implementation and sustainability of prehabilitation programs in the UK. By providing strategic direction, and addressing systemic barriers, policymakers can ensure that prehabilitation becomes a standard part of surgical care, ultimately improving patient outcomes and reducing healthcare costs. National strategies can focus on reducing healthcare disparities by ensuring prehabilitation services are accessible to all patient demographics, including those in remote or underserved areas. Improving patient awareness of prehabilitation is essential for ensuring maximal benefits and encouraging participation. Strategies to enhance patient awareness, need to focus on repeated, accessible messaging through communication channels, education, healthcare provider involvement, and policy interventions. While a detailed discussion is beyond the scope of this article, a simple suggested intervention can include the development of brochures, infographics, and videos explaining what prehabilitation is, its benefits, and how to participate. Ensure their availability in hospitals, general practitioner (GP) surgeries, pharmacies, and online. This material needs crucially to be culturally competent and address health literacy and language barriers. Another positive significant suggested step would be to integrate prehabilitation with national public health initiatives such as "One You".

The authors recommend the health policy in the UK develop strategies to address the three barriers highlighted in the rapid review to facilitate and support availability of prehabilitation nationally to all patients that would benefit from the intervention. The authors acknowledge their potential bias as both work within the prehabilitation field and a rapid review has its methodological limitations with an increased risk of bias and summation of the data from a wide range of methodological studies. The rapid review has been conducted in a limited timeframe to address a rapidly changing field and political narrative surrounding the three shifts required to build a National Health Service for the future. The current government cite moving care from hospitals to communities, making better use of technology and focusing on preventing sickness not just treating it as key shifts to meet the needs of the UK population (Department of Health and Social Care, 2024). Future research appraising or testing prehabilitation models should focus on making prehabilitation synonymous with prevention through collaboration with public health bodies, integrated care boards and national research institutions. Additionally, for this review, our primary aim was to explore the barriers to the implementation of prehabilitation programs, with a specific focus on organisational and systemic challenges. While patients' acceptance is undoubtedly a crucial factor for successful implementation and uptake, we believe that addressing organisational barriers is a necessary first step to ensure Prehab is widely available.

A lack of national policy support hampers the integration of multimodal prehabilitation as a standard part of surgical and cancer care pathways in healthcare

systems, limiting its widespread adoption. Additionally, the absence of robust evidence on its long-term effectiveness and cost-efficiency creates uncertainty among policymakers and healthcare providers. Furthermore, the successful implementation of prehabilitation programs requires a dedicated multidisciplinary workforce, which is often constrained by limited resources, human and infrastructure (space) and competing priorities within healthcare settings.

Digital prehabilitation offers a promising avenue to address these challenges. By leveraging digital technologies, such as mobile apps, telehealth platforms, and wearable devices, prehabilitation can overcome geographic and workforce constraints, enabling wider access to care. Moreover, digital solutions have the potential to facilitate real-time monitoring, personalized interventions, and scalable program delivery, even in resource-limited settings. To promote the adoption of digital prehabilitation, concentrated efforts are needed to establish supportive policies, invest in pilot programs to generate robust evidence, and address practical barriers such as technology accessibility and patient engagement.

Varied healthcare settings (e.g., urban versus rural) and socioeconomic factors are critical considerations in understanding the implementation of prehabilitation services. While our current manuscript primarily focuses on broader organisational barriers, we acknowledge that these variables significantly influence access and feasibility.

Again, we believe digital prehabilitation could provide a promising solution by bridging the gap between urban and rural settings. Digital platforms have the potential to overcome geographical limitations, deliver equitable services, and tailor interventions to different socioeconomic groups. For instance, remote access can reduce transportation barriers commonly faced in rural areas, and adaptable digital programs can accommodate varying levels of health literacy.

By embracing digital innovations and developing a strategic and robust national healthcare and workforce policy, healthcare systems can integrate prehabilitation more effectively, making it a cornerstone of patient-centred care and improving outcomes for diverse and increasingly challenging populations.

Conclusion

While prehabilitation holds significant promise for enhancing patient outcomes, it is not available as a standard intervention as part of surgical and cancer care pathways. This review article set out to explore the barriers to implementation, with a focus on organisational challenges. The authors found that the widespread adoption of prehabilitation is hindered by a lack of national policy support, limited resources, and insufficient evidence on its long-term effectiveness and cost-efficiency.

Digital prehabilitation offers a promising solution by leveraging technologies like mobile apps, telehealth platforms, and wearable devices to overcome geographic and workforce barriers. The authors recommend that concentrated efforts are needed to establish supportive and robust national and local policies, pilot digital programs to generate robust evidence, and address challenges like technology

accessibility and patient engagement, ensuring equitable access to prehabilitation and improved outcomes for diverse populations.

Key Points

- Prehabilitation has significant potential for improving patient outcomes.
- There is inconsistent provision and application of prehabilitation in the UK.
- This rapid review was conducted to explore potential barriers to implementation of prehabilitation.
- The authors conclude that the widespread adoption of prehabilitation is often prevented by a lack of national policy support, resources, and evidence on its long-term cost-effectiveness.

Availability of Data and Materials

All data included in this study are available from the corresponding author upon reasonable request.

Author Contributions

TR was responsible for the conception and design of the paper. TR as the first author was responsible for overall quality control and review of the article as well as supervision and management. ST was responsible for the collection and organization of the data. TR and ST were responsible for the collection and analysis of the data. ST was responsible for the analysis of the results of the paper's data and its interpretation, and for creating the tables and the figure. TR drafted the manuscript. Both authors contributed to important editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work, data summarization, and writing.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

Tarannum Rampal is the founder of QuestPrehab™. Shana Tribe is a Client Development Consultant for QuestPrehab™.

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Appendix

See Appendix A.

Appendix A
Database:
Ovid MEDLINE(R) ALL <1946 to September 05, 2024>
Ovid - Ovid MEDLINE® | Wolters Kluwer
Search Strategy 1:
1 exp Preoperative Exercise/ (650)
2 prehabilitation.mp. [mp=title, book title, abstract, original title, name of substance
word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word] (1954)
3 1 or 2 (2018)
4 barrier*.mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary
concept word, anatomy supplementary concept word] (465528)
5 obstacle*.mp. [mp=title, book title, abstract, original title, name of substance word,
subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary
concept word, anatomy supplementary concept word] (72352)
6 limitation*.mp. [mp=title, book title, abstract, original title, name of substance word,

subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary
concept word, anatomy supplementary concept word] (490722)
7 4 or 5 or 6 (1003784)
8 3 and 7 (154)
9 8 (154)
10 limit 9 to (english language and yr="2014 - 2024") (147)

Database: Ovid MEDLINE(R) ALL <1946 to September 05, 2024>
Search Strategy 2:
1 exp Preoperative Exercise/ (650)
2 prehabilitation.mp. [mp=title, book title, abstract, original title, name of substance
word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word] (1954)
3 1 or 2 (2018)
4 cost.m_titl. (98909)
5 3 and 4 (13)
6 5 (13)
7 limit 6 to (english language and yr="2014 - 2024") (13)

Database: Embase <1974 to 2024 September 05>
Welcome - Embase
Search Strategy 3:
1 exp preoperative exercise/ (1970)
2 prehabilitation.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (2931)
3 1 or 2 (3482)
4 barrier*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (604804)
5 obstacle*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (87384)
6 limitation*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (618861)
7 4 or 5 or 6 (1279311)

8 3 and 7 (248)
9 8 (248)
10 limit 9 to (english language and yr="2014 - 2024") (241)

Database: Embase <1974 to 2024 September 05>Search Strategy 4:
1 exp preoperative exercise/ (1970)
2 prehabilitation.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word] (2931)
3 1 or 2 (3482)
4 cost.m_titl. (136146)
5 3 and 4 (27)
6 5 (27)
7 limit 6 to (english language and yr="2014 - 2024") (26)