Evaluating the role of rehabilitation for lower limb joint replacement, deconditioning and cancer

A brief literature review prepared for the Australian Private Hospitals Association (APHA) by the Department of Rehabilitation Medicine, St Vincent's Hospital Sydney, Australia.

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Contents

Overview

Here we report the findings of a literature review conducted to evaluate current evidence relating to the role and efficacy of rehabilitation, principally in three key areas:

1. Following total hip and/or knee replacement surgery

2. For deconditioning or frailty

3. Following a diagnosis of cancer, and/or surgical, medical or radiotherapeutic treatment for cancer

This review is an initiative of the collaborative working party formed by representatives of the Private Practice Special Interest Group (SIG) of the Rehabilitation Medical Society of Australia and New Zealand (RMSANZ), and representatives of the Australian Private Hospitals Association (APHA).

4

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*Throughout this report the term 'private hospitals' is used inclusively to refer to licenced private hospitals and private day hospitals operated within Australia by both for-profit and not-for profit entities. It does not include public hospitals operated under contract by either for-profit or not-for profit entities.

Methodology

Published peer-reviewed literature was reviewed by the research team. Primary literature searches were conducted via the Medline, PubMed and Cochrane online databases, using the following search terms (or combination of terms):

rehabilitation; efficiency; effectiveness; cost-efficiency; cost-effectiveness; cost benefit; private hospital; public versus private; joint replacement; hip and knee replacement; total joint arthroplasty; reconditioning; deconditioning; frailty; debility; falls; fracture; cancer; oncology; outcomes; evaluation; patient satisfaction; in-patient; out-patient; community

References were included for review if they satisfied the following criteria:

1. Subjects at least 18 years of age

2. Article available in English

3. Published within the last 10 years – i.e. from 2007-2017 (with the rare exception of seminal or particularly pertinent early evidence if identified)

Articles were excluded if they discussed: paediatric rehabilitation; were not available in English; and/or were published prior to 2006.

5

Efforts were made to identify existing systematic reviews and meta-analyses in order to minimise duplication and provide high level evidence where available – these were strongly utilised during the review process and have been referred to throughout the text. Critical appraisal of the strength of evidence provided by reviewed literature was informed by the Evidence Hierarchy of the National Health and Medical Research Council of Australia (NHMRC)[1].

Titles of all identified articles were reviewed by one author, those deemed pertinent had their abstract read by two authors, and relevant publications were reviewed in their entirety by at least one author.

Introduction

What is rehabilitation medicine?

At its core, rehabilitation aims to restore functional capacity, limit impairment and disability and increase participation of an individual following illness and/or injury[2]. Rehabilitation is a multidisciplinary field that encompasses numerous personal, bio-psychosocial and environmental factors to address the needs of the individual. Given its multifaceted nature, evaluating rehabilitation is complex and heterogeneous.

How do we evaluate and measure rehabilitation outcomes?

Outcome measurement is primarily used in the evaluation of treatment efficacy and the quantification of rehabilitation results. The assessment of interventions and their outcomes allows providers to evaluate patterns of response and provides a mechanism for improving management and outcomes. Outcome measurement is increasingly becoming an important component of decision making and quality assurance in rehabilitation service delivery. Accurate assessment of process and outcome measures enables rehabilitations providers to:

1. Determine the need for the services

2. Determine the effectiveness of services

3. Judge the efficiency of the services

4. Monitor the quality of services in order to inform service improvement

There are no standard measures of rehabilitation effectiveness in Australia or overseas. A vast array of measurement tools are utilised in clinical practice and research studies, and there exists a growing body of literature on common functional outcome measures used in rehabilitation[3-8]. Routinely collected outcomes are typically limited to measures of impairment and/or activity limitations. However, additional measures of participation restriction (handicap), health-related quality of life (HRQoL), carer burden, consumer satisfaction and client goals and desires can be highly informative.

Both process and outcome measures are relevant to evaluating rehabilitation services. Some of the most common outcomes considered to date include:

‣ Functional measures of impairment

‣ Functional measures of disability

‣ Mortality

‣ Health-related complications

- HRQoL

- Patient goal attainment

- Patient satisfaction

- Participation measures (social engagement, rates of return to work and/or usual activities)

- Emotional and psychological well-being (including stress, anxiety and depression)

- Carer stress/burden

- Hospital length of stay

- Discharge destination

- Cost (both immediate and longer term cost-benefit analyses)

- Subsequent health service utilisation - including General Practitioner (GP) visits, Emergency Department (ED) presentations and hospital readmission rates

Of the many outcome measures used in rehabilitation the Functional Independence Measure (FIM)[9] is the most widely used both within Australia, and internationally. The FIM was developed for use in the inpatient rehabilitation setting, to assess physical and cognitive disability indicative of the burden and costs of caring for an individual. FIM scores on admission and discharge to inpatient rehabilitation are routinely collected and stored in the largest clinical registry of rehabilitation data, managed by the Australasian Rehabilitation Outcomes Centre (AROC). Increasingly, FIM data for a number of outpatient rehabilitation services are also being collected.

Considerations related to cost-effectiveness analyses

Economic evaluations of healthcare interventions including rehabilitation are of increasing interest. In the three focus areas of this review (hip/knee replacement, reconditioning and cancer rehabilitation), few studies were identified that performed distinct cost-benefit analyses. Those that did typically report establishment costs associated with service delivery, but longer-term cost benefits associated with reduced health service utilisation and gained quality-adjusted life years (QALYs) (details of individual studies are outlined in the following respective sections). A greater body of economic literature exists for neurological rehabilitation following stroke and/or traumatic brain injury[10-14]. While not directly applicable, general principles from economic evaluations of neurological rehabilitation could be identified and used to guide future research. Pertinent themes and issues for consideration are outlined below:

1. Investment in rehabilitation often leads to longer-term economic benefits, via decreasing dependency, ongoing care costs and reducing subsequent health service utilisation and readmissions to acute care[15, 10, 16, 11-14]. In neurorehabilitation populations, studies have shown that cost savings offset the initial costs of rehabilitation after five–30 months, depending on diagnosis/severity, and these savings can continue for years[15, 14, 12, 16, 13, 10]. Thus it must be considered that the cost-benefits of rehabilitation may take time to emerge, and long-term resource usage must be considered in addition to the initial cost of delivering the intervention

2. Different models of care will be more appropriate and cost-efficient for different patients (for example, inpatient versus outpatient services; group sessions versus individual sessions; face-to-face versus telehealth services). Further research is needed to better elucidate which models of rehabilitation are most suitable for different patient groups[17]

3. There is variability and lack of consensus regarding how best to define and quantify 'cost-efficiency'. This makes it difficult to perform meta-analyses and interpret findings in the literature[18]. Efforts to develop greater consensus are required

4. For complex rehabilitation interventions, it is likely that comprehensive cost-consequence analyses that encompass a variety of different outcomes will be required[19]. Key factors to consider include: costs of care delivery; ongoing care costs; transportation costs; subsequent health service utilisation, including re-presentations to hospital and readmission rates; need for residential care; and participation measures including return to work rates and productivity for both patients and their carers

Rehabilitation in the public and private health care systems

In Australia, rehabilitation services are delivered from both public and private hospital facilities. With respect to the three key rehabilitation areas of this review (joint replacement, reconditioning and cancer), no literature was able to be identified that specifically quantified rehabilitation outcomes for private versus public facilities. For this reason, literature included in the following sections of this review does not discriminate between rehabilitation delivered in public versus private facilities.

One article was identified that explored factors associated with consumer and clinician preferences for rehabilitation following joint arthroplasty specifically in the private sector[20]. Here it was noted that a higher proportion of arthroplasty patients appear to go to rehabilitation in the private versus public sector, with estimates of 40 percent versus 21 percent from the Royal Australia College of Surgeons and the Arthroplasty Clinical Outcomes Registry respectively[20]. In trying to understand this discrepancy, a number of possible contributing factors were identified among privately insured patients, including patient expectation, past experiences, a sense of entitlement or desire to achieve 'value for money', a sense that rehabilitation is advantageous for recovery, a desire to interact with others in a similar situation, and also clinician preferences and influences.

Two Australian studies were identified that sought to compare patient satisfaction and outcomes following arthroplasty in public versus private hospital facilities. While these publications were focused on acute care rather than rehabilitation per se, both revealed that overall outcomes and satisfaction levels were similar for patients treated across public and private facilities[21, 22].

8

Rehabilitation for hip and knee replacement

Introduction

In Australia, 40 percent of privately insured patients go to inpatient rehabilitation following total joint arthroplasty, while in the public sector only 20 percent are discharged from acute to inpatient rehabilitation[20]. In the United States of America (USA), with its managed care policies (private health insurers nominating hospitals or outpatient services for members based on premium price not clinical need), and the 2007 change of Medicare rules, the proportion of patients going to rehabilitation following total knee replacement (TKR) and total hip replacement (THR) is decreasing[23]. In 2009, approximately 14 percent of THR and 13 percent of TKR patients went to inpatient rehabilitation, down from 26 percent for each cohort in 1998[23]. This was accompanied by an increase in the proportion of patients being discharged with home-based rehabilitation services, from about 15 percent in 1998 to about 30 percent in 2009[23].

Internationally, there is an annual growth rate of five - 17 percent in the number of TKRs undertaken per year, across 18 countries[24]. Despite their increasing incidence, 25 percent of patients fail to make minimally important clinical gains by six months post-TKR[25], 15 percent of patients report moderate to severe pain[26], and a 20 percent of patients report moderate-to-severe activity limitations at 24 months post-TKR[27]. Rehabilitation may have a role to play in improving postoperative patient outcomes, and hence a review of evidence for the efficacy of different models of rehabilitation is warranted.

Can TKR be effectively managed at home, with home-based rehabilitation?

There is a growing body of literature concerned with the post-operative management of lower limb joint replacements. Evidence to date suggests that a considerable proportion of the patient population can be successfully managed at home (rather than a specialist inpatient or outpatient rehabilitation facility), to achieve equal outcomes in functional ability, pain and quality of life (QoL)[28-31]. This patient cohort are described as 'uncomplicated', typically:

1. 71 years of age or younger[29]

2. Have no post-operative complications

3. Have good social supports

4. Have someone living at home with them

5. Have minimal comorbidities (fewer than five, and ideally zero to two)[32, 33]

6. Able to walk greater than 35 percent of the expected final Six Minute Walk Test (6MWT) distance, at two-weeks post-operation[34]

In the Australian setting, the Hospital Inpatient versus HOme (HIHO) randomised controlled trial (RCT) recently compared inpatient to home-based rehabilitation following unilateral TKR, and found no benefit of inpatient rehabilitation over a home programme for this 'uncomplicated' patient group[28]. For home based versus supervised outpatient rehabilitation, a systematic review identified heterogeneity in the types of programmes being used, but overall no significant differences in outcomes[35]. This review did suggest that better outcomes are achieved if patients undertaking home-based exercise programmes are regularly contacted by telephone by their treating physiotherapist[35].

In addition to clinical indicators, a number of non-clinical drivers for home-based rehabilitation have been identified, including difficulties with transport, patients needing to care for family members and/or pets and having a strong need for familiarity (at times associated with mental health)[20].

Is it safe to manage TKR patients at home?

There is a lack of consensus regarding the safety of managing TKR patients at home post-operatively, and how this may affect readmission rates and the need for joint manipulation under anaesthesia (MUA). Two studies identified higher readmission rates among patients discharged home compared to those discharged to an inpatient rehabilitation facility[36, 37]. However, other studies reported higher readmission rates following inpatient rehabilitation, although the confounding factor of selection bias has been acknowledged (given these patients are typically more unwell at baseline than those discharged home)[38-40]. The main causes of readmission for patients who received home-based services were wound infections (60 percent) and MUA (35 percent), but among those in inpatient rehabilitation the main causes for readmission to an acute hospital were not stiffness or infection, rather cardiovascular events or stroke[39].

Estimates for the rate of MUA following TKR managed outside of rehabilitation range from 14.5 percent[41], to 20 percent[42], to 25 percent[43] across various studies. Research on a registry database identified a number of factors associated with an increased risk of MUA, including low socioeconomic status, poor pre-operative range of joint movement, diabetes and hypothyroidism[44]. While there is some preliminary evidence to suggest that physical therapies can reduce the incidence of MUA following TKR[45, 41], data quality is low and further research is needed.

Rehabilitation for patients who cannot be managed at home post-TKR

In studies of home-based rehabilitation following joint replacement, patients who have some or all of the following criteria are typically excluded from trials, or noted to have poorer outcomes [46, 39, 33, 47, 28, 48]:

1. Over the age of 72 years

2. More than five comorbidities

3. Obese

4. Poor social supports

5. Living alone

6. Complicated surgery

7. Poverty/low socioeconomic status

8. TKR revision

9. Bilateral joint replacements

10. Not being able to ambulate prior to surgery

11. At high risk of referral to a nursing home or respite care

12. Inflammatory arthritis, septic arthritis or traumatic arthritis as a cause

To date, patients with these demographic features have not been systematically studied in trials of home-based rehabilitation, and it may be considered unethical to do so given the insufficient evidence for safety and efficacy in these patients. If these patients are not suitable for home-based rehabilitation, it could be inferred that they require a more closely supervised and structured rehabilitation model of care. In line with currently available rehabilitation models of care in Australia, as outlined by New South Wales (NSW) Health[49], this would be delivered in either an inpatient setting, day-hospital setting or centre-based outpatient setting. Certain high-level care needs could only be managed in an inpatient setting – these include immobility/inability to safely mobilise, need for ongoing medical monitoring/treatment, and the need for high-level assistance with personal care activities such as showering, feeding and dressing. In order to determine which model of care would be most appropriate for individual patients, assessment by a qualified rehabilitation physician could be used to inform decision making.

If patients who go to inpatient rehabilitation are sicker, frailer and/or have a complicated medical/surgery history, it is reasonable to expect that they will likely have higher readmission and complication rates. Thus, trials of inpatient rehabilitation efficacy need to adjust for these factors using statistical modelling such as logistic regression, to more accurately reflect quality of care.

In the USA, 2.8 percent of TKR and 4.1 percent of THR require revision within five years[32]. In Australia, overall revision rates within three years include 2.8 percent of those having primary TKRs, 16.1 percent of those having revision TKRs, and two percent of those who have primary THR[50]. One needs to note that during the data collection period in Australia (about 2000 to 2005), it was rare for people to have TKR rehabilitation in the home. Analyses of US registry data for more than 108,000 hip and knee replacements revealed that having more than five co-morbidities on the Charlson Comorbidity Index increased the risk of revision by 40 percent for TKR and 68 percent for THR[32]. Given that revision is associated with poorer outcomes and higher mortality rates[32], admission to inpatient rehabilitation for those patients undergoing revision surgery, or those at high risk of future revision, may be a safer and a more cost effective option, although there are no studies examining this question. Issa et al. identified that patients with low socioeconomic status, poor pre-operative knee range of movement, diabetes and hypothyroidism are at higher risk of requiring MUA[44]. Of those who receive MUA, 26 percent do not achieve 90 degree knee flexion post-operatively, associated with poorer function, mobility and QoL[41]. There is preliminary evidence to suggest that rehabilitation can help to reduce the incidence of MUA[41, 45]. Therefore, patients at risk of requiring MUA[44], may be best managed in a closely supervised rehabilitation setting (inpatient or day hospital settings), although the number of studies examining this is issue is low.

11

What factors lead to a higher rate of admission to inpatient rehabilitation?

Buhagiar et al. recently conducted a mixed-methods study involving 95 semi-structured interviews with consumers and clinicians in NSW hospitals regarding rehabilitation in the private sector following joint replacement[20]. They identified a number of drivers for inpatient rehabilitation that were primarily non-clinical, including social, commercial and individual factors.

Prominent patient drivers included:

1. Recommendations received from others

2. Previous experience (evidence from an earlier study supports this, whereby patients were more likely to choose the same model of rehabilitation for a second joint arthroplasty if they were satisfied with their previous experience[22])

3. Recognition of personal 'laziness' or lack of self-motivation, leading to a fear of poor outcomes

4. Perceptions that inpatient rehabilitation was clinically indicated

5. A sense of entitlement, based on long-standing financial payments for private health insurance

Among surgeons, drivers included:

1. Personal preference either for or against inpatient rehabilitation – based on convenience, comfort and/or experience

2. Allowing patient preferences for rehabilitation setting in order to enhance patient satisfaction

Among rehabilitation specialists and physiotherapists, common drivers for inpatient rehabilitation included:

1. Patients who were older, frailer and had more medical comorbidities

2. Limited social support or inappropriate home environments

3. Patients living in rural areas, where distance and/or transport availability limited access to outpatient services

Finally, a number of economic factors were identified:

1. The private hospital business model – whereby inpatient rehabilitation followed on from acute surgical care as seemingly part of a 'streamed care' in the same institution, or a closely related one

2. Funding models for rehabilitation within private health funds - including more limited funding of outpatient as compared to inpatient rehabilitation services

There is limited evidence on when and where clinical decision making regarding rehabilitation post-TKR/THR is made. The above study by Buhagiar et al. provides some preliminary insights, and suggests that decisions about rehabilitation are most commonly made pre-operatively via the surgeon, patient and/or therapist[20]. Occasionally, decisions were made post-operatively through rehabilitation physicians, therapists or non-clinical agencies. It is not a commonplace practice to obtain a consultation by a rehabilitation physician prior to referral to inpatient, outpatient or home-based rehabilitation.

Costs of home-based versus inpatient rehabilitation

Evidence for the cost-efficiency of different rehabilitation models is mixed, however, most literature suggests that the costs of home-based rehabilitation are less than those of inpatient rehabilitation. Only two studies were identified that reported equal or superior cost efficiency for inpatient rehabilitation post-arthroplasty: a study by Li et al. from China (that has a public-private blended health financing system[51]), reported no differences in outcomes or costs for inpatient compared to home-based rehabilitation post-TKR[30]. The second study was conducted in the United Kingdom (UK) under the National Health Service (NHS), where it was found that home-based rehabilitation was actually more costly than inpatient rehabilitation, because patients had out-of-pocket expenses for home-based programmes but not for inpatient admission[52]. Because of the considerable differences between health systems and funding models in Australia, China and the UK, drawing international parallels between these studies should be approached with caution.

The remaining literature reports improved costs without decrement to patient outcomes for home based as compared to inpatient rehabilitation. At Lavernia et al, (2006) report that the average cost of inpatient rehabilitation was $13,400 (USD) per patient following TKR/THR, compared to approximately $2,400 (USD) for home-based rehabilitation that achieved similar clinical outcomes[53]. It should be noted that patients with identified criteria for inpatient rehabilitation (as discussed above) were not included in the trial, thus the cohort was well suited to home therapy.

Very few studies have examined potential long-term cost benefits of rehabilitation that may result from reduced health service utilisation and/or gained QALYs. A trial conducted by Liebs et al. found that rehabilitation following TKR/THR could add an additional 0.55 QALYs per patient, over and above gains made from the surgery alone[54]. This supports a role for rehabilitation and suggests further research in this area is warranted.

13

Telerehabilitation

A number of studies have demonstrated that internet-based, 'telerehabilitation' is feasible and can be as effective as conventional face-to-face rehabilitation following TKR[55-58], often via non-inferiority trials. Four studies report that patient satisfaction with this mode of therapy delivery is high[59, 56, 60, 55]. Two studies performed cost analyses: the first identified that telerehabilitation was 13 percent cheaper than conventional outpatient rehabilitation when patients lived further than 30 kilometres (km) away from the rehabilitation centre, and costs were comparable for those living within 30 km[61]. The other study found a mixed model of telerehabilitation and standard care was cost-effective compared to standard care alone, with cost savings largely related to transport costs[62].

Very limited data are available on the use of telerehabilitation following THR. One small validation study was identified that described the successful pilot trial of a Kinect-based telerehabilitation system with seven participants, although conclusions on efficacy and/or cost-efficacy cannot be drawn[63]. A protocol paper was also identified, which indicated that an RCT is currently being conducted in Australia comparing telerehabilitation to face-to-face treatment following THR[64]. (Results for this trial are not available).

Summary:

‣ The number of hip and knee replacements being performed is increasing

‣ The proportion of patients accessing inpatient rehabilitation following TKR/THR is decreasing, while the proportion receiving home based or ambulatory care is increasing

‣ A greater proportion of patients in the private hospital sector receive inpatient rehabilitation post-TKR/THR than in the public hospital sector – a variety of non-clinical drivers appear to be contributing to this (including consumer and clinical preference, social and financial factors)[20]

‣ Studies of home-based rehabilitation to date have only included 'uncomplicated' patients, who are: young (less than 72 years old), have good social supports, minimal comorbidities and an uncomplicated operative course. There is good evidence that these patients can be safely managed at home to achieve equal outcomes[28-32]

‣ Patients who are older than 72 years old; obese; have more than five comorbidities; poor social supports; low socioeconomic status; non-ambulatory prior to surgery; have surgical complications; are undergoing revision surgery or bilateral TKR have not been well studied. They represent the cohort most likely to require supervised rehabilitation following TKR/THR, in an inpatient or outpatient/day hospital setting

‣ There is some suggestion that low socio-economic status, poor pre-operative range-of-motion, diabetes and hypothyroidism increase the risk of requiring MUA[44], therefore these patients may be more likely to require supervised rehabilitation care

‣ There is preliminary evidence that telerehabilitation may be a beneficial and cost-effective alternative for patients with limited access to traditional outpatient therapies post-TKR, but more research is needed[55, 61, 62]

14

Rehabilitation for deconditioning or frailty

Introduction

There is growing interest in the role of rehabilitation to strengthen and or 'recondition' those who experience frailty, weakness or generalised deconditioning. This is commonly associated with advanced age[65], but can also be seen in association with critical illness, injury, and/or prolonged hospitalisation[66]. It has been recognised that rehabilitation can improve physical functioning in patients who are disabled by severe frailty, but also that rehabilitation has an important role to play in preventing decline among those with lesser degrees of frailty who are at risk of future disability[65]. In this review, we have examined literature focused on rehabilitation interventions designed to target generalised deconditioning or frailty. We have also considered two of the most common precipitants that may cause frail/deconditioned patients to present to acute or subacute care facilities: notably, falls and hip fractures.

Generalised deconditioning or frailty

There is a notable paucity of primary literature examining rehabilitation specifically for deconditioning or frailty[66, 67]. Research to date has primarily focused on exercise interventions - these are an important component of rehabilitation, but alone cannot necessarily be considered 'rehabilitation' interventions, which by definition are multidisciplinary in nature. There is systematic review evidence that exercise can improve physical functioning, strength, balance and QoL in pre-frail elderly[68], community-dwelling frail elderly[69-72, 68, 73] and also those living in institutional care[74]. While the optimal characteristics of such exercise remain uncertain, there is growing consensus that interventions are most beneficial when:

1. They are multicomponent, or incorporate different types of exercise such as strength, endurance and balance training[72, 74, 71]

2. They are moderate-to-high intensity and involve regular practice[72, 70, 74]

3. The programme has a prolonged duration, of at least 10 weeks[72, 70, 74]

There is evidence that combining physical exercise with an additional intervention such as a nutritional or education programme results in greater benefits[75], supporting the role of multidisciplinary interventions for the frail and deconditioned.

Specifically with respect to multidisciplinary rehabilitation, there is limited but emerging evidence examining the effect of rehabilitation for deconditioning and frailty, across both inpatient and outpatient settings.

INPATIENT REHABILITATION:

For the inpatient setting, few prospective studies of rehabilitation for deconditioning/frailty have been conducted. A systematic review by Timmer et al. in 2014 was unable to identify any RCTs of inpatient rehabilitation interventions for deconditioned older adults[67]. A small, prospective cohort study by Coleman et al. investigated the effect of multidisciplinary inpatient rehabilitation in a cohort of 32 frail elderly[76]. After a median length of stay of 49 days, they identified significant improvements in mobility, transfer ability, balance, exercise capacity, activities of daily living (ADLs), frailty scores and perceived health status across the cohort. Johansen et al. conducted a prospective observational study in Norway comparing inpatient rehabilitation of older adults delivered in a dedicated rehabilitation centre versus primary health care rehabilitation delivered to patients in short-term nursing home beds[77]. They report that rehabilitation delivered in dedicated inpatient rehabilitation centres resulted in greater immediate gains, within a shorter time frame (typically 2.4 weeks shorter). Long-term benefits of designated inpatient rehabilitation were also identified including greater patient independence at 18 months, no increase in institutionalisation rates and sustainably lower costs of care (1.6 times higher in the nursing home model)[78].

While prospective data are limited, retrospective analyses of large databases add considerable support for inpatient rehabilitation of those with deconditioning or frailty. The 'Uniform Data System for Medical Rehabilitation' in the USA is a national database of rehabilitation outcomes, and contains rich benchmark data for rehabilitation across a number of conditions, including debility or frailty. Data from more than 260,000 patients across 830 facilities who received inpatient rehabilitation for frailty between 2000 and 2010 are reported by Galloway et al.[79]. Across the cohort, mean FIM score improved from 66.8 on admission to 89.5 on discharge after an average 12.6 day rehabilitation admission, representing a FIM efficiency of 2.1. Thus considerable functional gains can be made by this patient cohort, and the majority (76 percent) were able to be discharged home to the community[79]. A separate publication provides benchmark data on hospital readmission among patients who receive rehabilitation for frailty (19 percent at 30 days and 34 percent at 90 days)[80]. Other analyses identified that functional recovery and rates of discharge to the community were similar following inpatient rehabilitation for patients with debility and other common conditions including hip fracture and myopathy[81, 82].

OUTPATIENT OR COMMUNITY-BASED REHABILITATION:

Similar to the inpatient setting, there are few published studies investigating the efficacy of outpatient or community-based rehabilitation for frailty. Most evidence to date comes from the Australian Frailty Intervention Trial (FIT) of Cameron, Fairhall et al.[83-85]. In this prospective RCT, a multidisciplinary rehabilitation programme designed specifically to target frailty was trialled in a cohort of community-dwelling frail elderly, and compared to usual care. The multifactorial intervention was delivered over a 12 month period, and incorporated case management, a home-based physiotherapy exercise programme, nutrition intervention and input from dieticians, psychology, physiotherapy, nurses, geriatricians and rehabilitation physicians[83]. The intervention was shown to reduce frailty and prevent mobility-related decline compared to usual care[85], however, no between-group differences were observed in deaths, hospital admissions or nursing home admissions. An economic evaluation was also conducted: this identified a low average cost of only $1582 per participant to deliver the intervention, which was found overall to be cost-effective, and even cost saving among those with severe frailty[84].

In another Australian study, Courtney et al. investigated a combined physiotherapy and nursing intervention to try and prevent hospital readmissions and improve QoL in a cohort of elderly patients at high risk of hospital readmission[86]. The intervention commenced during an acute medical admission for eligible participants, and continued in the community with home visits and telephone follow-up for 24-weeks post-discharge. The intervention was found to be effective when compared to usual care, resulting in fewer hospital readmissions (22 percent

compared to 47 percent), less emergency GP visits (25 percent compared to 67 percent), and greater improvements in QoL[86]. Formal cost-analyses were also performed, and these revealed that the intervention reduced costs by $333 per participant over the 24-week period, and added 0.118 extra QALYs per individual[87].

Only a single study could be identified that discussed a centre-based, day rehabilitation model of care. Parker et al. conducted a randomised study comparing a day rehabilitation model to rehabilitation in the home for elderly patients[88]. They found that rehabilitation in the home was not inferior to day rehabilitation and that costs were similar between groups, however, this trial was underpowered after having to cease recruitment early, thus results should be interpreted with caution until further corroboration.

REHABILITATION IN RESIDENTIAL CARE FACILITIES:

A number of systematic and reviews were identified examining the effects of physical rehabilitation interventions for older people living in residential care facilities[89-92]. These interventions typically involved regular 30 minute sessions two to three times per week, for a period of 12 weeks, with exercise being the major component[90]. Such interventions appear to be safe[92], and can benefit mobility, strength, flexibility, balance and ADL performance[90, 91]. The most recent Cochrane review by Crocker et al. concluded that rehabilitation in residential care facilities is effective, safe and reduces disability, but there is currently insufficient evidence to assess sustainability, cost effectiveness, optimal intervention design or which interventions are suitable for different resident populations[92].

Rehabilitation following hip fracture

INPATIENT REHABILITATION:

While limited, there is some evidence to suggest that inpatient rehabilitation can be beneficial following hip fracture in the frail and/or elderly. One prospective randomised trial identified that inpatient rehabilitation following hip fracture reduced one year mortality and rates of admission to an aged care facility in the short term[93]. In a study from the USA, patients who underwent inpatient rehabilitation were more likely to return to their premorbid functional level compared to those who were discharged to a skilled nursing facility, which could be most closely compared to a respite placement with access to limited physiotherapy in a residential care facility in the Australian setting[94].

HOME-BASED REHABILITATION:

In the available literature, most home-based rehabilitation programmes have been compared to no treatment[95]. A 2013 review of home-based rehabilitation following hip fracture surgery found it led to improvements in lower limb strength, functional status and balance compared to no treatment[95]. A particular advantage of home-based rehabilitation programmes is the context-specific and functional nature of the intervention. A RCT of home-based rehabilitation compared to conventional care for hip fracture (involving no structured rehabilitation) demonstrated improved balance, confidence and return to outdoor walking in the rehabilitation group[96]. Even when the home-based programme has minimal intervention, (as few as five or six physiotherapist visits over one year), when focused on functional tasks such as chair transfers and step practice, it appears to be able to improve physical function in hip fracture cohorts[97].

OPTIMAL SETTING:

Multi-disciplinary rehabilitation is recommended for patients post hip fracture[98]. Rehabilitation supervised by a geriatrician or rehabilitation physician has been shown to reduce mortality and reduce rate of discharge to an aged care facility[99]. However, it is not clear from the literature which setting (inpatient rehabilitation facility, skilled nursing facility, home-based rehabilitation, or other) has the best functional outcomes at discharge after controlling for covariates such as acute hospital - length of stay, patient demographics, premorbid function, time from surgery and patient characteristics at baseline[100]. Mallinson et al. note that the choice of post-acute care may depend on comorbidities of the patient; inpatients of specialist rehabilitation facilities had the most comorbidities, whereas home-based care patients were typically younger, with fewer comorbidities and higher levels of self-care and mobility[100]. This mirrors observations in the joint replacement literature (page 9–11), emphasising the common importance of assessing comorbidity when determining the most appropriate rehabilitation models of care for different patients.

In two Cochrane reviews, there is a tendency to improved outcome (reduced mortality) for patients receiving inpatient rehabilitation compared to other forms of rehabilitation such as home-based programmes, however this was not statistically significant[101, 102]. Whether this is a true reflection of clinical outcome is unclear. The authors note the difficulty of comparison between home based and inpatient rehabilitation due to the heterogeneity of programmes to date[101]. Furthermore, patient factors such as race, gender, functional status on admission as well as the type of inpatient rehabilitation facility (for example, government, for profit, rural) may also influence motor function and discharge to the community[103]. These demographic factors and whether rehabilitation intervention addressed psychosocial factors such as fear of falling, coping strategies and self-efficacy[104] may further complicate the comparison between different rehabilitation formats.

It is difficult to provide evidence-based recommendations due to the above, particularly when rehabilitation interventions and settings are not standardised, varying in nature, intensity, duration and timing of initiation, and are often poorly described in the literature[99, 105].

COST ANALYSIS:

A large Canadian retrospective analysis (n=18,773) found that inpatient rehabilitation following hip fracture reduces mortality and hospital readmission when compared to discharge to the community[106]. Unfortunately, and not unexpectedly, patients admitted to inpatient rehabilitation had higher health system costs. These findings were confirmed in the Australian veteran population, with significantly reduced early (90 days) and late-stage (two years) mortality, at an additional length of stay of 11 days and AUD $12,000 per patient in hospital costs[107]. There is a lack of evidence examining longer-term costs and potential cost savings of rehabilitation programmes administered acutely post hip fracture.

A large US database analysis found that average length of stay in inpatient rehabilitation following hip fracture has reduced from 14.5 (SD7.9) to 13.3 (5.5) days from 2000 to 2007[108]. In 2015, an Australian study reported length-of-stay data for hip fracture patients undergoing inpatient rehabilitation, where patients spent on average 24.8 days in hospital with 11.7 days in acute care, followed by 13.1 days in inpatient rehabilitation[109].

BEYOND THE INITIAL REHABILITATION PERIOD - SUPPORTIVE EVIDENCE FOR DAY PROGRAMMES:

Following hip fracture, balance, gait and ADLs all have different rates of recovery and may take up to one year to return to premorbid status[110]. Therefore, there is a role for ongoing multidisciplinary rehabilitation in the community post discharge. A meta-analysis of

rehabilitation after the initial rehabilitation period demonstrated improvements in balance, physical performance tests including the "Timed Up and Go", gait speed and knee extension[111]. This type of rehabilitation appears to result in significant improvements in physical and functional performance when undertaken in an outpatient, community setting compared to a home exercise programme[112].

SPECIAL PATIENT GROUPS: PATIENTS WITH COGNITIVE IMPAIRMENT OR DEMENTIA:

Cognitive impairment and dementia are common comorbidities in patients with hip fracture, with a prevalence of 19 percent for dementia and 42 percent for cognitive impairment[113]. Although there are only a small number of studies examining the impact of rehabilitation post hip fracture in patients with mild to moderate dementia, inpatient rehabilitation has been found to be safe and effective[114]. A systematic review in this cohort found that inpatient rehabilitation may result in decreased falls, improved function and mobility[115]. In addition, inpatient rehabilitation is associated with reduced mortality and the lowest risk of long-term care placement in this population when compared to patients who received no rehabilitation, complex continuing care and home-care based rehabilitation[116]. Ongoing rehabilitation in the home post discharge may also improve mobility and activities of daily living[117].

Rehabilitation for falls

A recent Cochrane review found that outpatient rehabilitation (multi-component group therapy) reduced falls risk (risk ratio 0.85, 95 percent CI 0.76-0.96) and the rate of falls (rate ratio 0.71 95 percent CI 0.63-0.82) in older people[118]. Despite the heterogeneity of interventions for falls reduction, the evidence is clear that exercise and multifactorial interventions in community-dwelling older adults is beneficial[118-120]. Exercise programmes also prevent falls-related injuries and falls-related medical care, with an estimated reduction of 61 percent for falls-related fractures and for 43 percent of falls-related severely injurious falls[121]. This is an important area of potential cost saving, given the high economic burden of falls-related injuries[122].

OPTIMAL SETTING:

A recent Cochrane review analysed exercise trials for falls prevention based on the number of interventions provided (single, multiple, or multifactorial) rather than the setting of the intervention (home-based versus outpatient)[118]. By contrast, Martin and colleagues undertook a systematic analysis to compare two different groups: that is, those receiving group therapy versus no intervention, and the effectiveness of group-based exercise compared to a home-based programme[123].

Unsurprisingly, group-based exercise (compared to no intervention) demonstrated reduced falls, increased balance and QoL[123]. Whilst there was no statistical difference in falls frequency between the group-based exercise and home-based programme, the group exercise intervention did show improvements in patient adherence, patient satisfaction, some physical function and QoL[123]. Logistical difficulties (e.g. effect size not being able to be calculated for all the studies in the systematic review) as well as heterogeneity of both the home exercise programme and group interventions in conjunction with only a small number of studies (three studies for group exercise versus no intervention, three studies for group exercise versus home based) means that these results should be interpreted with caution.

19

SPECIAL GROUPS: OLDER PEOPLE WITH DEMENTIA:

A small number of studies have evaluated the impact of rehabilitation on the number of falls in people with dementia. A systematic review and meta-analysis found that exercise (home based, or outpatient group therapy) reduced the risk of having a fall by 32 percent (risk ratio 0.68, 95 percent CI 0.55-0.85)[124].

Summary

▸ There is strong evidence that exercise interventions can improve physical functioning, strength, balance and QoL in the frail elderly. Multicomponent interventions appear to be most effective

▸ There are limited prospective data available for investigating the efficacy of multidisciplinary rehabilitation for frailty. Retrospective database analyses suggest that inpatient rehabilitation for deconditioning and/or frailty can lead to significant FIM gains

▸ One large Australian RCT supports that a 12-month community-based rehabilitation program for frailty can improve function[85]

▸ There is considerable variability in the type and setting of rehabilitation used for hip fracture and falls. Two Cochrane reviews identified a trend for improved outcomes following multidisciplinary inpatient rehabilitation for hip fracture, but these findings were not statistically significant[101, 102]

▸ There is good evidence that outpatient rehabilitation (largely exercise-based) can reduce falls risk in community-dwelling older people[118]

Rehabilitation for cancer

What is cancer rehabilitation?

With population ageing and the improved survival of cancer patients, long-term management of this population is a complex and growing area of need[125]. Caring for this patient population is challenging as adverse effects of cancer and cancer treatments continue to be detrimental to both physical and psychological health and contribute to decline in QoL. This group have a variety of rehabilitation needs and issues including, but not limited to: fatigue, pain, anxiety, depression and reduced physical capabilities. Cancer rehabilitation entails physical, social, psychological, and vocational services to promote maximum functional capacity for oncology and haematology patients. Cancer rehabilitation overlaps with both acute cancer services and palliative care services[126-128].

Of all rehabilitation interventions, physical exercise is the most effective single intervention for decreasing fatigue, improving physical functioning and QoL[129-131]. This is confirmed by a recent Cochrane review of 56 trials with 4,826 participants[132, 133]. The evidence for other rehabilitation interventions is accumulating rapidly[134-136].

The ideal comprehensive cancer rehabilitation programme would include a specialised cancer rehabilitation physician with skill and expertise in the evolution and treatment of a wide variety of neuromuscular, musculoskeletal, pain, and functional disorders common to cancer patients and survivors[137]. The cancer rehabilitation programme would serve both inpatients and outpatients and would be supported by highly trained allied health staff whose roles are described in many review articles[138-141].

21

What is the evidence for cancer rehabilitation?

There are many different types of cancer rehabilitation programmes, across both the inpatient and outpatient setting. Available evidence to date is summarised below:

INPATIENT REHABILITATION:

In 2011, Huang et al. published a narrative review of studies examining inpatient rehabilitation for cancer populations[142]. They discussed 11 studies across a variety of cancer subtypes, including breast cancers, primary central nervous system neoplasms, blood-related neoplasms, lung cancer, gastrointestinal cancers, genitourinary cancers and others (outlined in Table 1[142]). Their review highlighted that inpatient rehabilitation can lead to significant functional improvements among mixed cancer populations, that are largely comparable to those made by patients without tumour diagnoses[142]. To supplement these findings, Table 1 provides a list of subsequent publications since Huang's 2011 review examining inpatient rehabilitation for cancer.

Overall, the literature supports the benefits of inpatient rehabilitation for cancer patients[143, 142], but the majority of evidence to date comes from retrospective cohort studies rather than RCTs. Studies regarding inpatient programmes for cancer patients are heterogeneous in terms of design, patient characteristics, duration and content of the rehabilitation programme. Despite this, all studies report significant functional gains following a period of inpatient rehabilitation regardless of prognosis and whether there were metastases or not[127, 144-146]. Those discharged from inpatient rehabilitation with higher FIM scores appear to have better survival[144].

Table 1. Studies examining inpatient cancer rehabilitation, published since 2011.

STUDY	STUDY DESIGN, COUNTRY	PATIENT POPULATION	MEASURE
Bertheussen et al. 2012[147]	Prospective cohort study Norway	Breast cancer n=163	Three weeks primary stay and a one week follow-up stay eight to 12 weeks after the primary stay.

KEY FINDINGS

Participants had higher level of symptoms and fatigue and lower functioning at admission compared to a Norwegian reference population. However, they reported higher physical exercise level and 47 percent reported improved work status from initial to six month follow-up. Symptoms and functioning, fatigue, physical exercise and physical performance improved significantly from initial to 12 weeks and were maintained at six months.

STUDY	STUDY DESIGN, COUNTRY	PATIENT POPULATION	MEASURE
Mix et al. 2017[145]	Retrospective cohort USA	Cancer-related impairment n=27,952	Data collected from the Inpatient Rehabilitation Facility - Patient Assessment Instrument

KEY FINDINGS

72 percent of cohort discharged to the community, 16.5 percent discharged back to acute care.

Mean FIM total change ± SD: 23.5 ± 16.2 points.

Most cancer patients who undertake inpatient rehabilitation are discharged to a community setting and make functional gains.

STUDY	STUDY DESIGN, COUNTRY	PATIENT POPULATION	MEASURE
Saotome et al. 2015[144]	Retrospective audit Australia	Cancer-related impairment n=73	Functional gains, and survival following discharge from rehabilitation

Significant functional gains were observed following rehabilitation. Patients with a discharge FIM score of greater than or equal to 80 survived significantly longer than patients scoring less than 80.

STUDY	STUDY DESIGN, COUNTRY	PATIENT POPULATION	MEASURE
Shin et al. 2011[148]	Retrospective audit USA	Cancer-related impairment n=427	Discharge destination

KEY FINDINGS

324 participants (76 percent) were able to be discharged home, 72 (17 percent) went back to an acute care service, 15 (four percent) were sent to a skilled nursing facility, nine (two percent) were discharged to palliative care, and five (one percent) were discharged to a long-term acute care facility.

STUDY	STUDY DESIGN, COUNTRY	PATIENT POPULATION	MEASURE
Sliwa et al. 2016[143]	Retrospective audit USA	Cancer-related impairment n=176	Functional gains made during inpatient rehabilitation (Compared patients with the presence/ absence of metastatic disease)

23

KEY FINDINGS

All groups (total sample, metastatic versus non-metastatic, compliant versus noncompliant) made significant functional gains. There were no significant differences between groups regarding total, motor, or cognitive FIM gains or total motor or cognitive FIM efficiencies.

IN-REACH MOBILE REHABILITATION (ON AN ACUTE CARE WARD):

There are many challenges with inpatient rehabilitation for cancer patients. Inpatient rehabilitation units (especially those that are geographically separate and not attached to an acute hospital) may be reluctant to accept cancer patients as they are unable to administer blood transfusions, chemotherapy or more complicated medical and nursing care. Also, there may be some hesitancy to accept cancer patients in an offsite rehabilitation facility due to concerns about the medical stability of patients with cancer and their high rates of return to acute care (reported as 21-35 percent)[142].

This has stimulated the design of innovative services to provide rehabilitation to this patient group, such as in-reach mobile rehabilitation teams that are operating in numerous Australian public hospitals[49] and internationally[136]. This rehabilitation model of care is delivered to patients on an acute care ward while the patient remains under their oncologist using a shared care arrangement, and involves oversight by a specialist rehabilitation physician, and up to two sessions of physical therapy and one session of occupational therapy daily. The advantage of this model is that patients can receive intense therapy while their medical issues are still being addressed by the acute care medical service. Like an acute inpatient rehabilitation interdisciplinary team, the mobile rehabilitation team also meet weekly to discuss patient cases through the process of case conferences and goal setting among team members.

Providing acute hospital inpatients with concomitant rehabilitation services has not been formally explored in the private health sector. There is currently no research to guide the implementation and/or funding of this innovative rehabilitation model of care in the private health sector. Intuitively, triage of greater-risk cancer rehabilitation inpatients to in-reach teams where the patient can remain on an acute ward where there is more suitable medical care could potentially help save lives and reduce overall insurer costs, but this has yet to be formally explored. Research in the Australian public health sector suggests that in-reach rehabilitation increases rates of discharge from the acute hospital setting, minimises inpatient rehabilitation length of stay for those referred to rehabilitation and improves capacity and cost effectiveness of the subacute health system by a factor of 2.78[149].

OUTPATIENT AND COMMUNITY-BASED REHABILITATION:

Outpatient programmes can be clinic based (structured and supervised), home based and/or community based. Both cancer patients and oncologists have expressed a need for structured and supervised rehabilitation programmes for patients during and after cancer treatment[150].

Structured or supervised programmes are conducted in cancer centres or rehabilitation facilities and can be delivered either individually or in groups. The results of one study suggest that patients who attended group sessions were more likely to complete the programme[151]. However, many patients who were enrolled in the programme were physically debilitated at baseline and required one-on-one attention with the physical therapist for safety reasons.

A Cochrane review is available examining evidence for supervised multidisciplinary rehabilitation programmes (12 RCTs) for patients who have completed cancer treatment[152]. Due to the heterogeneity of included studies, the authors could not perform formal meta-analyses, but did pool the data together. Pooled data revealed that rehabilitation confers a benefit for cancer survivors in the domain of physical health-related QoL. The authors identified that programmes with a single domain or outcome focus appeared to be more successful than programmes with multiple aims, and those that included participants with different types of cancer compared to cancer site-specific programmes were more likely to confer a benefit. The most effective mode of service delivery appeared to be face-to-face contact supplemented with at least one follow-up interaction (via telephone for example). There was insufficient evidence to indicate whether programmes that lasted longer than six months conferred additional benefits. Other systematic reviews have identified multifactorial benefits of structured rehabilitation programmes for cancer patients, most notably for fatigue, physical functioning and QoL[153], but also for mood, psychological well-being, cognitive function, pain, social participation and return to work[154, 139, 140, 155, 138, 156, 141].

Home-based programmes often include behavioural change exercise interventions, typically combining exercise prescriptions with motivational counselling and cognitive behavioural therapy techniques to assess readiness for change, provide motivation to exercise and encourage self-monitoring[157]. Community-based interventions include one-to-one sessions or group sessions in community centres combined with home-based exercises. A meta-analysis of home-based and community programmes (across 14 studies) found that the interventions produced short-term positive effects on physical functioning, with overall effect sizes ranging from small (standardised mean difference 0.17; 95 percent confidence interval 0.07-0.27) to medium (0.45; 95 percent CI 0.23-0.67)[157]. The authors suggested that although these programmes have low efficacy, their higher reach and possible greater potential for sustainability could lead to broader population-level improvements.

24

Who should receive cancer rehabilitation and when?

Rehabilitation programmes should be available to patients at all stages of the disease trajectory from initial diagnosis of early-stage, non-symptomatic cancer to metastatic symptomatic disease[128].

Cancer 'prehabilitation' is the first part of the cancer rehabilitation care continuum and, by definition, occurs between the time of diagnosis and the start of acute oncology treatment[158]. There is emerging research demonstrating that prehabilitation can improve cancer-related outcomes and thereby reduce cancer-related health care costs[158] and early retirement[155] in survivors. However, the overall quality of evidence available for cancer prehabilitation is weaker than that available for more conventional cancer rehabilitation[159].

A meta-analysis of 18 studies demonstrated that prehabilitation can benefit cancer patients across a variety of health domains[160]. Interventions typically included one of the following: psychological support, education and exercise, started prior to cancer treatment with curative intent. Prehabilitation assessments and interventions are typically outpatient-based and may be part of a protocol that can be conducted as a single consultative one-to-one visit with a newly diagnosed patient; as several consultations linked together as part of a multidisciplinary clinic; or as a group workshop that can operate with or without integrated individual sessions. After conducting meta-analyses, the authors concluded that while such interventions were shown to confer a benefit for patients, there is currently insufficient evidence to comment on their cost-effectiveness[160]. No studies of inpatient cancer prehabilitation were identified.

Even late in the cancer trajectory, rehabilitation can have positive effects on fatigue, mood and coping with cancer. A systematic review of 13 RCTs (and a total of 1,169 participants) found that even in patients with advanced cancer, physical activity can significantly improve well-being and QoL[154]. There is some evidence that patients who are deconditioned at baseline benefit the most from rehabilitation programmes[151]. However, there remains a lack of evidence to determine the optimal time in the patient pathway to provide rehabilitation and the optimal duration and intensity of certain rehabilitation activities[137].

Is cancer rehabilitation feasible and cost-effective?

It is acknowledged that the cancer population have complex rehabilitation needs. These have implications for both patient safety, and the effectiveness of rehabilitation interventions[161, 128]. Safety considerations for the delivery of cancer rehabilitation have been well summarised by Cristian et al.[161]. Ultimately, with appropriate expertise, assessment, monitoring, communication and coordination of care with other treating medical teams, rehabilitation can be safely planned and provided to cancer patients[161, 128].

While limited, the literature suggests that most cancer survivors adhere to and complete rehabilitation programmes they commence, with drop-out rates of only 10 percent to 35 percent[151]. Importantly, surveys have also demonstrated that cancer patients highly value rehabilitation programmes and see them as an important component in their ongoing recovery[162].

The available economic literature is scarce, and uses variable methodology to examine different cancer rehabilitation interventions[153]. A review by Mewes et al. sought to synthesise current evidence. The authors found that despite the low comparability of studies, all showed acceptable cost-effectiveness ratios or cost savings for interventions that produced significant health gains[153].

How to translate cancer rehabilitation research into practice

Literature is emerging that explores how to translate cancer rehabilitation research into day-to-day rehabilitation programmes and how best to tackle some of the barriers to rehabilitation[130, 163]. One interesting paper described how use of the cardiac rehabilitation model (three phases including in-hospital, outpatient and independent group exercises) could bring oncology rehabilitation to a large number of cancer survivors[164].

The current status in NSW is that rehabilitation is not yet fully integrated into standard cancer care. Research suggests that nearly every patient with pain or functional issues related to cancer or the treatment of cancer would benefit from rehabilitative services[165, 128]. However, there are persistent low rates of cancer rehabilitation utilisation. This is due to many factors including low detection rate of functional problems, low referral rates even if functional decline is detected and lack of programmes targeted for this population.

The integration of rehabilitation expertise into the cancer care model, with open communication and shared input from treating specialist teams, will be essential to the success of this translation[166].

Summary:

▸ Physical exercise is the most well studied intervention, with good evidence that it can effectively reduce fatigue, improve physical functioning and QoL for cancer patients, supported by a recent Cochrane review[133]

▸ The evidence for inpatient cancer rehabilitation is largely from retrospective and heterogeneous studies to date, but they demonstrate that inpatient rehabilitation can confer significant benefits[142]

▸ Studies of outpatient rehabilitation are similarly heterogeneous, but also show positive effects

▸ In-reach rehabilitation in an acute care setting may be a particularly appropriate model of care for delivering rehabilitation to medically unstable cancer patients, but has yet to be formally explored in this population

▸ A recent Cochrane review supports that brief multidisciplinary rehabilitation programs can increase physical health and related QoL for cancer survivors (post-treatment)[152], but more research is needed to ascertain long term effects and perform cost-analyses

▸ There is growing recognition that rehabilitation has a role to play throughout the entire cancer care continuum[128], from diagnosis and pre-treatment, through to active treatment, and into survivorship, palliative and end-of-life care. More implementation and translational health research is needed to elucidate how best to integrate rehabilitation into cancer care

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38