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Towards a common definition of Hospital-Acquired Deconditioning in working-age adults: A Scoping Review

Journal:	BMJ Open
Manuscript ID	bmjopen-2024-086976
Article Type:	Original research
Date Submitted by the Author:	04-Apr-2024
Complete List of Authors:	Westlake, Meri; University of Nottingham Cowley, Alison; Nottingham University Hospitals NHS Trust, Research & Innovation Robinson, Katie; University of Nottingham, Gordon, Adam; University of Nottingham, Division of Rehabilitation and Ageing; National Institute for Health and Care Research
Keywords:	Review, Hospitalization, Inpatients

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Title

Towards a common definition of Hospital-Acquired Deconditioning in working-age adults: A Scoping Review

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Keywords: Hospital-Acquired Deconditioning, Scoping Review, Concept, Diagnosis, Adults

Word Count: 3146

Abstract

Background: Hospital-acquired deconditioning is a term utilised in clinical practice, describing a loss of physical and/or cognitive function associated with hospitalisation. Previous reviews have addressed interventions, its prevalence in older adults and potential assessment tools. However, each review has reported a core limitation, the need for an agreed-upon definition and diagnostic criteria for hospital-acquired deconditioning.

Objective: We aimed to identify key components used to define hospital-acquired deconditioning in adults. Our objectives were to describe: diagnostic criteria for hospital-acquired deconditioning; how hospital-acquired deconditioning is understood and operationalised; and how other syndromes relate to hospital-acquired deconditioning.

Design: A scoping review using the Joanna Briggs Institute methodology for evidence synthesis.

Eligibility Criteria: Published in English after 1st January 1990, investigating adults over 18, set in inpatient rehabilitation or acute care settings, and including either a definition or description of hospital-acquired deconditioning or an outline of strategies to assess, prevent or manage hospital-acquired deconditioning.

Sources of Evidence: Published and grey literature, no restriction was placed on study design

Charting methods: Relevant data, where available, was extracted from each source using a proprietary data extraction template.

Results: Ninety-eight articles were included from 2163 retrieved results. Thirty-two were from rehabilitation or post-acute care settings, 49 from acute care, 15 from intensive care, and 2 from other settings. The literature was diverse in methodology and research question

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addressed. Hospital-acquired deconditioning was poorly defined, no consistent patterns were identified in aetiology and sequelae; diagnostic criteria were not fully agreed upon.

Conclusions: The literature on hospital acquired deconditioning is large, diverse and incomplete. Further work is required to develop a shared definition of hospital-acquired deconditioning; enabling researchers to coalesce for better understanding of the phenomenon, and clinicians, in turn, to better treat and mitigate against it.

Review Registration: Protocol published on OSF; available at <https://osf.io/b5sgw/>

Strengths and Limitations:

- This review utilised a standard, recognised methodology for evidence synthesis, and followed a pre-published protocol.
- A diverse range of study designs were scoped, resulting in a broad conceptual overview.
- This enabled the variation and lack of agreement across the literature to be described in a way that a narrower review could not have achieved.
- Due to the breadth of this review, some depth has been sacrificed, and an element of subjectivity has been introduced in interpreting the results.
- In line with Joanna Briggs Institute guidance, no clinical decisions should be made based on this scoping review due to a lack of critical appraisal of the included sources.

Funding

This scoping review was supported by the National Rehabilitation Centre funded as part of Meri Westlake’s PhD project titled “How do Healthcare Professionals Recognise and Respond to Hospital-Acquired Deconditioning: A Mixed Methods Synthesis and Consensus.” Adam Gordon is an NIHR Senior Investigator and part-funded by the NIHR Applied Research Collaboration East Midlands (ARC-EM). The views expressed in this publication are those of the author(s) and not necessarily those of the NIHR, NHS or the UK Department of Health and Social Care.

Competing interests

Adam Gordon has received honoraria from Gilead Sciences in 2021 and Pfizer Inc in 2023 for consultancy work.

Introduction and rationale for review

Hospital-acquired deconditioning describes a loss of physiological and cognitive capacity, manifesting as diminished function in activities of daily living, associated with a stay in hospital (1). It is thought to result from periods of immobility, inactivity, or reduced activity (2–4). Around 30% of older adults experience deconditioning during or following a hospital stay (5); however, the incidence in working-age adults has not been reported.

Previously conducted systematic reviews of interventions for hospital-acquired deconditioning found limited effectiveness of interventions (5–10). One reason given for this is that hospital-acquired deconditioning is poorly conceptualised, rendering interventions challenging to design and effectiveness difficult to measure (5,6,8). Reviews refer to and conceptualise deconditioning occurring during hospitalisation in different ways and using different terminologies.

Several other syndromes have been described that overlap with hospital-acquired deconditioning in that they describe either physiological phenomena or clinical syndromes which commonly occur in hospitals during periods of immobility and which are associated with deteriorating performance in Activities of Daily Living (ADLs). These include Intensive Care Acquired Weakness (ICU-AW) (11,12), sarcopenia, hospital-associated disability (5), and post-hospital syndrome (13,14) – each of which comes with specific, discrete, but overlapping diagnostic criteria.

Against this background, and in preparation for empirical research into hospital-acquired deconditioning, we conducted a scoping review to describe and make sense of this diverse literature. We aimed to identify key components used to define hospital-acquired deconditioning in adults. The objectives of this review were to: describe diagnostic criteria used for hospital-acquired deconditioning; describe how hospital-acquired deconditioning is understood and operationalised within and between studies; and ascertain how other syndromes relate to hospital-acquired deconditioning.

Methods

We chose the Joanna Briggs Institute scoping review methodology because this is useful for concept clarification when there is variability or uncertainty in the literature (15). It allows for multiple systematic reviews that may have focused upon different or overlapping populations and for reviews and original empirical research to be considered in parallel (16). A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews,

PROSPERO, Epistemonikos and JBI Evidence Synthesis found no current or underway systematic or scoping reviews on the topic. The protocol was registered on the Open Science Framework in January 2022 and is available online (17).

Search terms

Seven electronic databases – MEDLINE, CINAHL, EMBASE, PsychInfo, AMED, PEDro and Cochrane Library – were searched from inception to February 2022 and updated in July 2023. No limits were applied at the database search stage on date, language, subject or source type. Three registers – ProQuest thesis and dissertations, GreyNet and GreyLit (grey literature databases) were used to find publications outside the peer-reviewed literature, which might include a working definition of hospital-acquired deconditioning.

The initial search string was developed using MEDLINE with support from the University of Nottingham Library Service, and the syntax was adapted for use in other databases. The MEDLINE search string is provided as a supplementary file.

Citation searching was undertaken to find further articles that met eligibility criteria.

Eligibility criteria

Articles were eligible for inclusion if published in English, after 1st January 1990, focussed on adults over 18, set in inpatient rehabilitation or acute care settings and including either: a definition or description of hospital-acquired deconditioning; or an outline of strategies to assess, prevent or manage hospital-acquired deconditioning. Sources were excluded if published before 1990, including paediatric, animal, or space flight population, or if hospital-acquired deconditioning was discussed in relation to specific health conditions rather than as a generic phenomenon.

Citations were organised and shared between reviewers using Rayyan (18). Duplicates were removed manually by the lead author (MW). Two independent reviewers (from MW & KR, LH, AC) conducted the title and abstract screening. Two independent reviewers (from MW, KR, AC, ALG) conducted full text screening. Where full texts of included citations were unavailable, authors were approached once if contact details were publicly available. Where full texts were unavailable, data were extracted from abstracts. Sources identified through citation searching were independently screened for inclusion by MW and KR at the title, abstract and full-text levels on Rayyan. Conflicts during screening were resolved through discussion between independent reviewers, with a third reviewer used to break ties where conflict couldn't be resolved.

After title and abstract screening, the authorship team deviated from the published protocol by refining the inclusion and exclusion criteria (17). This was due to an unmanageable number of potential full texts to review, given available resources.

Data charting process

Included sources were entered into a data extraction tool (appendix 5), which was piloted using five studies of varying types to ensure fitness for purpose. Data extraction was completed in full by MW and checked by ALG. KR and AC each checked a third of the data set for accuracy.

Data items

Items abstracted from each source, where available included article characteristics (e.g. publication type, country of origin, authorship membership), characteristics and definitions of hospital-acquired deconditioning (e.g. diagnostic criteria for hospital-acquired deconditioning, signs and symptoms reported, definitions or descriptions given for hospital-acquired deconditioning), physiological changes (body system changes), sequelae of hospital-acquired deconditioning (complications or consequences arising from hospital-acquired deconditioning), primary causes and contributors to hospital-acquired deconditioning (reported causes and factors associated with hospital-acquired deconditioning), and risk factors for hospital-acquired deconditioning (individual and contextual factors associated with the development of hospital-acquired deconditioning).

Data analysis

Data were analysed by publication rate by year, country of publication, study type, participant type and study settings. Results were analysed using a narrative approach and in descriptive tables.

Data quality

In line with the JBI scoping review methodology, critical appraisal of sources was not undertaken, and the risk of bias was not formally assessed.

Patient and public involvement

Specific PPI was not sought for this scoping review. However, MW's PhD thesis, of which this forms a part, has benefitted from consultation with several PPI groups throughout its design and execution to ensure the outcomes remain relevant.

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Results

A total of 2163 articles were identified, of which 822 were excluded through deduplication. A further 1257 and 109 were excluded at the abstract, title and full-text screening, respectively, leaving 98 for inclusion in the full review. A PRISMA diagram is shown in supplementary figure 1. Where relevant in the results, citations from primary research are marked *, and articles utilising quality improvement methodology in clinical settings are marked ^T, with the remainder representing secondary analyses or syntheses.

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Supplementary Figure 1 PRISMA flow chart demonstrating the article selection process

<Supplementary Figure 1>

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The majority of articles (n=70) were published from 2010 onwards. Forty-seven were from the USA, 14 from the UK and 11 from Australia. Fourteen of the remainder came from Europe, six from Asia, and four from the Americas.

Seventy-two sources were published as journal articles; the remaining twenty-six were abstracts from conference materials. Seventy-two articles were empirical research studies. First authorship data were available for 63 sources, of which 32 were medical doctors, 11 physiotherapists, ten nurses and six occupational therapists. The remainder were written by a diverse range of disciplines. The authorship team was multidisciplinary for 24, and author disciplines were not identifiable for 35 publications.

Table 1 study designs of the included sources

Research Type	Number of Sources	Relevant Citations
Interventional/Experimental	7	
RCT	2	(19,20)
Pilot/Exploratory RCT	3	(21–23)
Feasibility (cohort)	1	(24)
Evaluation (cohort)	1	(25)
Quality Improvement/Service Development ^T)	21	
Interventional	11	(26 ^T ,27 ^T ,28 ^T ,29 ^T ,30 ^T ,31 ^T ,32 ^T ,33 ^T ,34 ^T ,35 ^T ,36 ^T)
Non-Interventional	3	(37 ^T ,38 ^T ,39 ^T)
Mixed Designs	7	(40 ^T ,41 ^T ,42 ^T ,43 ^T ,44 ^T ,45 ^T ,46 ^T)
Non-Interventional Studies	33	
Prospective Studies	17	(11,12,47–61)
Retrospective Studies	11	(62–72)
Cross-Sectional Studies	4	(73–76)
Delphi	1	(77)
Qualitative	4	(78–81)

Literature (non-systematic sources denoted with *)	33	
Systematic Review	7	(6–8,82–85)
Narrative Literature Review	3	(86*,87*,88*)
State of the Art Review	2	(89*,90*)
Editorial	17	(14*,91*,92*,93*,94*,95*,96*,97*,98*,99*,100*,101*,102*,103*,104*,105*,106*)
Conference Materials	1	(107*)
Study Protocol	3	(108*,109*,110*)
Total Sources included	98	

A wide range of study designs were used. These are outlined in Table 1. Seven sources were secondary analyses of previously collected data sets (50,59,60,62,69,79,103*) or part of larger research programs (22,80,81,109*).

Study Participant and Context Characteristics

The majority (n=49) of sources, where reported, originated from acute care settings with specialities covering a range of medical and surgical pathways. Rehabilitation or post-acute care was featured in 32 sources, critical care 15, and prehabilitation and research care focus's had one source each. The settings where the included research was conducted are summarised in Supplementary Table 1.

Supplementary Table 1 Focus of care and specialisms reported from the included sources of evidence.

<Supplementary table 1>

It was not possible to provide a total number of participants to avoid double counting due to the inclusion of systematic reviews, which also draw on the same primary studies as this scoping review. Further, not all included sources reported participant numbers. Descriptive statistics have been provided for interventional, non-interventional and systematic review population characteristics, including the total reported figure of participants, the mean age range (unadjusted) and the gender balance in Table 2.

Table 2 Population characteristics of the included sources

Study Population	Number	Mean Age Range (years)	Percentage Female %(range)	Relevant citations
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Total Interventional Study Participants	5058	54.45-83.95	32-75	(19– 25,26 ^T ,27 ^T ,28 ^T ,29 ^T ,3 0 ^T ,31 ^T ,32 ^T ,33 ^T ,34 ^T ,3 5 ^T ,36 ^T ,40 ^T ,41 ^T ,42 ^T ,4 3 ^T ,44 ^T ,45 ^T ,46 ^T ,78)
Total Non- Interventional Study Participants	212199	33.4-84.6	0-77	(11,12,37 ^T ,38 ^T ,39 ^T ,4 7–49,51–76,79)
Total Systematic Review Participants	21820 across 68 reviewed original studies	65.95-82.5	39-61	(6–8,82–85)

Some studies were conducted partially or exclusively with staff participants rather than patients, summarised in Table 3.

Table 2 Characteristics of non-patient populations from included sources

Non-Patient Populations	Sample recruited from	Number of Participants	Number of Studies	Citations
Registered Nurses	Medical and Surgical Units	27	2	(73,79)
Nursing Associates	Working in Geriatric Medicine	36	1	(44 ^T)
Occupational Therapists	“Experts” (5 years or more experience)	26	1	(77)
Caregivers	For people with Hip Fracture or Discharge Delay	22	1	(81)

Healthcare Providers	Not specified	62	2	(37 ^T ,81)
Decision Makers	For people with Hip Fracture or Discharge Delay	11	1	(81)

Characteristics and Definitions of Hospital-Acquired Deconditioning

There were sixty-three unique descriptions of hospital-acquired deconditioning. Eighteen of these were generated de novo for a given study with no reference to development, consensus, or validation work.

(11,14*,24,25,28^T,43^T,45^T,58,63,71,75,80,88*,92*,101*,103*,104*,107*).

Popularly cited works included Hoenig and Rubenstein (101*), who described hospital-acquired deconditioning as, "In addition to the effects of whatever acute illness brought them to the hospital, older people frequently incur major Functional setbacks stemming from in-hospital treatment and immobilisation." (101* p.220)

In parallel, Siebens et al. (3) published the following definition: "Deconditioning is probably best defined as the multiple changes in organ system physiology that are induced by inactivity and reversed by activity." (3 p.177) Researchers using this definition frequently omitted the second half: "The type of changes depend on prior fitness level and the degree of superimposed inactivity." (3 p.177)

These definitions were superseded mainly after 2009 by that of Kortebein (86*), who described deconditioning as:

"the cumulative effect of a prolonged or complicated hospitalization, a patient has experienced a significant functional decline." (86* p.67)

Forty-nine articles reported an alternative name for Hospital-Acquired Deconditioning, resulting in 26 different terms.

(7,86*,8,84,97*,75,88*,14*,19,20,31^T,32^T,34^T,37^T,39^T,40^T,45^T,48,49,12,57–63,65,66,73,76,80–83,92*,93*,94*,98*,99*,100*,101*,102*,103*,104*,105*,106*,109*,110*). The most common alternative name was “functional decline” or “decline in function” or similar description (n=30). Other descriptors included are listed in Supplementary Table 2.

Supplementary Table 3 Alternative names identified for Hospital-Acquired Deconditioning

<Supplementary table 2>

Clinical Presentations of Hospital Acquired Deconditioning

Information on the clinical presentation (signs and symptoms) of hospital-acquired deconditioning from 7 rehabilitation, 13 acute care and four intensive care studies was available. The descriptors and features are summarised in Figure 1. Diagnostic criteria or thresholds for hospital-acquired deconditioning needed to be clarified in much of the literature.

Figure 2 The range of signs and symptoms and descriptors utilised by the included articles were given.

<Figure 1>

Falvey et al. (99*), described a core cluster of symptoms, including muscular weakness, decreased stamina, diminished appetite, fatigue, and decreased ability to perform ADLs, informed by their understanding of older adults' experience after hospitalisation. They described this pattern of symptoms as associated with loss of functional reserve, decreased physical performance and increased risk of further adverse health events (99*).

Hospital-acquired deconditioning was frequently described as being identified at the time patients attempted to return to their usual activities (91*), which often coincided with discharge or the period immediately post discharged when patients were challenged by a return to their usual activities (6,40^T,78,88*,99*).

A few of the included sources discussed the components/features of hospital-acquired deconditioning, which should be considered diagnostic or presented as tools to assess the presence of hospital-acquired deconditioning. Returning to Figure 1, this diagram further demonstrated the range of descriptors and variables utilised across the three clinical

populations of acute care, rehabilitation or post-acute and intensive care used to identify suspected cases of hospital-acquired deconditioning.

Three sources provided explicit criteria for diagnosing hospital-acquired deconditioning (11,12,54). Of which, only one validated diagnostic framework -the Post-operative Physical Deconditioning Scale (PPDS) provided a framework to judge severity of deconditioning (54,111). This scale categorised hospital acquired into three levels of: none, simple and complex, depending on the presence of neurological or orthopaedic co-morbidities and the level of impairment experienced.

The remaining two diagnostic criteria were designed to establish hospital-acquired deconditioning as being present or absent in a binary way. Wakabayashi & Sashika (12) outlined four criteria, all of which were required by the Japanese government for a diagnosis of hospital-acquired deconditioning: (i) a period of inactivity or bed restriction after acute hospitalisation; (ii) a new disability to complete one of the basic ADLs needed to live independently without assistance: bathing, dressing, rising from bed or a chair, using the toilet, eating, or walking across a room during acute hospitalisation; (iii) a new disability is unrelated to a specific neurological or orthopaedic insult, or both; (iv) Barthel index score is 85 points or under. (12) Raj et al. (25), meanwhile, based their diagnosis on the basis of one or more social, emotional, cognitive or physical conditions which interfere with Quality of Life following hospitalisation (25).

Physiological Changes in Hospital Acquired Deconditioning

Thirty-one studies reported on physiological changes associated with hospital-acquired deconditioning. Despite numerous papers exploring causal relationships between physiological changes and hospital-acquired deconditioning, a consistent pattern has yet to emerge.

(6,14*,20,31^T,32^T,40^T,41^T,49,50,53,55,57,68,72,82,86*,87*,90*,91*,92*,93*,94*,97*,98*,99*,100*,101*,102*,104*,106*,109*). Loss of muscle strength and mass was the most frequently described physiological correlate of hospital admission. Still, it was not consistently associated with clinical measures of functional decline(6,8,34^T,55,57,68,77,89*,90*,104*,106*).

Sequelae of hospital-acquired deconditioning

The most commonly reported sequel of hospital-acquired deconditioning caused was functional decline (6,8,12,24,31^T,32^T,34^T,36^T,44^T,45^T,48,55,57,58,60,63–66,68,71,75,77,79,80,84,86*,88*,93*,95*,98*,99*,100*,101*,102*,104*,106*,112).

Functional decline was described by Graf (104* p.60) as “*the consequence of those physiologic changes [that result from either ageing or immobility] – the resulting inability to perform activities that ensure a person’s independence, such as rising unaided from a chair*”. Inouye et al. (58), defined functional decline as “*a deterioration in self-care skills*” (58 p.645) , or more broadly as “*a decrement in physical and/or cognitive function*” (103* p.1967) (103*).

Mobility impairment was reported as a specific form of functional decline in seven studies (6,24,45^T,55,65,68,79)., Mobility impairment was purposefully excluded as a feature of hospital-acquired deconditioning in Brown (60) because of near universal implementation of physician-directed bed rest orders on admission in US care settings at the time of writing.

Whilst functional decline, with or without mobility impairment, was identified as the dominant sequel of hospital-acquired deconditioning. Further reported consequences included increased rates of readmission (53,100*), institutionalisation (36^T,100*), cognitive function decline (6,25,103*), a requirement for extended rehabilitation (24,38^T,110*), the generation of additional social costs, extended length of stay (33^T,81) and pressure injuries (34^T,106*).

Reversibility was presumed with a return to activity in five studies that cited Sieben's 1990 definition (3,20,23,86*,91*,93*). Sanchez-Rodriguez et al. (116) suggest that newly developed functional limitations following acute medical or surgical intervention may prove reversible. Creditor (1993) was the least optimistic, stating that hospitalisation [of older adults] is often the beginning of an irreversible decline in function termed the *cascade to dependency* (101*,102*).

Primary causes of Hospital-Acquired Deconditioning and contributing factors

Forty-two studies reported that the adverse changes experienced in functional capacity as part of hospital-acquired deconditioning resulted from acute hospital care or exposure. (6–8,12,14*,20,24,25,31^T,32^T,36^T,40^T,43^T,44^T,46^T,48,53,57,58,60,62–64,66,68,73,75,79–81,84,86*,88*,90*,98*,99*,100*,101*,102*,104*,108*,112,113). But just under half (n=15) of these studies made this assertion without reference to underpinning data illustrating a causal association. Eight sources found hospital-acquired deconditioning was unrelated to the admission diagnosis (23,44^T,86*,88*,92*,95*,98*,107*). Nine studies found that impairment during and after hospitalisation was unrelated to a specific neurological or orthopaedic diagnosis (12,32^T,57,65,68,72,75,86*,98*). Supplementary Table 3 further summarises the identified causes and contributors to hospital-acquired deconditioning.

Reduced activity levels (inactivity, bed rest, reduced activity) were reported as an association, correlation, or causative factor for hospital-acquired deconditioning in 30 studies. This finding was predominantly reported in empirical studies (n= 15). However many other articles made the same assertion (6,8,20,23,24,28^T,31^T,34^T,40^T,43^T,45^T,53,55,62,65,66,68,73,78–80,86*,89*,91*,93*,95*,97*,100*,100*,101*,104*). Other important phenomena that were associated with the development and subsequent recognition of hospital-acquired deconditioning included medically complex conditions (61,66), persistently raised C-reactive protein (53), and directly disabling pathologies such as stroke or fracture (48,55). Prolonged hospital stays (8,44^T,61,66,86*,90*,108*), impairment despite successful treatment of the cause of admission (7,88*,102*,108*) and generalised risk and stress from acute hospital care (81,99*) were also suggested, although predominantly in from editorials or quality improvement literature.

The practices of bed rest and activity restriction were reportedly facilitated through tradition (40^T,43^T,87*,91*,95*,105*), a lack of staff resources (26^T,29^T,30^T,33^T,37^T,40^T,41^T,44^T,46^T,79,81,88*,97*,102*,103*,104*,105*,106*,109*) and equipment (33^T,35^T,37^T,100*), an unfriendly hospital environment (e.g. lack of adaptive equipment, slippery floors) (23,78,81,88*,92*,102*,104*), and organisational and professionals risk aversion to adverse events associated with mobility (e.g. perceived lack of safety, increased risk of falls) (8,33^T,44^T,64,79,81,88*,96*,100*,105*).

Supplementary Table 4 Identified Causes and Contributors to Hospital-Acquired Deconditioning

<Supplementary table 3>

Risk factors for Hospital-Acquired Deconditioning

Relevant data about risk factors were extracted and available from 31 acute hospital (6,20,21,23,26^T,31^T,34^T,53–56,58,60,64,71,79,81,82,86*,88*,91*,92*,93*,94*,101*,102*,103*,104*,105*,106*,109*), 14 from rehabilitation (8,12,25,27^T,32^T,61,65,68,69,72,75–77,98*) and 7 from intensive care studies (40^T,43^T,95*,100*,107*). These are summarised in Table 4.

Table 5 Identified risk factors for Hospital-Acquired Deconditioning

Risk Factor/Setting	Acute Hospital	Rehabilitation	Intensive Care

Potentially Modifiable	Marginal Activity Acute Illness Illness and Hospital Beliefs (to rest) Pre-hospital functional limitation (IADL, BADL, cognition, mobility aids/devices) Lack of exercise tolerance Reduced Motivation or ability for formal exercise Pain Patient Resistance Frailty (cognitive and physical) - deterioration on admission Sustained inflammation Smoking Delerium Physical Complexity Social Complexity (precarious housing, limited caregiver support, financial instability) Premorbid continence, sensory or perceptive issues Pressure injury Cognitive Impairment Low social activity (community participation) Slow gait speed Falls	Long and Difficult Acute Hospitalisation Depression (Impaired motor coordination and longer response time) Anti-hypertensive use Low body mass Malnutrition CV and Gastro Cohorts (lowest Bartel on admission) Cognitive Frailty or Deficits Sarcopenia (exacerbated functional decline and impairs functional restoration) Delirium on Admission Poor Mobility or Aid use BADL or IADL deficits on admission Fear of Falling	Pain Sleep Deprivation Fear Anxiety Lack of Control Nightmares Delirium Frailty Weakness Fatigue Physiologic Instability Obesity Poor Activity Tolerance ICU-AW Hyperglycemia Hypoalbuminemia
Non-Modifiable	Advancing Age (physical peak at 30, particularly 85+)	Advancing Age Multiple Co-Morbidity	Complex care needs Advancing age Female sex

	Caucasian Ethnicity		
	Hx of CVA		
Iatrogenic	Operation >3 hours duration Pushing out patients before they feel ready Hospital Acquired Infections Treatment Side Effects Invasive Procedures	Tethering Interventions Antidepressant Use Hospital Immobility Fasting Medications that affect cognitive or physical function Long-term IV use Dialysis for end-stage renal failure	PTSD from oversedation Tethering Interventions Depth of Sedation Parenteral Nutrition Corticosteroid Use Use of Neuromuscular Blockade

Discussion

The main finding of this scoping review of the peer-reviewed and grey literature on Hospital Acquired Deconditioning is that the condition is poorly defined, aetiological factors and sequelae are far from clear, and diagnostic criteria are not fully agreed upon. Hospital-acquired deconditioning has been visited as a physiological phenomenon, a clinical syndrome defined by deterioration, and a source of avoidable harm. These separate approaches to the phenomenon interdigitate and overlap incompletely in the literature.

Given the lack of clarity in the published literature, it is tempting to ask whether Hospital Acquired Deconditioning is a useful descriptor that serves a worthwhile function. If it had utility, would it not be better defined by now? Despite its heterogeneity, the literature we found was large. It was united by a recognition that the correlation between hospitalisation and deterioration in well-being and functional independence that persists beyond hospitalisation is an important one. It is essential because it may be predictable by the presence of risk factors, preventable through attendance to aetiological factors, and treatable through appropriate and timely intervention. It is not yet clear the extent to which hospital-acquired deconditioning is a consequence of an acute illness sufficiently severe to mandate hospitalisation or a consequence of the limitations that modern hospitalisation imposes on patients. Most authors suggest it is a combination of both.

This work adds to the existing published reviews, which have largely had a narrow focus on papers around interventions (7,8,82) or the natural history of hospital-acquired

deconditioning (5), by enabling the full breadth of published literature to be considered as one. This serves to highlight key areas of uncertainty around hospital-acquired deconditioning. One crucial issue that only becomes apparent when viewing the literature in a broad sense is the issue of temporality. There is a clear overlap in the criteria used to diagnose hospital-acquired deconditioning by way of functional deterioration and the criteria used to identify new physical disability of a longer-standing nature as a sequel of deconditioning. But it's not clear when such deterioration is sufficiently established to meet the diagnostic criteria for hospital-acquired deconditioning and when it moves from being hospital-acquired deconditioning into longer-standing disability. These concepts play into issues of primary and secondary prevention and reversibility. There is much subjectivity at play here – a parallel with other oft-mentioned but frequently poorly specified concepts such as rehabilitation potential, which are similarly the subject of broad clinical consensus and complex and contradictory underpinning literature (114)

The strengths of this study lie in the broad search terms, applied systematically, using diverse sources to capture the broadest conceptualisation of Hospital-Acquired Deconditioning. Standardised methodologies were used, and a written protocol was published in advance. Limitations relate to the difficulty of accommodating broad variations in study design, aims, and objectives within a single narrative framework, which led to some subjectivity of interpretation. The broad overview may have sacrificed some depth. Publication bias is always possible, with the bibliographic databases used favouring the English language, physician-led, formally-funded research over less formal work led by other professional groups and published in different languages.

In conclusion, the literature on hospital-acquired deconditioning is large, diverse and incohesive. While authors largely agree on the importance of the phenomenon, they describe it in sufficiently different ways so that it is not entirely clear that they're talking about the same thing. If we are to accept that within the concept of hospital-acquired deconditioning lies an opportunity to predict, prevent and/or intervene to minimise adverse outcomes, then we need first to arrive at a consensus around the definition and diagnostic criteria. This would enable more focused science around the epidemiology and natural history of the condition so that logical and evidence-based prevention and management strategies could be proposed.

Author Contributions

All authors (MW, KR, AC, ALG) contributed to the design, undertaking, and writing up of this scoping review manuscript, MW conducted the initial and subsequent searches. LH acted as a second reviewer for title and abstract screening.

References

1. #EndPJParalysis: the revolutionary movement helping frail older people [Internet]. [cited 2023 Sep 12]. Available from: <https://www.england.nhs.uk/2018/06/endpjparalysis-revolutionary-movement-helping-frail-older-people/>
2. Powers JH. The abuse of rest as a therapeutic measure in surgery. *The Journal of the American Medical Association*. 1944;125(16):1079–83.
3. Siebens H. Deconditioning. In: Kemp B, Brummel-Smith K, editors. *Geriatric Rehabilitation*. Boston, MA: College-Hill Press; 1990.
4. Chen Y, Almirall-Sánchez A, Mockler D, Adrion E, Domínguez-Vivero C, Romero-Ortuño R, et al. Hospital-associated deconditioning: Not only physical, but also cognitive. *International Journal of Geriatric Psychiatry* [Internet]. 2022 Mar;37(3):1–13. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=cui&AN=155474473&site=ehost-live>
5. Loyd C, Markland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of hospital-associated disability in older adults: A meta-analysis. *J Am Med Dir Assoc* [Internet]. 2020 Apr [cited 2022 Jun 6];21(4):455–461.e5. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7469431/>
6. Gordon S, Grimmer KA, Barras S. Assessment for incipient hospital-acquired deconditioning in acute hospital settings: A systematic literature review. *Journal of rehabilitation medicine*. 2019;51(6):397–404.
7. Hartley P, Keating JL, Jeffs KJ, Raymond MJ, Smith TO. Exercise for acutely hospitalised older medical patients. *Cochrane Database Syst Rev*. 2022 Nov 10;11(11):CD005955.
8. Smith TO, Sreekanta A, Walkeden S, Penhale B, Hanson S. Interventions for reducing hospital-associated deconditioning: A systematic review and meta-analysis. *Archives of gerontology and geriatrics*. 2020;90(8214379):104176.
9. Flake JK, Fried EI. Measurement Schmeasurement: Questionable Measurement Practices and How to Avoid Them. *Advances in Methods and Practices in Psychological Science* [Internet]. 2020 Dec 1 [cited 2023 Sep 12];3(4):456–65. Available from: <https://doi.org/10.1177/2515245920952393>
10. Cartwright ND. What is This Thing Called 'Efficacy'. In: Mantzavinos C, editor. *Philosophy of the social sciences: Philosophical theory and scientific practice*. Cambridge University Press; 2009. p. 185–206.

11. Sottile PD, Quan D, McNulty M, Gray L, Higgins C, Moss M. Outcomes in critical illness polyneuropathy and myopathy compared with deconditioning and normal neuromuscular function. In: American Journal of Respiratory and Critical Care Medicine [Internet]. San Diego; 2014. Available from: http://www.atsjournals.org/doi/pdf/10.1164/ajrccm-conference.2014.189.1_MeetingAbstracts.A3878
12. Wakabayashi H, Sashika H. Malnutrition is associated with poor rehabilitation outcome in elderly inpatients with hospital-associated deconditioning a prospective cohort study. *Journal of rehabilitation medicine*. 2014;46(3):277–82.
13. Caraballo C, Dharmarajan K, Krumholz HM. Post hospital syndrome: Is the stress of hospitalization causing harm? *Revista española de cardiología (English ed)*. 2019;72(11):896–8.
14. Krumholz HM. Post-Hospital Syndrome – A Condition of Generalized Risk. *N Engl J Med* [Internet]. 2013 Jan 10 [cited 2022 Jun 6];368(2):100–2. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3688067/>
15. Peters MDJ, Godfrey CM, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping reviews. In: Aromataris E, Munn Z, editors. *JBİ manual for evidence synthesis* [Internet]. JBI; 2020. Available from: <https://synthesismanual.jbi.global>.
16. Mays N, Roberts E, Popay J. Synthesising research evidence. In: *Studying the organisation and delivery of health services: Research methods*. 2004. p. 188–220.
17. Westlake M, Cowley A, Robinson K, Gordon A. Towards a common definition of Hospital Acquired Deconditioning (HAD) [in working-age adults]: A Scoping Review. 2022 Jan 15 [cited 2023 Aug 30]; Available from: <https://osf.io/b5sgw/>
18. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews* [Internet]. 2016 Dec 5;5(1):210. Available from: <https://doi.org/10.1186/s13643-016-0384-4>
19. Timmer AJ, Unsworth CA, Browne M. Occupational therapy and activity pacing with hospital-associated deconditioned older adults: a randomised controlled trial [with consumer summary]. *Disability and Rehabilitation* 2020;42(12):1727-1735. 2020;
20. Siebens H, Aronow H, Edwards D, Ghasemi Z. A Randomized Controlled Trial of Exercise to Improve Outcomes of Acute Hospitalization in Older Adults. *Journal of the American Geriatrics Society* [Internet]. 2000;48(12):1545–52. Available from: <https://doi.org/10.1111/j.1532-5415.2000.tb03862.x>
21. Soares SMTP, Nucci LB, Silva MMC. Effects of preoperative exercises on postoperative physical rehabilitation in patients submitted to abdominal surgery. In: *American Journal of Respiratory and Critical Care Medicine* [Internet]. New York: American Thoracic Society; 2012. Available from: http://www.atsjournals.org/doi/pdf/10.1164/ajrccm-conference.2012.185.1_MeetingAbstracts.A4850
22. Goodman BA, Bonner S, Wright J, Hugill K, Howard P, Danjoux G, et al. Impact of an aerobic rehabilitation programme on fitness and qol in ICU survivors: An exploratory trial (pix study). In: *Intensive Care Medicine*. Lisbon, Portugal: Springer; 2012. p. S90.

23. Eyres L, Unsworth CA. Occupational therapy in acute hospitals: The effectiveness of a pilot program to maintain occupational performance in older clients. *Australian Occupational Therapy Journal*. 2005;52(3):218–24.
24. Small W, Tasneem S, Bagheri A, Chodosh J, Adelsheimer A, Sutera J, et al. Safety and feasibility of a novel in-bed resistance training device in older inpatients. In: *Journal of the American Geriatrics Society*. Long Beach, CA,: American Geriatrics Society; 2020. p. S134.
25. Raj G, Munir J, Ball L, Carr DB. An inpatient rehabilitation service for deconditioned older adults [corrected]. *Topics in Geriatric Rehabilitation* [Internet]. 2007;23(2):126–36. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=105970310&site=ehost-live>
26. Corcoran G, Gavaghan G, Lyons C, Moloney E. Timely identification of frailty & comprehensive multidisciplinary assessment on a newly established specialist geriatric ward. In: *International Journal of Integrated Care (IJIC)* [Internet]. Ubiquity Press; 2017. p. 1–2. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=131980975&site=ehost-live>
27. Donnelly G, Jevons G, Wentworth L. Cognitively frail patients can be rehabilitated. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.
28. O'Sullivan NL, Cleffken BI. Does functional ability improve for patients in the intensive care unit (ICU) with a structural physiotherapy indication using the patient mobility framework (PMF) protocol? In: *Intensive Care Medicine Experimental* [Internet]. Paris, France: Springer; 2018. Available from: <https://icm-experimental.springeropen.com/articles/supplements/volume-6-supplement-2>
29. Stapley S, Colley S, Richards K. Development of recreational therapy role within the elderly care department. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.
30. Parkinson P. What are the impacts of a structured exercise class on patients with a longer inpatient stay in elective orthopaedics? In: *Physiotherapy (United Kingdom)*. 2019. p. e83–4.
31. Koh^T SY, Sridaran MN, Goh ML. Patients performing lower limb exercises in an orthopedic ward: a best practice implementation project. *JBHI evidence implementation*. 2020;19(3):257–67.
32. Suriyaarachchi^T P, Chu L, Bishop A, Thew T, Matthews K, Cowan R, et al. Evaluating Effectiveness of an Acute Rehabilitation Program in Hospital-Associated Deconditioning. *Journal of geriatric physical therapy* (2001). 2020;43(4):172–8.
33. Butler J, Welford T. A Multidisciplinary Team Initiative to End PJ Paralysis Was Successful in Achieving Cultural Change on An Acute Geriatric Ward. In: *Age and Ageing* [Internet]. Online: Oxford University Press; 2021 [cited 2023 Aug 15]. p. i12–42. Available from: 10.1093/ageing/afab030.69
34. Beam^T G, Gorman K, Kist BS, Giles H, Kiser K, Dumire R. Using the Mobilization of Vulnerable Elders Protocol to Improve Elderly Patient Outcomes in Pennsylvania: A Quasi-Experimental Project. *J Geriatr Med Gerontol* [Internet]. 2022 May 12 [cited 2023

- Aug 4];8(1). Available from: <https://clinmedjournals.org/articles/jgmg/journal-of-geriatric-medicine-and-gerontology-jgmg-8-130.php?jid=jgmg>
35. Pack QR, Miwa S, Engelman R, Lagu T, Visintainer P, Lindenauer P, et al. The impact of an ambulation orderly program on hospital outcomes for patients with recent open heart surgery. In: *Circulation*. 2016.
 36. Sayer K, Whiteaway K, Dawson JO, Simpson J, Chu W. Physical activity improvement in elderly hospitalised patients at the Royal London: Exercise as part of a multimodal intervention. In: *Age and Ageing* [Internet]. Online: Oxford University Press; 2020. p. i1–i1. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=149478740&site=ehost-live>
 37. Bono G, Reyes R. Keeping granny moving: A quality improvement project to improve mobility in hospitalized medicine and surgical patients. In: *Journal of the American Geriatrics Society*. Long Beach, CA,: American Geriatrics Society; 2020. p. S204.
 38. Husain-Qureshi A, Kirkwood R. Critical illness and physical deconditioning-an intervention to improve patient outcomes. In: *Anaesthesia*. 2019. p. 17.
 39. Rogerson F, Kendall C. Pyjama paralysis. In: *Age and Ageing*. London, United Kingdom: Oxford University Press; 2019.
 40. Drolet^T A, DeJuilio P, Harkless S, Henricks S, Kamin E, Leddy EA, et al. Move to improve: the feasibility of using an early mobility protocol to increase ambulation in the intensive and intermediate care settings. *Physical therapy*. 2013;93(2):197–207.
 41. Engel^T HJ, Tatebe S, Alonzo PB, Mustille RL, Rivera MJ. Physical Therapist-Established Intensive Care Unit Early Mobilization Program: Quality Improvement Project for Critical Care at the University of California San Francisco Medical Center. *Physical Therapy* [Internet]. 2013;93(7):975–85. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=104215172&site=ehost-live>
 42. Friedman M, Mayer RS, Hoyer E, Atanelov L. Reducing post-hospital syndrome: A quality improvement (QI) project. In: *PM and R*. Maryland: Wiley-Blackwell; 2013. p. S145.
 43. Booth^T K, Rivet J, Flici R, Harvey E, Hamill M, Hundley D, et al. Progressive Mobility Protocol Reduces Venous Thromboembolism Rate in Trauma Intensive Care Patients: A Quality Improvement Project. *Journal of trauma nursing : the official journal of the Society of Trauma Nurses*. 2016;23(5):284–9.
 44. Ritchie^T R, Wood S, Martin FC, Jones GD. Impact of an educational training program on restorative care practice of nursing assistants working with hospitalized older patients. *Journal of Clinical Outcomes Management* [Internet]. 2017;24(9):425–32. Available from: http://www.turner-white.com/pdf/jcom_sep17_restorative.pdf
 45. Horgan A, Carr M, Murphy A. The Impact of an Early Mobilisation Initiative Evidence from an Acute Care Setting. In: *Age and Ageing* [Internet]. Cork: Oxford University Press; 2019. p. iii17–65. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=138865066&site=ehost-live>

46. Asif A, Taube C, Sivarajah V, Tsironis C, Koizia L. Multidisciplinary team approach to reducing PJ Paralysis and time spent in bed in post-operative patients. In: Winter DC, editor. *British Journal of Surgery* [Internet]. Glasgow: Wiley-Blackwell; 2020. p. 41. Available from: <https://doi.org/10.1002/bjs.12068>
47. Ng YS, Jung H, Tay SS, Bok CW, Chiong Y, Lim PAC. Results from a prospective acute inpatient rehabilitation database: clinical characteristics and functional outcomes using the Functional Independence Measure. *Annals of the Academy of Medicine, Singapore*. 2007;36(1):3–10.
48. Baztan JJ, Galvez CP, Socorro A. Recovery of functional impairment after acute illness and mortality: one-year follow-up study. *Gerontology*. 2009;55(3):269–74.
49. Dennis RA, Johnson LE, Roberson PK, Heif M, Bopp MM, Garner KK, et al. Changes in activities of daily living, nutrient intake, and systemic inflammation in elderly adults receiving recuperative care. *Journal of the American Geriatrics Society*. 2012;60(12):2246–53.
50. Belavy DL, Miokovic T, Ambrecht G, Richardson CA, Rittweger J, Felsenberg D. Differential atrophy of the lower-limb musculature during prolonged bed-rest. *European journal of applied physiology*. 2009;107(4):489–99.
51. Silveira L, Pez M, Nogueira P, Furlan S, Colombo A. Physiotherapy indication and accomplishment at ICU. In: *European Respiratory Journal* [Internet]. 2013. Available from: http://erj.ersjournals.com/content/42/Suppl_57/P1358.full.pdf+html?sid=3bab0263-7ace-4098-871d-391440476518
52. Artaza I, Valera R, San Juan O, Urien M, Fernandez N, Malafarina V. Influence of the deficit of vitamin D in the functional gain of patients admitted to a unit of functional recovery. In: Michel JP, editor. *European Geriatric Medicine*. Lisbon, Portugal: Elsevier; 2016. p. S207–8.
53. Norheim KL, Bautmans I, Kjaer M. Handgrip strength shows no improvements in geriatric patients with persistent inflammation during hospitalization. *Experimental gerontology*. 2017;99:115–9.
54. Petrucci L, Ricotti S, Monteleone S, Ferriero G, Giromini E, Gullace M, et al. Disability after major abdominal surgery: determinants of recovery of walking ability in elderly patients. *European journal of physical and rehabilitation medicine*. 2018;54(5):683–9.
55. Higgins JT, Frazier SK, Lennie T, Rayens MK, Avila J. Early Ambulation After Injury Is Associated With Increased Muscle Size and Strength. *Biological research for nursing*. 2020;22(4):527–35.
56. Kovar A, Carmichael H, Jones T, Nichols Robinson T. Postoperative Delirium in Older Adults Is Associated with Prolonged Decreased Mobility. In: *Journal of the American College of Surgeons*. Lippincott Williams & Wilkins; 2020. p. S117–8.
57. Laneuville O, Rocheleau L, Chan Chun Kong D, Pelchat M, Trudel G. Effect of rehabilitation on biologic and transcriptomic responses after hospital-acquired deconditioning: a prospective longitudinal feasibility study. *Disability and rehabilitation*. 2021;(9207179):1–9.

58. Inouye SK, Wagner DR, Acampora D, Horwitz RI, Cooney LM, Hurst LD, et al. A predictive index for functional decline in hospitalized elderly medical patients. *J Gen Intern Med*. 1993 Dec;8(12):645–52.

59. Brown CJ, Friedkin RJ, Inouye SK. Prevalence and outcomes of low mobility in hospitalized older patients. *Journal of the American Geriatrics Society*. 2004;52(8):1263–70.

60. Brown CJ, Roth DL, Peel C, Allman RM. Predictors of regaining ambulatory ability during hospitalization. *Journal of Hospital Medicine* [Internet]. 2006 [cited 2022 Jun 6];1(5):277–84. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jhm.104>

61. Sánchez-Rodríguez D, Marco E, Miralles R, Fayos M, Mojal S, Alvarado M, et al. Sarcopenia, physical rehabilitation and functional outcomes of patients in a subacute geriatric care unit. *Archives of Gerontology and Geriatrics* [Internet]. 2014 Jul 1 [cited 2022 Aug 15];59(1):39–43. Available from: <https://www.sciencedirect.com/science/article/pii/S0167494314000272>

62. Haley R, Sullivan D H, Granger C V, Kortebein P. Inpatient rehabilitation outcomes for older adults with nondebility generalized weakness. *American journal of physical medicine & rehabilitation* [Internet]. 2011 Oct [cited 2022 Jun 6];90(10). Available from: <https://pubmed.ncbi.nlm.nih.gov/21862907/>

63. Kortebein P, Bopp MM, Granger CV, Sullivan DH. Outcomes of inpatient rehabilitation for older adults with debility. *Am J Phys Med Rehabil*. 2008 Feb;87(2):118–25.

64. Johnson SP, Swiatek PR, Wang L, Liu M, Chung TT, Chung KC. Risk Factors for Undergoing Elective Abdominal Contouring Surgery Shortly After Hospitalization. *The Journal of surgical research*. 2019;236:51–9.

65. Galloway RV, Karmarkar AM, Graham JE, Tan A, Raji M, Granger CV, et al. Hospital readmission following discharge from inpatient rehabilitation for older adults with debility. *Physical Therapy* [Internet]. 2016;96(2):241–51. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=112782599&site=ehost-live>

66. Fisher SR, Graham JE, Krishnan S, Ottenbacher KJ. Predictors of 30-Day Readmission Following Inpatient Rehabilitation for Patients at High Risk for Hospital Readmission. *Physical Therapy* [Internet]. 2016;96(1):62–70. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=112088391&site=ehost-live>

67. Vargo MM, Wilson RD, Fuentes Tirado EM. Functional recovery in surgical and medical deconditioning. In: PM and R. 2012. p. S297.

68. Guy N, Lerman Y, Justo D. Admission Norton scale scores (ANSS) correlate with rehabilitation outcome and length in elderly patients with deconditioning. *Archives of gerontology and geriatrics*. 2012;54(2):381–4.

69. Siegler EL, Stineman MG, Maislin G. Development of complications during rehabilitation. *Archives of internal medicine*. 1994;154(19):2185–90.

70. Deshpande SA, MacNeill SE, Lichtenberg PA, Pithadia J, Velez L. Functional outcome differences in acute versus subacute geriatric rehabilitation. *Journal of Rehabilitation Outcomes Measurement* [Internet]. 1998;4(1):57–64. Available from:

https://journals.lww.com/topicsingeriatricrehabilitation/Abstract/1998/06000/Functional_Outcome_Differences_in_Acute_versus.6.aspx

71. Lim SC, Doshi V, Castasus B, Lim JKH, Mamun K. Factors causing delay in discharge of elderly patients in an acute care hospital. *Annals of the Academy of Medicine, Singapore* [Internet]. 2006;35(1):27–32. Available from: <https://annals.edu.sg/pdf/35VolNo1200601/V35N1p27.pdf>
72. Aizen E, Shugaev I, Lenger R. Risk factors and characteristics of falls during inpatient rehabilitation of elderly patients. *Archives of gerontology and geriatrics*. 2006;44(1):1–12.
73. Manning DM, Frank DL, Keller SA. Home alone: Assessing mobility independence before discharge. *Journal of Hospital Medicine* [Internet]. 2009;4(4):252–4. Available from: <http://www3.interscience.wiley.com/cgi-bin/fulltext/122351424/PDFSTART>
74. Burkhardt H, Parigger L. How may B-mode sonography help to assess muscle aspects in an acute care setting. In: *European Geriatric Medicine*. 2018. p. S104.
75. Yoshimura Y, Wakabayashi H, Bise T, Tanoue M. Prevalence of sarcopenia and its association with activities of daily living and dysphagia in convalescent rehabilitation ward inpatients. *Clinical Nutrition* [Internet]. 2018;37(6):2022–8. Available from: <http://www.elsevier-international.com/journals/clnu/>
76. Churilov I, Brock K, Murphy D, Macisaac RJ, Churilov L, Ekinci EI. SARC-F score is negatively associated with functional independence in general rehabilitation patients. In: *Osteoporosis International* [Internet]. 2019. p. S403–4. Available from: <https://doi.org/10.1007/s00198-019-04993-w>
77. Timmer AJ, Unsworth CA, Taylor NF. Occupational therapy inpatient rehabilitation interventions with deconditioned older adults following an acute hospital admission: a Delphi study. *Australian occupational therapy journal*. 2015;62(1):41–9.
78. Spencer J, Hersch G, Eschenfelder V, Fournet J, Murray-Gerzik M. Outcomes of protocol-based and adaptation-based occupational therapy interventions for low-income elderly persons on a transitional unit. *American Journal of Occupational Therapy*. 1999;53(2):159–70.
79. Doherty-King B, Bowers BJ. Attributing the responsibility for ambulating patients: A qualitative study. *International Journal of Nursing Studies* [Internet]. 2013;50(9):1240–6. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=104211818&site=ehost-live>
80. McInerney M, McCarthy M, McCullagh R, Fox S, Timmons S. Patient perception of an augmented prescribed exercise programme during medical inpatient stay. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.
81. Guilcher SJT, Overall AC, Cadel L, Li J, Kulski K. A qualitative study exploring the lived experiences of deconditioning in hospital in Ontario, Canada. *BMC Geriatrics* [Internet]. 2021;21(1):1–9. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=149149977&site=ehost-live>

82. De Morton NA, Keating JL, Jeffs K. Exercise for acutely hospitalised older medical patients. *Cochrane Database of Systematic Reviews*. 2007;(1):CD005955.

83. Cabilan CJ, Hines S, Munday J. Prehabilitation for surgical patients: A systematic review protocol. *JBI Database of Systematic Reviews and Implementation Reports* [Internet]. 2013;11(5):112–22. Available from: <http://www.joannabriggslibrary.org/jbilibrary/index.php/jbisrir/article/view/517/1236>

84. Timmer AJ, Unsworth CA, Taylor NF. Rehabilitation interventions with deconditioned older adults following an acute hospital admission: a systematic review [with consumer summary]. *Clinical Rehabilitation* 2014 Nov;28(11):1078-1086. 2014;

85. Churilov I, Churilov L, MacIsaac RJ, Ekinici EIACI, <http://orcid.org/---> O. Systematic review and meta-analysis of prevalence of sarcopenia in post acute inpatient rehabilitation. *Osteoporosis International* [Internet]. 2018;29(4):805–12. Available from: <http://link.springer.de/link/service/journals/00198/index.htm>

86. Kortebein P. Rehabilitation for hospital-associated deconditioning. *American journal of physical medicine & rehabilitation*. 2009;88(1):66–77.

87. Schweickert WD, Kress JP. Implementing early mobilization interventions in mechanically ventilated patients in the ICU. *CHEST* [Internet]. 2011;140(6):1612–7. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=108208760&site=ehost-live>

88. Covinsky K E, Pierluissi E, Johnston B. Hospitalization-associated disability: “She Was Probably Able to Ambulate, but I’m Not Sure”. *JAMA* [Internet]. 2011 [cited 2022 Jun 6];306(16):1782–93. Available from: <https://jamanetwork.com/journals/jama/fullarticle/1104539>

89. Hoenig HM, Nusbaum N, Brummel-Smith. Geriatric rehabilitation state of the art. *Journal - American Geriatrics Society*. 1997;45(11):1371–81.

90. Venturelli E, Crisafulli E, Antoni FD, Trianni L, Clini EM. Rehabilitation in critically ill patients. *Annals of Respiratory Medicine* [Internet]. 2011;1(2). Available from: http://www.slm-respiratory.com/uploads/media/Rehabilitation_in_Critically_Ill_Patients.pdf

91. Conlin Shaw MM. Pressure ulcers in older persons: a preventive approach. *Wound repair and regeneration : official publication of the Wound Healing Society [and] the European Tissue Repair Society*. 1996;4(3):316–20.

92. Rader MC, Vaughen JL. Management of the frail and deconditioned patient. *Southern medical journal* [Internet]. 1994;87(5):S61-5. Available from: <https://pubmed.ncbi.nlm.nih.gov/8178204/>

93. Killewich LA. Strategies to Minimize Postoperative Deconditioning in Elderly Surgical Patients. *Journal of the American College of Surgeons*. 2006;203(5):735–45.

94. Silver KHC, Siebens AA. Rehabilitation medicine. *Surgical Clinics of North America* [Internet]. 1994;74(2):465–88. Available from: <http://www.elsevier.com/inca/publications/store/6/2/3/1/9/6/index.htm>

95. Bailey PP, Miller Ii RR, Clemmer TP. Culture of early mobility in mechanically ventilated patients. *Critical Care Medicine*. 2009;37:S429–35.
96. Gosselink R, Needham D, Hermans G. ICU-based rehabilitation and its appropriate metrics. *Current opinion in critical care*. 2012;18(5):533–9.
97. Mendez-Tellez PA, Nusr R, Feldman D, Needham DM. Early Physical Rehabilitation in the ICU: A Review for the Neurohospitalist. *The Neurohospitalist*. 2012;2(3):96–105.
98. Wakabayashi H, Sakuma K. Rehabilitation nutrition for sarcopenia with disability: a combination of both rehabilitation and nutrition care management. 2014;5(4):269–77. Available from: <http://www.springer.com/medicine/internal/journal/13539>
99. Falvey JR, Mangione KK, Stevens-Lapsley JE. Rethinking hospital-associated deconditioning: Proposed paradigm shift. *Physical therapy*. 2015;95(9):1307–15.
100. Dirkes SM, Kozlowski C. Early mobility in the intensive care unit: Evidence, barriers, and future directions. *Critical Care Nurse [Internet]*. 2019;39(3):33–42. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=136783751&site=ehost-live>
101. Hoenig HM, Rubenstein LZ. Hospital-Associated Deconditioning and Dysfunction. *Journal of the American Geriatrics Society [Internet]*. 1991 [cited 2022 Feb 24];39(2):220–2. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1532-5415.1991.tb01632.x>
102. Creditor MC. Hazards of hospitalization of the elderly. *Ann Intern Med*. 1993 Feb 1;118(3):219–23.
103. Inouye SK, Bogardus Jr. ST, Baker DI, Leo-Summers L, Cooney Jr. LM. The Hospital Elder Life Program: A Model of Care to Prevent Cognitive and Functional Decline in Older Hospitalized Patients. Reuben DB, editor. *J Am Geriatr Soc*. 2000;48(12):1697–706.
104. Graf C. Functional Decline in Hospitalized Older Adults: It's often a consequence of hospitalization, but it doesn't have to be. *AJN The American Journal of Nursing [Internet]*. 2006 Jan [cited 2022 Jun 7];106(1):58–67. Available from: https://journals.lww.com/ajnonline/Fulltext/2006/01000/Functional_Decline_in_Hospitalized_Older_Adults_.32.aspx
105. Chastin SF, Harvey JA, Dall PM, McNally L, Mavroei A, Skelton DA, et al. Beyond “#endpjaralysis”, tackling sedentary behaviour in health care. *AIMSMEDS [Internet]*. 2019 [cited 2022 Aug 11];6(1):67–75. Available from: <http://www.aimspress.com/article/doi/10.3934/medsci.2019.1.67>
106. Swinnerton E., Price A. Recognising, reducing and preventing deconditioning in hospitalised older people. *Nurs Older People*. 2023;35(2):34–41.
107. Latronico N. ICU acquired weakness. In: *European Journal of Neurology [Internet]*. Berlin, Germany: Wiley-Blackwell; 2015. p. 870–1. Available from: <https://onlinelibrary.wiley.com/toc/14681331/2015/22/S1>
108. Timmer AJ, Unsworth CA, Browne M. A randomized controlled trial protocol investigating effectiveness of an activity-pacing program for deconditioned older adults.

Canadian journal of occupational therapy Revue canadienne d'ergotherapie.
2019;86(2):136–47.

109. Kamper RS, Schultz M, Hansen SK, Andersen H, Ekmann A, Nygaard H, et al. Biomarkers for length of hospital stay, changes in muscle mass, strength and physical function in older medical patients: protocol for the Copenhagen PROTECT study-a prospective cohort study. *BMJ open*. 2020;10(12):e042786.

110. Beisheim-Ryan E.H., Butera K.A., Hinrichs L.A., Derlein D.L., Malone D.J., Holtrop J.S., et al. Advancing Rehabilitation Paradigms for Older Adults in Skilled Nursing Facilities: An Effectiveness-Implementation Hybrid Type 1 Clinical Trial Protocol. *Phys Ther*. 2023;((Beisheim-Ryan, Hinrichs, Stevens-Lapsley) VA Eastern Colorado Geriatric Research, Education, Clinical Center (GRECC), VA Eastern Colorado Health Care System, Aurora, CO, United States).

111. Monteleone S, Dalla Toffola E, Emiliani V, Ricotti S, Bruggi M, Conte T, et al. Recovery of deambulation after cardiothoracic surgery: a single center experience. *European Journal of Physical and Rehabilitation Medicine* [Internet]. 2015 [cited 2022 Jun 8];51(6):763–71. Available from: <https://www.minervamedica.it/en/journals/europa-medicophysica/article.php?cod=R33Y2015N06A0763>

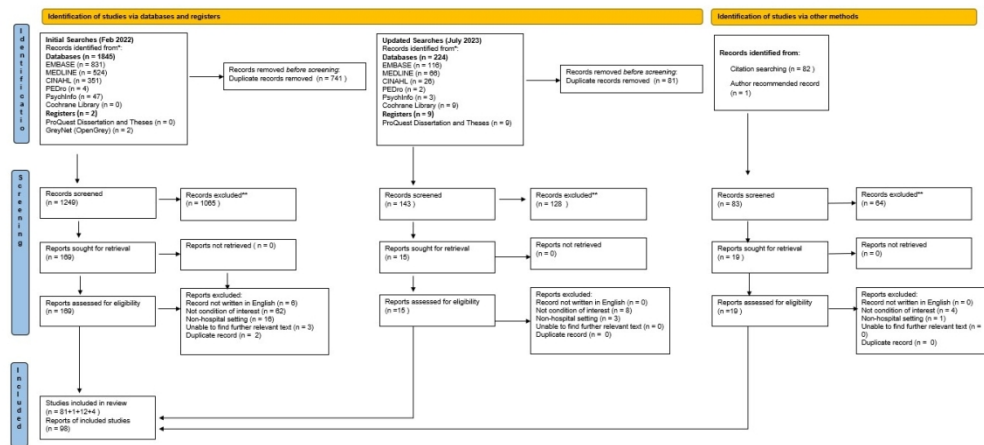
112. Inouye SK, Bogardus Jr. ST, Baker DI, Leo-Summers L, Cooney Jr. LM. MODELS OF GERIATRICS PRACTICE; The Hospital Elder Life Program: A Model of Care to Prevent Cognitive and Functional Decline in Older Hospitalized Patients. Reuben DB, editor. *Journal of the American Geriatrics Society*. 2000;48(12):1697–706.

113. Sanchez-Rodriguez D, Miralles R, Muniesa JM, Mojal S, Abadia-Escartin A, Vazquez-Ibar O. Three measures of physical rehabilitation effectiveness in elderly patients: a prospective, longitudinal, comparative analysis. *BMC geriatrics*. 2015;15(100968548):142.

114. Cowley A, Goldberg SE, Gordon AL, Logan PA. Rehabilitation potential in older people living with frailty: a systematic mapping review. *BMC Geriatrics* [Internet]. 2021 Oct 7;21(1):533. Available from: <https://doi.org/10.1186/s12877-021-02498-y>

Supplementary Information

1. PRISMA-ScR checklist: Available as a supplementary file
2. Data Sharing Statement: Data utilised in the results of this scoping review are available in the supplementary file.
3. Search Strategy: The search strategy for each database has been included as a supplementary file
4. Original Protocol: Available to view as a supplementary file
5. Data extraction tool: Available to view as a supplementary file



Supplementary Figure 1 PRISMA flow chart demonstrating the article selection process

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Supplementary table 3 Care focus and specialisms of the included sources of evidence

Care Focus (Where Reported)	Specialisms	Number of Sources	Citations
Rehabilitation/ Post Acute Care	Convalescent, Functional, Geriatric Early, Geriatric, Inpatient, Subacute Geriatric, Transitional Unit, Virtual Beds	32	(8,12,19,25,27 ^T ,32 ^T , 47–49,52,57,61– 63,65–70,72,74– 78,84,85,89*,98*,10 8*,110*)
Acute Care	Medical, Surgical, Orthopaedics, Geriatric Surgery, Major Trauma, Elective Surgery, Cardiac Surgery	49	(6,7,14*,20,21,23,24 ,26 ^T ,29 ^T ,30 ^T ,31 ^T ,33 ^T , 34 ^T ,35 ^T ,36 ^T ,37 ^T ,39 ^T , 42 ^T ,44 ^T ,45 ^T ,46 ^T ,53– 56,58– 60,64,71,73,79– 82,86*,88*,91*,92*,9 3*,94*,99*,101*,102* ,103*,104*,105*,106 ,109*)
Intensive Care	Medical, Surgical, Intermediate Care, Neurology, Neurotrauma,	15	(11,22,28 ^T ,38 ^T ,40 ^T ,4 1 ^T ,43 ^T ,51,87*,90*,95 ,96*,97*,100*,107*)
Other	Prehabilitation, Research	2	(50,83)

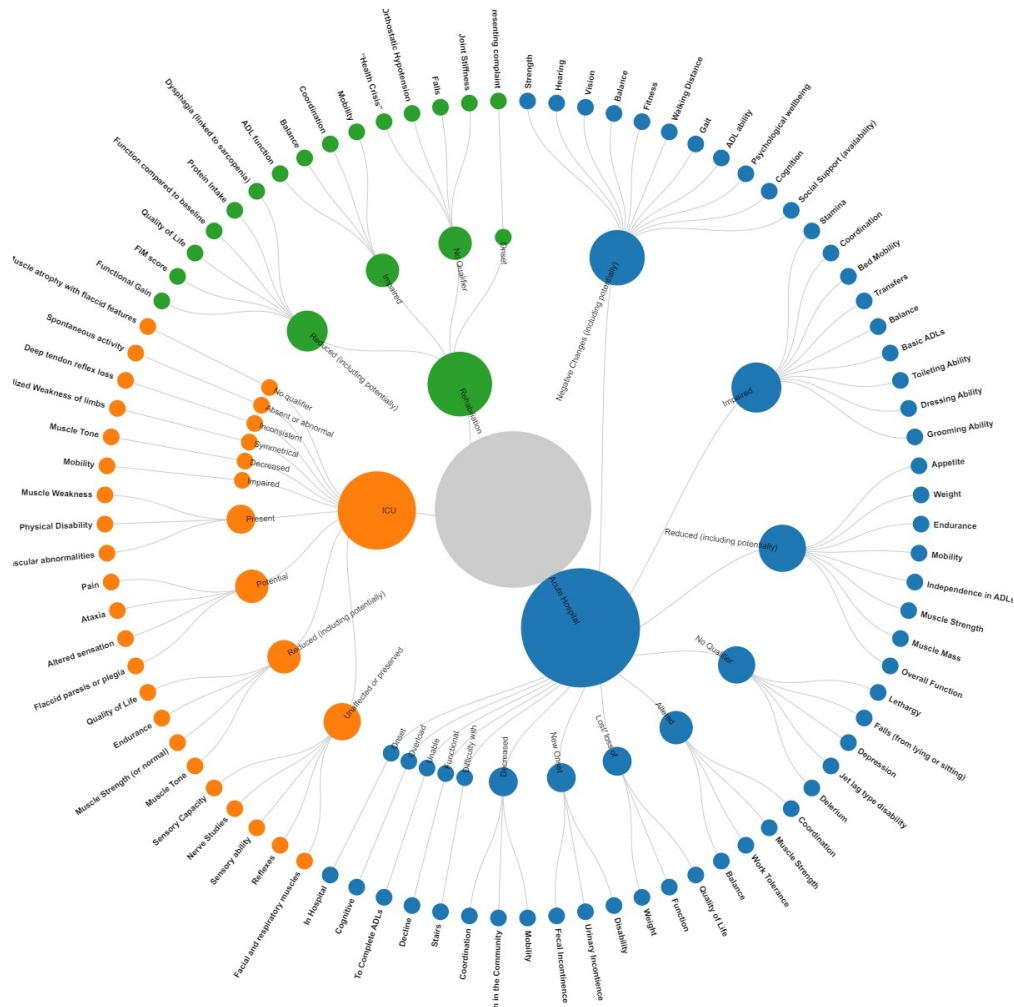


Figure 1 The range of signs and symptoms and descriptors utilised by the included articles were given.

423x423mm (72 x 72 DPI)

Alternative names for HAD	Totals
None given	49
Decline in Function/ Functional Decline	27
Debility	7
Disuse atrophy	4
Post-hospital syndrome	4
Hospital-associated functional deficits / functional decline	3
Immobilisation/ immobility syndrome	2
Disuse syndrome	2
Deterioration in Cognitive or Physical function	2
Muscle wasting	2
Asthenia	2
Malaise/fatigue	2
Hospital associated deconditioning	1
Hospital(isation) associated disability	2
Reduced physiologic capacity	1
Generalised weakness	1
Physical functionality	1
Activity related sarcopenia	1
Medical deconditioning	1
Other	1
State of Frailty	1
Pyjama paralysis	1
Hospital-acquired disability	1
Frailty	1
Hospitalisation disability syndrome	1
Nondebility generalised weakness	1
Muscle weakness	1

Supplementary table 5

Supplementary Table 6

Setting	Acute Hospital	Rehabilitation	Intensive Care
Exposure or Cause	<p>Inactivity (relative, bed rest, lack of ambulation)</p> <p>Acute Illness that necessitates bed rest (complications of disease and its management)</p> <p>Disabling insult that limits or precludes mobility</p> <p>Chronic disease that causes a gradual decline in activity</p> <p>Psychological Changes</p> <p>Changes in Social Circumstances</p> <p>Lack of engagement in occupation</p> <p>Surgical Stress Response</p> <p>Prolonged Hospital Stay</p> <p>Acute Hospitalisation (prolonged exposure to medical care)</p> <p>Multi-Factorial - could be anything.</p> <p>Pain</p> <p>Stress of Hospitalization (physiological and psycho-social), overall uncertainty, mentally challenging situations</p> <p>Nutritional Deficits</p> <p>Sleep Disturbances</p> <p>Sedentary Behaviour</p> <p>Social Isolation</p> <p>Stress-related to socioeconomic concerns.</p> <p>Lack of MDT input</p> <p>Hospitals built environment</p> <p>[Lack of] social capital resources (family, volunteers,</p>	<p>Bed Rest</p> <p>Inactivity or Low Levels of Physical Activity (any reason)</p> <p>Inadequate Nutrient Intake/ Poor Nourishment</p> <p>Systemic Inflammation</p> <p>Acute Hospitalisation</p> <p>Pneumonia</p> <p>Exacerbation of CHF</p> <p>Falls</p> <p>Neurosurgery (Emergency & Elective)</p> <p>Laparotomy</p> <p>Infectious or Inflammatory Diseases</p> <p>Acute Coronary Syndrome</p> <p>Acute Renal Failure</p> <p>Peripheral Vascular Procedures</p> <p>Sleep Deprivation/ Circadian Disruption</p> <p>Pain/Discomfort</p> <p>Mentally Challenging Situations</p> <p>Sedentary Lifestyle</p> <p>Prolonged or Complex LOS</p>	<p>Critical Illness</p> <p>ARDS</p> <p>Immobility or Acute Inactivity</p> <p>Mechanical Ventilation</p> <p>Prolonged or Complete Bed Rest</p> <p>Hyperglycemia</p> <p>Critical illness polyneuropathy-thrombotic</p> <p>Ischemic Injury to Neural Tissue</p> <p>Inflammatory States - sepsis, SIRS</p> <p>Malnutrition</p> <p>MODS</p>

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Setting	Acute Hospital	Rehabilitation	Intensive Care
	roommates, staff) Interaction of hospitalisation and ageing Poor food Lack of reserved Disrupted daily rhythms Fatigue Ongoing health issues		
Iatrogenic	Medications, eg sedatives, GA side effects, narcotics, polypharmacy, psychoactive reactions Nosocomial Infections Use and consequences of restraint (physical or chemical) Post-operative bed rest or immobility Treatment Effects Adverse Events Indwelling (tethering) interventions e.g. catheters, IV's NBM orders	Medications that affect cognitive or physical function Long-term IV use Dialysis for end-stage renal failure	Neuromuscular blockage use Corticosteroid Use Sedative-related prolonged immobility
Contributors, modifiers or accelerators	Ability to Learn Active Medical Problems BMI Boredom Depression Fatigue Fear of developing a functional decline Fear of strategies to reduce functional decline Financial Resources or Insurance Pain Patient Motivation Patient or Family Preference Post-operative complications Potential for	Sarcopenia Subacute rehab population Malnutrition Medical Complexity Physiological Stress	Cardio respiratory Deconditioning Anxiety Depression PTSD

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Setting	Acute Hospital	Rehabilitation	Intensive Care
	Functional Recovery Pre-hospital function PT/OT intervention Rehab Tolerance Sarcopenia Social Set up		

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Towards a common definition of Hospital Acquired Deconditioning (HAD) [in working-age adults]: A Scoping Review

Authors

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Abstract

Objective: The objective is to identify the key components used to define hospital-acquired conditioning in adults from previous literature.

Introduction: Hospital-acquired-deconditioning (HAD) is becoming increasingly recognised as a complication of inpatient care. The prevalence is estimated to be approximately 30% in older adults, but it has not been assessed in working-age adults (1). Much of the literature describes a non-standardised description HAD (1-5). Therefore, delineating the criteria used to outline HAD provides a better platform to inform future practice and research.

Inclusion criteria: all literature that investigates or discusses HAD in working-age adults (18+), including the aim of assessing and/or managing HAD within the inpatient setting (acute, sub-acute hospital or rehabilitation settings). Opinion pieces, grey literature, qualitative, quantitative, and systematic review designs will be included. Literature that does not define or describe HAD will be excluded.

Methods: The scoping review will follow the Joanna Briggs Institute scoping review methodology (6). All sources which provide a definition or description of HAD assessment and/or management will be included. Literature must be written in English. Eight electronic

databases and grey literature platforms will be searched from 1st January 1990 to 31st January 2022 (MEDLINE OVID, CINAHL (EbscoHost), EMBASE, AMED (OVID) PsychInfo(OVID), PEDro, OpenGrey, GreyLit). Citation searching of selected studies will be conducted using Web of Science. Titles, abstracts, and full-text screening will be completed independently by two reviewers. Data will be descriptively summarised and presented using tables and diagrams. Reporting will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist(7).

Introduction

Deconditioning is a variably defined term that describes the loss of physiological and cognitive capacity as measured by a loss of independent function in basic activities of daily living. Hospital-acquired disability proves furthermore elusive in its specificity as a diagnosable condition. Furthermore, deconditioning has also been implicated in other conditions like non-specific lower back pain (8), postural orthopaedic tachycardia syndrome (5) and spinal cord injury (9). Deconditioning is thought to arise from extended periods of immobility, inactivity, or reduced activity(10). Dock described the "Evil Sequelae of Bed Rest" as grievous unintended effects from the traditionally prescribed lengthy periods of enforced bed rest during and following illness (11). Kortebein 2009 discusses the variety of meanings attributed to deconditioning (12), alluding to the complexity and difficulty in qualifying succinctly what deconditioning means in a multi-stakeholder system and an acute environment. Kortebein also noted substantial variation in the use of HAD as a concept. Since this paper was published in 2009, there have been no subsequent publications to update the literature on HAD definitions(12)."

There have been several distinct but overlapping conceptual approaches to the definition of HAD or deconditioning. Some authors focus on the observable consequences of reduced activity, whilst others have emphasised the underlying physiological mechanisms (e.g. changes in muscle morphology or orthostatic intolerance) (13, 14). Three broad understandings have emerged in the literature thus far. These are 'deconditioning as a consequence, 'deconditioning as a physiological phenomenon demonstrated by functional losses, and 'deconditioning as an adverse event' (5, 15). These broad categories will be used as *a priori* categories for data analysis. To overcome risk of predefined bias, these categories

will be iterative in nature and will be assessed by two independent reviewers. A strength of this approach is streamlined sorting of a large dataset.

Deconditioning as a consequence:

Perhaps due to the nature of the search terms, limited, strictly physiological explanations and definitions have been observed. Bender in 2018 defined deconditioning as a consequence of inactivity and bed rest characterised by alterations in mental status, continence, ADLs and mobility(16). This definition aligns to Creditors 1993 eight hazards of bed rest: loss of muscle strength, loss of aerobic capacity, vasomotor instability, reduced bone density, reduced pulmonary ventilation, altered sensory continence (delirium features), and loss of appetite and thirst, and finally urinary incontinence. Oda et al. in 2021 state “hospitalised older adults often experience deconditioning manifested as cognitive and physical function decline” p7. Suggesting that deconditioning is fallout from poor oral care practices and linked to sarcopenia and aspiration pneumonia through poor nutritional status(17).

Deconditioning as a physiological phenomenon demonstrated by functional loss:

Jones, in 2006 divided their definition of deconditioning into physiological and functional strands reflecting the dynamic between pathology and observed outcome(13). Timmer, 2014 also adopted the separation of physiology and function. In finding limited literature for deconditioning specific interventions for older adults, they operationalised the effect of deconditioning functionally. They specified hospital-acquired deconditioning (HAD) as “functional decline resulting from acute hospital admission for a general medical condition” (14) p1081. Falvey, in 2015 highlighted physiology first in stating deconditioning to mean “declines in muscle strength, muscle mass, cognitive function, muscle protein synthesis and physical function” p 1308(3). They further translate these physiological effects into functional loss in ADLs.

It is more common to see function or outcome focussed definitions, including those shared by Kortebein, Convinsky, Fox and Loyd, which emphasise the loss of independence in basic activities of daily living, which include bathing, transferring, eating/drinking, room-based ambulation and toileting (1, 12, 18, 19).

Deconditioning as an adverse event.

As a preventable consequence of inpatient medical care, HAD is a recently emerging theme, despite being discussed in early enhanced recovery after surgery work completed in 1944 by authors such as Powers(10). Qualitative research by Guilcher in 2021 defines HAD as preventable harm, also known as a post-hospital syndrome or the trauma of hospitalisation(20). They emphasise the increased period of risk for adverse events following inpatient care. The post-hospital syndrome was discussed by Caraballo in cardiac patients and identified a seven-week window where the risk of all-cause re-admission is highest following discharge(21). Falvey further discusses HAD as partially avoidable and links HAD to the category of 'iatrogenic disability' (15). They suggest that HAD is increasingly referred to as Post Hospital syndrome but focus on HAD because it is a more clinically relevant term to physical therapists(3).

Research focusing on deconditioning as avoidable harm emphasises the psychological, cultural, organisational and environmental stressors and barriers that reduce patient independence and facilitate the development of dependence. Gordon's review of outcome measures in 2019 highlights the expectation that patients will not leave the hospital worse than on admission(4). Moersch, 2020 in their thesis, explored the experience of a common HAD intervention, early mobilisation, and how older adults experience deconditioning; however, the full text of this thesis is unavailable currently(22).

Taking all three categories together, it can be concluded that deconditioning is a multi-system event that can be examined and understood from several different features and paradigms. Furthermore, HAD appears dynamic with past, present and future implications for care and health. To date, no models have been found to explain the interaction of factors involved in the definition or acquisition of HAD.

Loyd et al. assessed the prevalence of HAD in 2020, where they conducted a systematic review and meta-analysis. They found that 30% of older adults developed deconditioning following an acute medical event necessitating hospital admission (1). This is a significant figure given the burden of reduced functional ability, including the economic cost of care

packages, discharge to residential facilities, loss of quality of life, the potential for mood disorders and carer strain. In American populations, this financial burden is 10% of the Medicare budget (2, 3). The Medicare budget, for context, covers treatment for over 65's with some exceptions relating to inpatient care, including residential care facilities and rehabilitation (23, 24).

A scoping review has been chosen to clarify what is meant by the term Hospital-Acquired-Deconditioning. Furthermore, the clinical presentation, assessment, responsible parties and management hinge on a shared understanding of what is meant when deconditioning is presented as a diagnosis. Scoping reviews are appropriate for concept clarification when there is variability or uncertainty in the literature (6).

A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, PROSPERO, Epistemonikos and *JBIC Evidence Synthesis*, was conducted. No current or underway systematic reviews or scoping reviews on the topic were identified.

In conclusion, this review will aim to capture the core features of HAD in adults with a specific focus on those of working age if possible.

Review question

What are the defining components/features of hospital-acquired deconditioning in [working age adults]?

- What is the diagnostic criteria for HAD?*
- How is HAD understood and operationalised?*
- How is it separate from other syndromes linked to reduced activity, e.g. frailty, Intensive care acquired weakness (ICU-AW), sarcopenia, hospital-associated disability, post-hospital syndrome?*

Keywords

Adverse Event; Assessment; Deconditioning; Inpatient; Scoping Review

Inclusion criteria

Participants

Adults over 18 included who are being assessed or treated for HAD. Children under 18 will be excluded.

Concept

Evidence which gives a definition or description of HAD and/or other descriptors, including strategies to assess, prevent, manage and descriptions of the experience of HAD. Literature discussing deconditioning because of a specific health condition will be excluded (e.g. cancer, neuromuscular disorders or frailty).

Context

The literature will be included from those reporting from any setting inpatient hospital or inpatient rehabilitative settings (e.g. care homes, inpatient facilities, interim beds) but not rehabilitation at home for HAD. There will be no geographical exclusion. However, studies will need to be written in English for inclusion.

Types of sources

This scoping review will consider both experimental and quasi-experimental study designs, including but not limited to randomised controlled trials, non-randomised controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control

studies and analytical cross-sectional studies will be considered for inclusion. This review will also consider descriptive observational study designs, including case series, individual case reports and descriptive cross-sectional studies for inclusion.

Qualitative studies will also be considered that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.

In addition, systematic reviews that meet the inclusion criteria will also be considered, depending on the research question.

Text and opinion papers will also be considered for inclusion in this scoping review.

Methods

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews (6). Reporting will be guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist (7).

Search strategy

The search strategy will aim to locate both published and unpublished studies. A three-step search strategy will be utilised in this review. The search will be abductive in nature and may evolve as the reviewers’ knowledge of the evidence base develops (6, 25, 26). First, an initial limited search of MEDLINE OVID and CINAHL (EBSCO) was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the articles will be used to develop a complete search strategy for MEDLINE (OVID), CINAHL (EBSCO), EMBASE (OVID), AMED (OVID) PsychInfo (OVID), PEDro, OpenGrey and GreyLit (see Appendix 1). These databases were chosen to reflect the breadth of stakeholders in defining and utilising HAD. The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. Finally, the reference list of all included sources of evidence will be screened for additional studies by hand and in Web of Science. Only studies published in English will be included because the translation of non-English studies is

beyond the resources available to conduct this review. Studies published before 1st January 1990 will be excluded.

Study/Source of evidence selection

Following the search, all identified citations will be collated and uploaded into EndNote version 9.0 (2021) and duplicates removed using the Covidence software. Following a pilot test, titles and abstracts will then be screened by two or more independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full and their citation details imported into Rayyan for the title and abstract screening (27). The full text of selected citations will be assessed in detail against the inclusion criteria by two or more independent reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review PRISMA-ScR flow chart. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion or with an additional reviewer/s if a consensus cannot be reached.

Data extraction

Data will be extracted from papers included in the scoping review by two or more independent reviewers using a data extraction tool developed by the reviewers for the purpose of this review. The data extracted will include specific details about the participants, concept, context, study methods and key findings relevant to the review question/s. The data extraction tool will be piloted by the first author on five studies and then reassessed by the second reviewer for clarity and consistency.

A draft extraction form is provided (see Appendix 2). The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included evidence source. Modifications will be detailed in the scoping review. Any disagreements that arise between the reviewers will be resolved through discussion or with an additional reviewer/s. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Data analysis and presentation

Initial screening of the literature will be presented in a PRISMA-ScR flow chart to report the selection process(7). Study characteristics including participant age range, geographical location, study context, purpose and design will be tabulated. Findings will be categorised around a *priori* criteria based on HAD as an adverse event, HAD as a physiological phenomenon, HAD as a consequence and emergent findings from the literature. Further categories for analysis will include a definition or description of HAD and/or other descriptors, including strategies to assess, manage and the experience of HAD.

Common words used in defining HAD will be presented in a word diagram to emphasise significant and less significant concepts and frequency. Overlap with other hospital-acquired syndromes will be presented in a Venn diagram to demonstrate commonality and distinct features. A body chart may be included to demonstrate physiological descriptors of HAD and/or identified assessments for the specific component. A narrative summary will accompany the results and describe how the results relate to the review objective and question/s.

Acknowledgements

The production of this scoping review contributes to the award of Doctor of Philosophy in Ageing and Rehabilitation through the University of Nottingham for MW.

Funding

This review is independent and funded by the National Rehabilitation Centre (NRC). The views expressed in this publication are those of the author(s) and do not necessarily reflect those of the NHS, NRC or the University of Nottingham.

Declarations

MW, KR, AC, LH and FH are physiotherapists in the United Kingdom with experience of working with adult inpatients in both acute and rehabilitative settings of the NHS. AG is a Professor in Rehabilitation and Ageing and a practising Geriatrician.

Conflicts of interest

There is no conflict of interest in this project.

References

1. Loyd C, Markland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of Hospital-Associated Disability in Older Adults: A Meta-analysis. *Journal of the American Medical Directors Association*. 2020;21(4):455-61.e5.
2. Smith TO, Sreekanta A, Walkeden S, Penhale B, Hanson S. Interventions for reducing hospital-associated deconditioning: A systematic review and meta-analysis. *Archives of Gerontology and Geriatrics*. 2020;90:104176.
3. Falvey JR, Mangione KK, Stevens-Lapsley JE. Rethinking Hospital-Associated Deconditioning: Proposed Paradigm Shift. *Physical Therapy*. 2015;95(9):1307-15.
4. Gordon S, Grimmer KA, Barras S. Assessment for incipient hospital-acquired deconditioning in acute hospital settings: A systematic literature review. *Journal of rehabilitation medicine*. 2019;51(6):397-404.
5. Joyner MJ. Standing up for exercise: should deconditioning be medicalized? *The Journal of Physiology*. 2012;590(15):3413-4.
6. Peters MDJ, Godfrey CM, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping reviews. 2020. In: *JBI manual for evidence synthesis* [Internet]. JBI. Available from: <https://synthesismanual.jbi.global>.
7. Tricco AC, Lillie E, Zarin W, O'Brien K, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine*. 2018;169(7):467-73.
8. Tagliaferri SD, Armbrrecht G, Miller CT, Owen PJ, Mundell NL, Felsenberg D, et al. Testing the deconditioning hypothesis of low back pain: A study in 1182 older women. *European Journal of Sport Science*. 2020;20(1):17-23.

9. Maher JL, McMillan DW, Nash MS. Exercise and Health-Related Risks of Physical Deconditioning After Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation*. 2017;23(3):175-87.
10. Powers JH. The abuse of rest as a therapeutic measure in surgery. *The journal of the american medical association* [Internet]. 1944; 125(16):[1079-83 pp.].
11. Dock W. The evil sequelae of complete bed rest. *Journal of the American Medical Association*. 1944;125(16):1083-5.
12. Kortebein P. Rehabilitation for hospital-associated deconditioning. *American journal of physical medicine & rehabilitation*. 2009;88(1):66-77.
13. Jones CT, Lowe AJ, MacGregor L, Brand CA, Tweddle N, Russell DM. A randomised controlled trial of an exercise intervention to reduce functional decline and health service utilisation in the hospitalised elderly. *Australasian journal on ageing*. 2006;25(3):126-33.
14. Timmer AJ, Unsworth CA, Taylor NF. Rehabilitation interventions with deconditioned older adults following an acute hospital admission: a systematic review. *Clinical rehabilitation*. 2014;28(11):1078-86.
15. Martínez-Velilla N, Herrero AC, Cadore EL, Sáez de Asteasu ML, Izquierdo M. Iatrogenic Nosocomial Disability Diagnosis and Prevention. *Journal of the American Medical Directors Association*. 2016;17(8):762-4.
16. Bender D, Holyoke P. Why some patients who do not need hospitalization cannot leave: A case study of reviews in 6 Canadian hospitals. *Healthcare Management Forum*. 2018;31(4):121-5.
17. Oda K, Montayre J, Parsons J, Boyd M. Oral Care in Hospital Settings: Breaking the Vicious Circle of Older Adult Deconditioning. *Journal of Gerontological Nursing*. 2021;47(6):7-12.
18. Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-Associated Disability: "She Was Probably Able to Ambulate, but I'm Not Sure". *JAMA*. 2011;306(16):1782-93.
19. Fox MT, Sidani S, Persaud M, Tregunno D, Maimets I, Brooks D, et al. Acute Care for Elders Components of Acute Geriatric Unit Care: Systematic Descriptive Review. *Journal of the American Geriatrics Society (JAGS)*. 2013;61(6):939-46.
20. Guilcher SJT, Overall AC, Cadel L, Li J, Kulski K. A qualitative study exploring the lived experiences of deconditioning in hospital in Ontario, Canada. *BMC Geriatrics*. 2021;21(1):169.

21. Caraballo C, Dharmarajan K, Krumholz HM. Post hospital syndrome: Is the stress of hospitalization causing harm? *Revista española de cardiología* (English ed). 2019;72(11):896-8.
22. Moersch LS. The Experience of Early Mobility after One Week of Hospital-Acquired Deconditioning [Ph.D.]. Ann Arbor: University of Missouri - Saint Louis; 2020.
23. U.S. Centers for Medicare and Medicaid Services. Inpatient rehabilitation care 2021 [Available from: <https://www.medicare.gov/coverage/inpatient-rehabilitation-care>.
24. Mong S, N. Taking care of our own: When family caregivers do medical work. New York, USA: Cornell University Press 2021.
25. Andreewsky E, Bourcier D. Abduction in language interpretation and law making. *Kybernetes*. 2000;29(7/8):836-45.
26. Jetli P. Abduction as the mother of all argumentation. *Argument Cultures: Proceedings of OSSA 09*; University of Windsor 2009. p. 1-10.
27. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*. 2016;5(1):210.

Appendices

Appendix I: Initial search strategies

Medline (Ovid)

#	Query	Results from 4 Jan 2022
1	(decondition* or decondition* syndrome).mp. [mp=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]	2443
2		64

	(decondition* adj2 (bed-rest or bedrest)).mp	
3	decondition*.mp.	2443
4	(decondition* adj4 (physiolog* or pathophysiol* or patholog*)).mp. [mp=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]	74
5	(decondition* adj3 (diagnos* or assess*)).mp.	26
6	(diagnos* or respond* or response* or recogni*).mp. [mp=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]	9213494
7	(present* or "clinical present*" or "clinical finding*").mp. [mp=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,	4763551

	synonyms]	
8	(symptom* adj4 (assess* or evaluat*)).mp.	64850
9	Interven*.mp. [mp=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]	1244408
10	(differen* adj2 diagnos*).mp. [mp=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]	549644
11	(framework or tool or classif*).mp. [mp=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]	2033448
12	exp Diagnosis/	9088124
13	((inpatient* or hospital) adj2 stay*) or "inpatient* stay*").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-	103196

	heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
14	(rehabilitat* or rehab cent* or community bed).mp. [mp=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]	351137
15	1 or 2 or 3 or 4 or 5	2443
16	6 or 7 or 8 or 9 or 10 or 11 or 12	17306748
17	13 or 14	449844
18	15 and 16 and 17	513

CINAHL (Ebsco Host)

Major concepts, subject headings

#	Query	Results as of 4 Jan 2022
1	decondition* or decondition* syndrome	1070
2	(decondition* n2 (bed-rest or bedrest))	17
3	(MH "Deconditioning")	411
4	(decondition* n4 (physiolog* or pathophysiol* or patholog*))	35
5	(decondition* n3 (diagnos* or assess*))	18
6	(diagnos* or respond* or response* or recogni*).	1747294

7	(present* or "clinical present*" or "clinical finding*").	877451
8	(symptom* n4 (assess* or evaluat*)).	26285
9	Interven*	533829
10	(differen* w2 diagnos*)	25527
11	(framework or tool or classif*).	727241
12	(MH "Diagnosis+")	2033875
13	((inpatient* or hospital) n2 stay*) or "inpatient* stay*")	64801
14	(rehabilitat* or rehab cent* or community bed).	196826
15	S13 OR S14	256561
16	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12	3723860
17	S1 OR S2 OR S3 OR S4 OR S5	1074
18	S15 AND S16 AND S17	310

Appendix II: Data extraction instrument

Source characteristics	
Study citation (authors, year, title, DOI)	
Study type (qual, quant, mixed)	
Methods +/- methodology	
Country	
Cohort characteristics (age, gender, occupation if given)	
Setting (inpatient – acute or rehab)	
Study aim	

Study outcomes	
Data/Results	
Definition given for hospital acquired deconditioning	
Stated prevalence (and citation)	
Operational parameters (eg functional decline)	
Compared syndromes (eg post hospital, ICU, frailty) how is deconditioning differentiated?	
Assessment/diagnostic criteria (eg loss of ADLs)	
Risk factors for deconditioning	
Clinical course including presenting feature, trajectory, natural progression	
Professionals involved in assessment/management	
Intervention and expected outcome	
Outcome measures utilised	
HAD presented as (a) an adverse event (avoidable harm), (b) a consequence of hospitalisation or (c) a physiological event demonstrated by functional loss.	
If applicable	
Scale or framework for judging severity of deconditioning	
Rationale for importance of studying HAD	

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Search database rationales

Database	Search and Index Terms	Justification	Number of results Jan/Feb 2021	Updated results 17/07/2021 (# of new papers)
Medline (Ovid)	(Decondition* or Decondition* syndrome) or (decondition* adj2 (bed-rest or bedrest)) or (decondition* adj4 (physiolog* or pathophysiol* or patholog*)) or (decondition* adj3 (diagnos* or assess*)) or de-conditioning.mp or exp deconditioning/ or de\$condition*.mp. AND (diagnos* or respond* or response* or assess*)) or (present* or “clinical present*” or “clinical finding*”) or symptom* adj4 (assess* or evaluat*) or interven* or (differen* adj2 diagnos*) or (framework or tool or classif*) or exp diagnosis AND (((inpatient* or hospital) adj2 stay*) or “inpatient* stay*”) or	National library of medicine database. Captures biomedicine and health studies in the areas of behaviour sciences, life sciences, chemical sciences and bioengineering. Chosen to capture biological and medical explanations of HAD.	524 (entered into rayyan = 524)	66

	(rehabilitat* or rehab* cent* or community bed)			
CINAHL (Ebsco) Cumulative index of Nursing and Allied Health Literature	Decondition* or decondition* syndrome (decondition* n2 (bed-rest or bedrest)) or (MH "deconditioning") or (decondition* n4 (physiolog* or pathophysiol* or patholog*)) or (decondition* n3 (diagnos* or assess*)) or (diagno* or respond* or response* or recogni*) or (present* or "clinical present*" or "clinical finding*") or (symptom* n4 *(assess* or evaluat*)) or interven* or (differen* w2 diagnos*) or (framework or tool or classif*) or (MH "diagnosis+") AND (((inpatient* or hospital) n2 stay*) or "inpatient* stay*") or (rehabilitat* or rehab*	Allied health and nursing literature database capturing health studies from a multidisciplinary perspective. Chosen to show breadth of assessors and meanings depending on professional affiliation.	351 (Entered into rayyan = 351)	26

	cent* or community bed)			
EMBASE (OVID)	(Decondition* or Decondition* syndrome) or (decondition* adj2 (bed-rest or bedrest)) or (decondition* adj4 (physiolog* or pathophysiol* or patholog*)) or (decondition* adj3 (diagnos* or assess*)) or exp deconditioning/ or de\$condition*.mp.AND (diagnos* or respond* or response* or assess*)) or (present* or “clinical present*” or “clinical finding*”) or symptom* adj4 (assess* or evaluat*) or interven* or (differen* adj2 diagnos*) or (framework or tool or classif*) or exp diagnosis AND (((inpatient* or hospital) adj2 stay*) or “inpatient* stay*”) or (rehabilitat* or rehab* cent* or community bed)	Captures international biomedical and pharmaceutical literature. Chosen for cross country comparison of HAD explanations.	793 results (831 entered into rayyan)	116

PsychInfo) (OVID)	(Decondition* or Decondition* syndrome) or (decondition* adj2 (bed-rest or bedrest)) or (decondition* adj4 (physiolog* or pathophysiol* or patholog*)) or (decondition* adj3 (diagnos* or assess*)) or exp deconditioning/ or de\$condition*.mp. or de-conditioning.mp AND (diagnos* or respond* or response* or assess*) or (present* or “clinical present*” or “clinical finding”) or symptom* adj4 (assess* or evaluat*) or interven* or (differen* adj2 diagnos*) or (framework or tool or classif*) or exp diagnosis AND (((inpatient* or hospital) adj2 stay*) or “inpatient* stay”) or (rehabilitat* or rehab* cent* or community bed)	Search platform for American Psychological literature. Chosen to capture behavioral and psychological features or experiences of HAD.	47 (47 entered into rayyan)	3
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AMED (OVID) – Allied and Complimentary medicine	As per all ovid searches	Database capturing literature complementary and alternative therapies. Chosen to ensure wider components of HAD are captured from multiple perspectives.	106 – repeats mostly but some novel (106 entered into rayyan)	0
PEDro - Physiotherapy Evidence Database	Decondition* and hospital* or inpatient*	Database capturing physiotherapy and allied health literature. Chosen to focus on rehabilitation focused literature.	4 (4 entered into rayyan)	2
OpenGrey – now GreyNet	Decondition*	Covers grey literature (reports, dissertations, conference papers) within a European context.	Link not currently opening- now archived in GreyNet (multiple sources) 2 found (2 entered into rayyan as separate files)	0 Greynet no longer seems to have a search function
GreyLit	Decondition* or functional decline	Covers grey literature (theses, reports, conference proceedings etc). Extends search beyond peer reviewed and traditionally published evidence	0	Can no longer search – subscription required
Cochrane Library		Database for Cochrane systematic reviews. Chosen to ensure scoping review not		1

		already completed recently.		
ProQuest dissertations and theses	hospital* AND (acquire* or associat*) AND decondi*	Chosen to search unpublished multidisciplinary theses and dissertations.		9
Below not entered into rayyan				
Epistimonikos	Decondition* and hospital* or inpatient* and diagnosis*	Chosen to search unpublished work and registered protocols for upcoming or in progress systematic reviews.	3 (?2 relevant)	
JB1 Evidence Synthesis	Decondition* and hospital* or inpatient*	Chosen to search unpublished work and registered protocols for upcoming or in progress systematic reviews conducted under the JB1 methodology.	23 (? 1	
Trip – Turning research into practice	Deconditioning	Covers literature (including protocols) that is practice focused	1120	
ETHOS	Decondition*	UK thesis repository	18 (?2 relevant inactive older adults- deconditioning as an adverse event. investigating and preventing loss of function in frail older adults- doesn't talk	

			about deconditioning in abstract) https://ethos.bl.uk/OrderDetails.do?did=15&uin=uk.bl.ethos.793206	
OpenGrey	Decondition*	Covers grey literature (reports, dissertations, conference papers) within a European context.	Link not currently opening	
GreyLit		I'm not yet able to find a link to search this one.		

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Added articles (snowballed for screening – double blind) w/c 15 august 2022 (cant use this table to draw frequency citation counts as some articles already included in primary search) taken from zotero

Author and year	Present on excel sheet	What column/purpose	Cited from	Included by me?	Included by Katie	On email
1. Dharmarajan et al 2015	y	Assessment	Johnson 2019	y		y
2. Cohen 2002	y	Assessment/ dx Outcome measures	Timmer 2014	n		y
3. Brownlee et al 2017	y	Clinical course	Johnson 2019	n		y
4. De Klein et al 2019	y	Contributory factors	Koh 2020	y		y
5. Gravlin and Bittner 2010	y	Contributory factors	Koh 2020	n		y
6. Law et al 1998	y	Contributory factors	Unsworth & Eyres 2005	n		y
7. Maloney et al 2015	Y	Contributory factors	Koh 2020	n		y
8. Resnick et al 2012	y	Contributory factors	Ritchie 2017			
9. Sims-Gould et al 2017	y	Contributory factors	Ritchie 2017	n		y
10. Wilcock 1998 A + B	Y (book and key note speech)	Contributory factors	Unsworth & Eyres 2005			
11. Brown et all 2004	y	Definition	Smith 2020	y	y	y
12. Brown et al 2009	y	Definition	Smith 2020	y	y	y
13. Brown et al 2006	y	Definition	Doherty-King 2013		y	
14. Brown et al 2012	y	Definition	Norheim 2017	y		y
15. Buschbasher and P 2000	y	Definition	Kortebein 2009	n- cant get book		y
16. Chang 2019	y	Definition	Guilcher 2021	y	y	y
17. Chastin 2019	y	Definition	Smith 2020	y	y	y
18. Combes et al 2003	y	Definition	Venturelli 2011	N not condition of interest		
19. Convertino et al 1998	y	Definition	Bailey 1997 (ITU)	n		
20. Covinsky et al 2011	y	Definition	Timmer 2015 Timmer 2019	y	y	

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		Incidence	Wakabayas 2014 a			
21. Creditor 1993	y	Definition	Hoenig 1997 Timmer 2015 Gordon 2019 Timmer 2019	y	y	y
22. Dean 2008	y	Definition	Drolet 2013 (ITU)	no		y
23. Detsky & Krumholz 2014	y	Definition	Guilcher 2021	y		y
24. English et al 2010	Y	Definition	Dirkes 2019			
25. Gerely et al 2000	y	Definition	Manning 2009	Need full reference		y
26. Gillis and Macdonald 2005	y	Definition	Ng et al 2007 Gordon 2019	y	y	y
27. Graf 2006	y	Definition	Guy 2012 Koh 2020	y		y
28. Halar and Bell 2005	Y	Definition	Kortebein 2009	N cant find book		y
29. Haley et al 2011	y	Definition	Galloway 2016	y	y	y
30. Hoenig and Rub 1991	y	Definition	Hoenig 1997 Baztan et al 2009 Kortebein 2009 Guy 2012 Timmer 2014, 2015	Requested	y	y
31. Hogarth et al 1997	y	Definition	Norheim 2017			n
32. Holtslag et al 2007	y	Definition	Higgins 2020	n		y
33. Inouye 2000	y	Definition	Guy 2012	Y	y	y
		Incidence	Laneuville 2021			

			Raj 2007			
34. Kramer et al 2017	y	Definition	Laneuville 2021	n		y
35. Krumholz 2013	y	Definition	Johnson 2019 Guilcher 2021			
		Assessment	Johnson 2019			
		Clinical course	Johnson 2019			
36. LeBlanc 1992	y	Definition	Hoenig 1997	n		y
37. Mahoney 1998	y	Definition	Doherty King 2013	N falls		y
		Incidence	Doherty King 2013 De Morton 2007			
		Risk factors	De Morton 2007			
38. Monteleon et al 2015	y	Definition	Petrucci 2018	y		y
39. Montuclard 2000	y	definition	Venturelli 2011	n- community follow up		y
40. Schweickert et al 2009	y	Definition	Husain- Qureshi 2019	y		y
41. Siebens 1990 (in Kemp)	y	Definition	Conlin-Shaw 1996 Unsworth & Eyres 2005 Killewich 2006 Siebens 2000	n		y
42. Stevens et al 2009	y	Definition	Mendez-Tellez 2012	n		y
43. Tanaka and seals 2003	y	Definition	Killewich 2006	n		y

44. Ticinesi et al 2017	y	Definition	Norheim 2017	n		y
45. Van Vliet et al 2017	y	Definition	Gordon 2019	y		y
46. Vorhies and Riley 1993	y	Definition	Spencer et al 1999	y		y
47. Covinsky 2003	y	Incidence	Suriyaarach 2020 Kamper 2020 Timmer 2019 Timmer 2015	y		y
48. Gill et al 2004	y	Incidence	Falvey 2015	n		
49. Gill et al 2009	y	Incidence	Smith 2020	n		y
50. Hirsch et al 1990	y	Incidence	Siebens 2000 Doherty King 2013	y		y
51. Jencks et al 2009	y	Incidence	Johnson 2019	n		y
52. Jette et al 1987	Y incidence	Incidence	Killewich 2006	n		
53. Lamont et al 1982	y	Incidence	Siebens 2000 Killewich 2006	n		y
54. McVey 1989	y	Incidence	Timmer 2014 Doherty king 2013	n		y
55. Okawa 2009	y	Incidence	Wakabayas 2014b			
56. Sager et al 1996	Y -	Incidence	Siebens 2000 Unsworth & Eyres 2005	y		y
57. Sier 1987	y	Incidence	Siebens 2000	n		y
58. Warshaw et al 1982	y	Incidence	Siebens 2000	n		y
59. Wu et al 2006	y	Incidence`	Timmer 2019 Timmer 2015	n		y
60. Rubenstein et al 1984	Y	Outcome measures	Timmer 2014	N pre 1990	y	y
61. White et al 1994	y	Outcome measures	Timmer 2014	N		y
62. Young et al 2007	Y	Outcome measures	Timmer 2014	n		
63. Kessler et al 2010	y	Professionals	Ritchie 2017	n		y

On sheet but not in zotero / somewhere else (all on email now) – need to make sure all are on zotero, divide into sections on definition, incidence etc. only upload definition ones for further screening?

Author/ year	Column	Cited from	Added to zotero / screened	Included?	Included by Katie
Australian Rehab Outcomes	Assessment / dx	Suriyaarach et al 2020			
Sanchez- Rodriguez et al 2014	Assessment/ diagnostic	Churilov & Churilov 2018	yes	y	y
Kwon et al 2012	Clinical course	Petrucci et al 2018	Yes	n	
Whiteford 2000	Contributory factors	Unsworth & Eyres 2005	yes	N	
British Geriatrics Society	Definition	Sayer 2021	Cant find – no citation available		
IRF PAI manual	Definition	Galloway 2016	?	n	
Pearson 2002	Definition	Doherty king 2013	Cant find – no citation available		
Taber Cyclopedic	Definition	Kortebein 2009			
Cox 2009	Incidence	Engel 2013	yes	n	
De Jonge et al 2002	Incidence	Mendez-Tellez	Yes	N	
Gillik et al 1982	Incidence	Raj et al 2007	Yes	N	
Hermans et al 2014	Incidence	Latronico 2015	Yes	n	
Herridge et al 2011	Incidence	Engel 2013	Yes	N	
Inouye 1993	Incidence	Manning 2009	Yes	Full text requested , yes for now	y
Jones 2012	Incidence	Engel 2013	Yes	N	

De Jonghe et al 2004	Incidence	Latronico 2015	Yes	N	
Kortebein et al 2008	Incidence	Kortebein 2009	Yes	Y	y
Livingston 2009	Incidence	Engel 2013	Yes	N	
Timmers et al 2011	Incidence	Engel 2013	Yes	N	
Van der Schaaf 2009	Incidence	Engel 2103	Yes	N	
Mulder et al 2015	Other findings	Higgins 2020	Yes	n	
Morris 2007	Physiology	Higgins 2020	yes	y	
Morris 2011	Physiology	Higgins 2020	Yes	n	
Winkleman 2009	Physiology	Higgins 2020	yes	y	

82 snow balled articles, not included 4 unable to locate

Included 27 from me as of 15th august 2022

Katie screened 16/8/22 – included 13, excluded 53, 16 conflict. Post conflicts = 18

(I went with katie's decision on most of them, the only ones I queried were Krumholz, van Vliet and Detsky)

Added in to the 13 – graf and sanchez which I had actually said yes to but clicked no like an idiot.

Yellow highlight = included no conflicts, blue highlight = included post full text

I've included 16 from full texts – 17/8/22

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Seed articles from application

1. Mudge AM, O'Rourke P, Denaro CP (2010). Timing and Risk Factors for Functional Changes Associated With Medical Hospitalization in Older Patients. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*. 2010;65A(8):839-846. doi:10.1093/geronlba/65.8.839
2. Hanson S, Jones A, Lane K and Penhale B (2019). Evidence Briefing: Hospital-Associated Deconditioning (HADS) Available at https://ueaeprints.uea.ac.uk/id/eprint/71832/1/Evidence_Briefing_HADS_Approved_FINAL_version.pdf [Accessed 10/12/20]
3. T.M. Gill, E.A. Gahbauer, L. Han, H.G. Allore (2009). Functional trajectories in older persons admitted to a nursing home with disability after an acute hospitalization. *Journal of the American Geriatrics Society*, 57 pp. 195-2010
4. Smith TO, Sreekanta A, Walkeden S, Penhale B, Hanson S (2020). Interventions for reducing hospital-associated deconditioning: A systematic review and meta-analysis. *Arch Gerontol Geriatr*. Sep-Oct; 90:104176. doi: 10.1016/j.archger.2020.104176. Epub 2020 Jul 6. PMID: 32652367
5. Falvey JR, Mangione KK, Stevens-Lapsley JE (2015). Rethinking Hospital-Associated Deconditioning: Proposing a Paradigm Shift. *Phys Ther*; 95(9):1307-1315. doi:10.2522/ptj.20140511

Other useful articles I've found

1. Loyd 2020 – prevalence – would've picked up somewhere else

Source type definitions (by research design)

Type	Definition/ Criteria
Experimental / Interventional	
RCT	Randomized controlled trial – any form of randomization
Interrupted time series / pre and post designs/ Historical control	Eg QI work, audit/ measure, intervention, audit/measure and compare Compared to hospitals' previous outcomes
Interventional Cohort / self-controlled	Cohort study undergoing intervention with baseline and follow-up measures (no control group)
Observational	
Retrospective cohort	Eg notes audits for outcomes Case-control Case series
Prospective cohort	Eg outcomes of a rehab unit by condition Longitudinal designs
Cross-sectional (cohort)	Snap shots, eg prevalence of a condition at any given time Could be descriptive or survey results
Consensus	Expert agreement, guidelines, etc
Literature	
Expert opinion	Authors view point on strengths and weaknesses of a hypothesis or theory. No new data presented
Commentary	Draw attention to or criticize published work. No new data, may have anecdotal evidence, heavily dependent on authors perspective . Tend to be quite short
Literature review	Non systematic approach/background articles
Systematic review	Systematic reviews or scoping reviews
Perspective article	Takes a new perspective on a topic – eg current advances, innovation, may have original data . It May be peer reviewed
Book Chapter	

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commentary

[s/6-article-types-that-journals-publish-a-guide-for-early-career-researchers](#)

[g.uk/public-health-textbook/research-methods/1c-health-care-evaluation-he](#)

generally useful link

1. Original research
2. Review articles
3. Clinical Case Study
4. Clinical Trial
5. Perspective, opinion and commentary
6. Book Reviews

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<https://www.healthknowledge.org.uk/public-health-textbook/research-methods/1c-health-care-evaluation-health-care-assessment/study-design-assessing-effectiveness> generally useful link

Source characteristics	
Study citation (authors, year, title, DOI)	
Source type - Study type (qual, quant, mixed) OR literature or background or opinion piece or abstract/poster	
Methods +/- methodology	
Country	
Cohort characteristics (age, gender, occupation if given)	
Setting (inpatient – acute or rehab)	
Study/research aim	
Study outcomes	
Profession of author (eg GP/ geriatrician, physio etc)	
Theme: consequence = occurs as part of hospital care, OR physiological syndrome demonstrated by functional loss, OR adverse event = preventable (usually found in rationale/background)	
Definition or description given for hospital-acquired deconditioning (+ source)	
What is the diagnostic criteria for HAD?	
Cause given	
Physiological changes discussed (?pulled from other populations)	
Stated incidence and prevalence (and citation)	
Assessment/diagnostic criteria (eg loss of ADLs)	
Risk factors for deconditioning – individual traits	
Associated co-morbidities	
Outcome measures utilised	
How is HAD operationalised?	
Alternative names for HAD	
Clinical course including presenting feature, trajectory, associated consequences	
Contributory factors for HAD – environmental, economic, social, big picture	
Operational parameters (eg functional decline)	
Professionals involved in assessment/management/ prevention/ treatment	
Preventative practices/ strategies	
Intervention and expected outcome (treatment targets)	

How is HAD different to other hospital-acquired syndromes	
Compared syndromes (eg post hospital, ICU, frailty) how is deconditioning differentiated?	
If applicable	

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Scale or framework for judging severity of deconditioning	
Rationale for importance of studying HAD	
Other text/ findings of interest	
Reflections/ questions arising	

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Towards a common definition of Hospital-Acquired Deconditioning in adults: A Scoping Review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2024-086976.R1
Article Type:	Original research
Date Submitted by the Author:	17-Oct-2024
Complete List of Authors:	Westlake, Meri; University of Nottingham Cowley, Alison; Nottingham University Hospitals NHS Trust, Research & Innovation Robinson, Katie; University of Nottingham, Gordon, Adam; University of Nottingham, Division of Rehabilitation and Ageing; National Institute for Health and Care Research
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health services research
Keywords:	Review, Hospitalization, Inpatients
Note: The following files were submitted by the author for peer review, but cannot be converted to PDF. You must view these files (e.g. movies) online.	
Figure1prisma26.09.2024.svg	

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Title: Towards a common definition of Hospital-Acquired Deconditioning in Adults: A Scoping Review

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Keywords: Hospital-Acquired Deconditioning, Scoping Review, Concept, Diagnosis, Adults

Word Count: 4357

Abstract

Background: Hospital-acquired deconditioning is a term utilised in clinical practice, describing a loss of physical and/or cognitive function associated with hospitalisation. Previous reviews have addressed interventions, its prevalence in older adults and potential assessment tools. However, each review has reported a core limitation, the need for an agreed-upon definition and diagnostic criteria for hospital-acquired deconditioning.

Objective: We aimed to identify key components used to define hospital-acquired deconditioning in adults. We sought to do this by : identifying diagnostic criteria; ,describing how authors operationalised HAD; and describing differences between HAD and other immobility-linked syndromes. This article focuses on how hospital-acquired deconditioning is understood and operationalised.

Design: A scoping review using the Joanna Briggs Institute methodology for evidence synthesis.

Eligibility Criteria: Published in English after 1st January 1990, investigating adults over 18, set in inpatient rehabilitation or acute care settings, and including either a definition or

description of hospital-acquired deconditioning or an outline of strategies to assess, prevent or manage hospital-acquired deconditioning.

Sources of Evidence: Published and grey literature, no restriction was placed on study design

Charting methods: Relevant data, where available, was extracted from each source using a proprietary data extraction template.

Results: Ninety-eight articles were included from 2163 retrieved results. Thirty-two were from rehabilitation or post-acute care settings, 49 from acute care, 15 from intensive care, and 2 from other settings. The literature was diverse in methodology and research question addressed. Hospital-acquired deconditioning was poorly defined, no consistent patterns were identified in aetiology and sequelae; diagnostic criteria were not fully agreed upon.

Conclusions: The literature on hospital acquired deconditioning is large, diverse and incomplete. Further work is required to develop a shared definition of hospital-acquired deconditioning; enabling researchers to coalesce for better understanding of the phenomenon, and clinicians, in turn, to better treat and mitigate against it

Review Registration: Protocol published on OSF; available at <https://osf.io/b5sgw/>

Strengths and Limitations:

- This review utilised a standard, recognised methodology for evidence synthesis, and followed a pre-published protocol.
- A diverse range of study designs were scoped, resulting in a broad conceptual overview.
- This enabled the variation and lack of agreement across the literature to be described in a way that a narrower review could not have achieved.
- Due to the breadth of this review, some depth has been sacrificed, and an element of subjectivity has been introduced in interpreting the results.
- In line with Joanna Briggs Institute guidance, no clinical decisions should be made based on this scoping review due to a lack of critical appraisal of the included sources.

Funding

This scoping review was supported by the National Rehabilitation Centre funded as part of Meri Westlake's PhD project titled "How do Healthcare Professionals Recognise and Respond to Hospital-Acquired Deconditioning: A Mixed Methods Synthesis and Consensus."

Adam Gordon is an NIHR Senior Investigator and part-funded by the NIHR Applied Research Collaboration East Midlands [ARC-EM]. The views expressed in this publication are those of the author[s] and not necessarily those of the NIHR, NHS or the UK Department of Health and Social Care.

Competing interests

Adam Gordon has received honoraria from Gilead Sciences in 2021 and Pfizer Inc in 2023 for consultancy work. Meri Westlake, Katie Robinson and Alison Cowley have no competing interests to declare.

INTRODUCTION AND RATIONALE FOR REVIEW

Hospital-acquired deconditioning is portrayed in the media as describing a loss of physiological and cognitive capacity, manifesting as diminished function in activities of daily living, associated with a stay in hospital [1]. It is thought to result from periods of immobility, inactivity, or reduced activity [2–4]. Around 30% of older adults experience deconditioning during or following a hospital stay [5]; however, the incidence in adults has not been reported.

Previously conducted systematic reviews of interventions for hospital-acquired deconditioning found limited effectiveness of interventions [6,7]. One reason given for this is that hospital-acquired deconditioning is poorly conceptualised, rendering interventions challenging to design and effectiveness difficult to measure [5,7,8]. Reviews refer to and conceptualise deconditioning occurring during hospitalisation in different ways and using different terminologies [8].

Several other syndromes have been described that overlap with hospital-acquired deconditioning in that they describe either physiological phenomena or clinical syndromes which commonly occur in hospitals during periods of immobility and which are associated with deteriorating performance in Activities of Daily Living [ADLs]. These include Intensive Care Acquired Weakness [ICU-AW] [9,10], sarcopenia, hospital-associated disability [5][5], and post-hospital syndrome [9,10] – each of which comes with specific, discrete, but overlapping diagnostic criteria.

Against this background, and in preparation for empirical research into hospital-acquired deconditioning, we conducted a scoping review to describe and make sense of this diverse literature. We aimed to identify key components used to define hospital-acquired

deconditioning in adults. The objectives of this review were to: describe diagnostic criteria used for hospital-acquired deconditioning; describe how hospital-acquired deconditioning is understood and operationalised within and between studies; and ascertain how other syndromes relate to hospital-acquired deconditioning.

METHODS

We chose the Joanna Briggs Institute scoping review methodology because this is useful for concept clarification when there is variability or uncertainty in the literature [11]. It allows for multiple systematic reviews that may have focused upon different or overlapping populations and for reviews and original empirical research to be considered in parallel [12]. A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, PROSPERO, Epistemonikos and JBI Evidence Synthesis found no current or underway systematic or scoping reviews on the topic. The protocol was registered on the Open Science Framework in January 2022 and is available online and in the supplementary material [13].

Search terms

Seven electronic databases – AMED, CINAHL, Cochrane Library, EMBASE, PEDro, and PsychInfo were searched from inception to February 2022 and updated in July 2023 and September 2024. No limits were applied at the database search stage on date, language, subject or source type. Three registers – ProQuest thesis and dissertations, GreyNet and GreyLit [grey literature databases] were used to find publications outside the peer-reviewed literature, which might include a working definition of hospital-acquired deconditioning.

The initial search string was developed using MEDLINE with support from the University of Nottingham Library Service, and the syntax was adapted for use in other databases. The MEDLINE search string is provided as appendix A in supplementary file “Appendices and Supplementary Files for “Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”

Citation searching was undertaken to find further articles that met eligibility criteria.

Eligibility criteria

Articles were eligible for inclusion if published in English, after 1st January 1990, focussed on adults over 18, set in inpatient rehabilitation or acute care settings and including either: a definition or description of hospital-acquired deconditioning; or an outline of strategies to

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3 assess, prevent or manage hospital-acquired deconditioning. Sources were excluded if
4 published before 1990, including paediatric, animal, or space flight population, or if hospital-
5 acquired deconditioning was discussed in relation to specific health conditions rather than as
6 a generic phenomenon. These criteria were implemented based on the acknowledgement
7 that physiological decline, often cited as contributing to negative hospital outcomes, begins
8 in the third decade [14].. In addition, this scoping review placed no geographical limitations
9 to account for the wide variation in the descriptor used for residential clinical facilities where
10 patients may be affected by hospital-acquired deconditioning[15] . Specific health conditions
11 were excluded as it was anticipated that these conditions result in limitations as part of their
12 presentation. Therefore, it would be unclear what symptoms and signs were reported due to
13 the underlying condition, and which were due to systematic processes resulting in hospital-
14 acquired deconditioning.

15
16 Citations were organised and shared between reviewers using Rayyan [16]. Duplicates were
17 removed manually by the lead author [MW]. Two independent reviewers [from MW & KR,
18 LH, AC] conducted the title and abstract screening. Two independent reviewers [from MW,
19 KR, AC, ALG] conducted full text screening. Where full texts of included citations were
20 unavailable, authors were approached once if contact details were publicly available. Where
21 full texts were unavailable, data were extracted from abstracts. Including data from abstracts
22 is compatible with the JBI methodology [17,18] and reflects a commitment to the breadth of
23 the review. This acknowledges that research on hospital-acquired deconditioning often takes
24 the form of quality improvement projects published as conference posters that communicate
25 important records of what hospital-acquired deconditioning is being understood as in clinical
26 practice-based research. Sources identified through citation searching were independently
27 screened for inclusion by MW and KR at the title, abstract and full-text levels on Rayyan.
28 Conflicts during screening were resolved through discussion between independent
29 reviewers, with a third reviewer used to break ties where conflict couldn't be resolved.

30
31 After title and abstract screening, the authorship team deviated from the published protocol
32 by refining the inclusion and exclusion criteria [the final criteria are discussed above] [13].
33 The refined criteria are available to view in appendix B. This was due to an unmanageable
34 number of potential full texts to review, given available resources.

35 36 37 Data charting process

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39 Included sources were entered into a data extraction tool appendix C, which was piloted
40 using five studies of varying types to ensure fitness for purpose. Data extraction was

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completed in full by MW and checked by ALG. KR and AC each checked a third of the data set for accuracy.

Data items

Items extracted from each source, where available, included article characteristics [e.g publication type, country of origin, authorship membership], characteristics and definitions of hospital-acquired deconditioning [e.g. diagnostic criteria for hospital-acquired deconditioning, signs and symptoms reported, definitions or descriptions given for hospital-acquired deconditioning], physiological changes [body system changes], sequelae of hospital-acquired deconditioning [complications or consequences arising from hospital-acquired deconditioning], primary causes and contributors to hospital-acquired deconditioning [reported causes and factors associated with hospital-acquired deconditioning], and risk factors for hospital-acquired deconditioning [individual and contextual factors associated with the development of hospital-acquired deconditioning].

Data analysis

Data were analysed by publication rate by year, country of publication, study type, participant type and study settings. Results were analysed using a narrative approach and in descriptive tables.

Data quality

In line with the JBI scoping review methodology, critical appraisal of sources was not undertaken, and the risk of bias was not formally assessed. However, where relevant in the results, citations from primary research are marked *, and articles utilising quality improvement methodology in clinical settings are marked ^T, with the remainder representing secondary analyses or syntheses

Patient and public involvement

Specific PPI was not sought for this scoping review. However, MW’s PhD thesis, of which this forms a part, has benefitted from consultation with several PPI groups throughout its design and execution to ensure the outcomes remain relevant.

RESULTS

A total of 2403 articles were identified, of which 750 were excluded through deduplication. A further 1347 and 123 were excluded at the title and abstract, and full-text screening stages

respectively, leaving 103 for inclusion in the full review. A PRISMA diagram is shown in Figure 1.

<figure 1>

Figure 1 PRISMA flow chart demonstrating the article selection process

The majority of articles [n = 75] were published from 2010 onwards. Forty-nine were from the USA and Canada, 14 from the UK and 11 from Australia. Seventeen of the remainder came from Europe, six from Asia, and four from the Americas.

Seventy-seven sources were published as journal articles; the remaining twenty-six were abstracts from conference materials. Seventy-seven articles were empirical research studies. First authorship data were available for 67 sources, of which 35 were medical doctors, 12 physiotherapists, ten nurses and six occupational therapists. The remainder were written by a diverse range of disciplines. The authorship team was multidisciplinary for 27, and author disciplines were not identifiable for 36 publications.

Table 1 study designs of the included sources

Research Type	Number of Sources	Relevant Citations
Interventional/Experimental	8	
RCT	3	[19–21]
Pilot/Exploratory RCT	3	[22–24]
Feasibility [cohort]	1	[25]
Evaluation [cohort]	1	[26]
Quality Improvement/Service Development [7]	22	
Interventional	12	[27 ^T ,28 ^T ,29 ^T ,30 ^T ,31 ^T ,32 ^T ,33 ^T ,34 ^T ,35 ^T ,36 ^T ,37 ^T ,38 ^T]
Non-Interventional	3	[39 ^T ,40 ^T ,41 ^T]
Mixed Designs	7	[42 ^T ,43 ^T ,44 ^T ,45 ^T ,46 ^T ,47 ^T ,48 ^T]
Non-Interventional Studies	36	
Prospective Studies	18	[49–66]
Retrospective Studies	12	[67–78]
Cross-Sectional Studies	5	[79–83]

Research Type	Number of Sources	Relevant Citations
Delphi	1	[84]
Qualitative	4	[85–88]
Literature [non-systematic sources denoted with *]	33	
Systematic Review	7	[6–8,89–92]
Narrative Literature Review	3	[93*,94*,95*]
State of the Art Review	2	[96*,97*]
Editorial	17	[98*,99*,100*,101*,102*,103*,104*,105*,106*,107*,108*,109*,110*,111*,112*,113*,114*]
Conference Materials	1	[115*]
Study Protocol	3	[116*,117*,118*]
Total Sources included	98	
Table 1 study designs of the included sources		

A wide range of study designs were used. These are outlined in Table 1. Seven sources were secondary analyses of previously collected data sets [52,63,64,67,74,86,110*] or part of larger research programs [23,87,88,117*].

Study Participant and Context Characteristics

It was not possible to provide a total number of participants to avoid double counting due to the inclusion of systematic reviews, which also draw on the same primary studies as this scoping review. Further, not all included sources reported participant numbers. Descriptive statistics have been provided for interventional, non-interventional and systematic review population characteristics, including the total reported figure of participants, the mean age range [unadjusted] and the gender balance in Table 2.

Study Population	Number	Mean Age Range [years]	Percentage Female %[range]	Relevant citations
Total Interventional Study Participants	38210	54.45-88	32-75	[19–26,27 ^T ,28 ^T ,29 ^T ,30 ^T ,31 ^T ,32 ^T ,33 ^T ,34 ^T ,35 ^T ,36 ^T ,37 ^T ,38 ^T ,42 ^T ,43 ^T ,44 ^T ,45 ^T ,46 ^T ,47 ^T ,48 ^T ,85]
Total Non-Interventional Study Participants	213038	33.4-84.6	0-77	[39 ^T ,40 ^T ,41 ^T ,49–51,53–83,86]
Total Systematic Review Participants	21820 across 68 reviewed original studies	65.95-82.5	39-61	[6–8,89–92]

Table 2 Population characteristics of the included sources

The majority [n=53] of sources, where reported, originated from acute care settings with specialities covering a range of medical and surgical pathways. Rehabilitation or post-acute care was featured in 33 sources, critical care 15, and prehabilitation and research care focus's had one source each. The settings where the included research was conducted are summarised in Supplementary Table 1, available with all supplementary material in the file beginning "Appendices and Supplementary Files".

<Supplementary table 1>

Some studies were conducted partially or exclusively with staff participants rather than patients, summarised in Table 3.

Table 3 Characteristics of non-patient populations from included sources

Non-Patient Populations	Sample recruited from	Number of Participants	Number of Studies	Citations
Registered Nurses	Medical and Surgical Units	27	2	[79,86]
Nursing Associates	Working in Geriatric Medicine	36	1	[46 ^T]
Occupational Therapists	“Experts” [5 years or more experience]	26	1	[84]
Caregivers	For people with Hip Fracture or Discharge Delay	22	1	[88]
Healthcare Providers	Not specified	62	2	[39 ^T ,88]
Decision Makers	For people with Hip Fracture or Discharge Delay	11	1	[88]

Table 3 Characteristics of non-patient populations from included sources

Characteristics and Definitions of Hospital-Acquired Deconditioning

There were sixty-three unique descriptions of hospital-acquired deconditioning. Eighteen of these were generated de novo for a given study with no reference to development, consensus, or validation work.

[25,26,29^T,45^T,47^T,54,62,68,76,81,87,95*,99*,108*,110*,111*,112*,115*]

Popularly cited works included Hoenig and Rubenstein from 1991 [108*], who described hospital-acquired deconditioning as, "In addition to the effects of whatever acute illness brought them to the hospital, older people frequently incur major Functional setbacks stemming from in-hospital treatment and immobilisation." [108* p.220].

In parallel, Siebens et al. in 1990 [3] published the following definition: "Deconditioning is probably best defined as the multiple changes in organ system physiology that are induced by inactivity and reversed by activity." [3 p.177] Researchers using this definition frequently omitted the second half: "The type of changes depend on prior fitness level and the degree of superimposed inactivity." [3 p.177]

These definitions were superseded mainly after 2009 by that of Kortebein's 2009 paper [93*], who described deconditioning as:

"the cumulative effect of a prolonged or complicated hospitalization, a patient has experienced a significant functional decline." [93* p.67].

Fifty-four articles reported an alternative name for Hospital-Acquired Deconditioning, resulting in 27 different terms.

[6,93*,7,91,104*,81,95*,112*,19,20,32^T,33^T,35^T,39^T,41^T,42^T,47^T,50,51,55,61–65,67,68,70,71,79,82,87–90,99*,100*,101*,105*,106*,107*,108*,109*,110*,111*,113*,114*,117*,118*]. The most common alternative name was "functional decline" or "decline in function" or similar description [n=30]. Other descriptors included are listed in Supplementary Table 2.

<Supplementary table 2>

Clinical Presentations of Hospital Acquired Deconditioning

Information on the clinical presentation [signs and symptoms] of hospital-acquired deconditioning from eight rehabilitation, 18 acute care and four intensive care studies was available. The descriptors and features are summarised in supplementary figure 1.

Diagnostic criteria or thresholds for hospital-acquired deconditioning needed to be clarified in much of the literature.

<Supplementary Figure 1>

Hospital-acquired deconditioning was frequently described as being identified at the time patients attempted to return to their usual activities [91*], which often coincided with discharge or the period immediately post discharged when patients were challenged by a return to their usual activities [8,42^T,83,85,95*,106*]

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While most sources referred to the impact of or need for action to address hospital-acquired deconditioning, only a few of the included sources discussed the components/features of hospital-acquired deconditioning, which should be considered diagnostic or presented as core assessment areas. Supplementary figure 1 further demonstrates the range of descriptors and variables utilised across the three clinical populations of acute care, rehabilitation or post-acute and intensive care used to identify suspected cases of hospital-acquired deconditioning.

While also non-diagnostic, Falvey's core cluster of muscular weakness, decreased stamina, diminished appetite, fatigue, and decreased ability to perform ADLs, informed by their understanding of older adults' experience after hospitalisation, was often cited. Falvey and other authors described this pattern of symptoms as associated with loss of functional reserve, decreased physical performance and increased risk of further adverse health events [106*].

Six sources provided explicit criteria for diagnosing hospital-acquired deconditioning [21,54,55,58,66,83]. Of which, only one validated diagnostic framework -the Post-operative Physical Deconditioning Scale [PPDS] provided a framework to judge severity of deconditioning [58,119] This scale categorised hospital acquired deconditioning into three levels of: none, simple and complex, depending on the presence of neurological or orthopaedic co-morbidities and the level of impairment experienced.

The remaining five diagnostic criteria were designed to establish hospital-acquired deconditioning as being present or absent in a binary way. Wakabayashi & Sashika [55] outlined four criteria, all of which were required by the Japanese government for a diagnosis of hospital-acquired deconditioning: [i] a period of inactivity or bed restriction after acute hospitalisation; [ii] a new disability to complete one of the basic ADLs needed to live independently without assistance: bathing, dressing, rising from bed or a chair, using the toilet, eating, or walking across a room during acute hospitalisation; [iii] a new disability is unrelated to a specific neurological or orthopaedic insult, or both; [iv] Barthel index score is 85 points or under. [55] Raj et al. [26] meanwhile, based their diagnosis on the basis of one or more social, emotional, cognitive or physical conditions which interfere with Quality of Life following hospitalisation [26]. Sourd et al, Pavon et al, and Ortiz-Alonso [21,66,83] each used the Katz ADL scale and set a diagnostic threshold of 0.5 to a 1 point decline for diagnosis of hospital-acquired deconditioning.

Physiological Changes in Hospital Acquired Deconditioning

Thirty-two studies reported on physiological changes associated with hospital-acquired deconditioning. Despite numerous papers exploring causal relationships between physiological changes and hospital-acquired deconditioning, a consistent pattern has yet to emerge.

[8,20,32^T,33^T,38^T,42^T,43^T,51,52,57,59,61,73,77,89,93*,94*,97*,98*,99*,100*,101*,104*,105*,106*,107*,108*,109*,111*,112*,114*,117*].

Loss of muscle strength and mass was the most frequently described physiological correlate of hospital admission. Still, it was not consistently associated with clinical measures of functional decline [7,8,35^T,38^T,59,61,66,73,84,96*,97*,111*,114*]

Sequalae of hospital-acquired deconditioning

The most commonly reported sequel of hospital-acquired deconditioning caused was functional decline [7,8,21,25,32^T,33^T,35^T,37^T,38^T,46^T,47^T,50,55,59,61,62,64,66,68–71,73,76,78,81,83,84,86,87,91,93*,95*,100*,102*,105*,106*,107*,108*,109*,111*,114*,120]

Functional decline was described by Graf [111* p.60] as “*the consequence of those physiologic changes [that result from either ageing or immobility] – the resulting inability to perform activities that ensure a person’s independence, such as rising unaided from a chair*”. Inouye et al. [62] defined functional decline as “*a deterioration in self-care skills*” [62 p.645] , or more broadly as “*a decrement in physical and/or cognitive function*” [110* p.1967]

[110*]

Mobility impairment was reported as a specific form of functional decline in seven studies [8,25,47^T,59,70,73,86]., Mobility impairment was purposefully excluded as a feature of hospital-acquired deconditioning in Brown [64] because of near universal implementation of physician-directed bed rest orders on admission in US care settings at the time of writing.

Whilst functional decline, with or without mobility impairment, was identified as the dominant sequel of hospital-acquired deconditioning. Further reported consequences included increased rates of readmission [57,107*], institutionalisation [21,37^T,78,83,107*], cognitive function decline [8,26,110*], a requirement for extended rehabilitation [25,40^T,118*], the generation of additional social costs, extended length of stay [34^T,88] and pressure injuries [35^T,114*].

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Reversibility was presumed with a return to activity in five studies that cited Sieben's 1990 definition [3,20,24,93*,98*,100*]. Sanchez-Rodriguez et al. [116] suggest that newly developed functional limitations following acute medical or surgical intervention may prove reversible. Creditor [1993] was the least optimistic, stating that hospitalisation [of older adults] is often the beginning of an irreversible decline in function termed the *cascade to dependency* [108*,109*]

Primary causes of Hospital-Acquired Deconditioning and contributing factors

Forty-three studies reported that the adverse changes experienced in functional capacity as part of hospital-acquired deconditioning resulted from acute hospital care or exposure. [6–8,20,25,26,32^T,33^T,37^T,42^T,45^T,46^T,48^T,50,55,57,61,62,64,67–69,71,73,79,81,83,86–88,91,93*,95*,97*,105*,106*,107*,108*,109*,111*,112*,116*,120,121]. But just under half [n=16] of these studies made this assertion without reference to underpinning data illustrating a causal association. Nine sources found hospital-acquired deconditioning was unrelated to the admission diagnosis [24,46^T,78,93*,95*,99*,102*,105*,115*]. Nine studies found that impairment during and after hospitalisation was unrelated to a specific neurological or orthopaedic diagnosis [33^T,55,61,70,73,77,81,93*,105*]. Supplementary table 3 further summarises the identified causes and contributors to hospital-acquired deconditioning.

Reduced activity levels [inactivity, bed rest, reduced activity] were reported as an association, correlation, or causative factor for hospital-acquired deconditioning in 34 studies. This finding was predominantly reported in empirical studies [n= 19]. However many other articles made the same assertion [7,8,20,24,25,29^T,32^T,35^T,42^T,45^T,47^T,57,59,67,70,71,73,79,85–87,93*,96*,98*,100*,102*,104*,107*,107*,108*,111*]. Other important phenomena that were associated with the development and subsequent recognition of hospital-acquired deconditioning included medically complex conditions [65,71], persistently raised C-reactive protein [57], and directly disabling pathologies such as stroke or fracture [50,59]. Prolonged hospital stays [7,46^T,65,71,93*,97*,116*], impairment despite successful treatment of the cause of admission [6,95*,109*,116*] and generalised risk and stress from acute hospital care [88,106*] were also suggested, although predominantly in from editorials or quality improvement literature.

The practices of bed rest and activity restriction were reportedly facilitated through tradition [42^T,45^T,94*,98*,102*,113*], a lack of staff resources [27^T,30^T,31^T,34^T,36^T,39^T,42^T,43^T,46^T,48^T,86,88,95*,104*,107*,109*,110*,111*,113*,114*,117

, an unfriendly hospital environment [e.g. lack of adaptive equipment, slippery floors] [24,85,88,95,99*,109*,111*], and organisational and professionals risk aversion to adverse events associated with mobility [e.g. perceived lack of safety, increased risk of falls] [7,34^T,46^T,69,86,88,95*,103*,107*,113*].

Supplementary Table 3 Identified causes and contributors to hospital-acquired deconditioning

<Supplementary table 3>

Risk factors for Hospital-Acquired Deconditioning

Relevant data about risk factors were extracted and available from 33 acute hospital [8,20,22,24,27^T,32^T,35^T,38^T,57–60,62,64,69,76,83,86,88,89,93*,95*,98*,99*,100*,101*,108*,109*,110*,111*,113*,114*,117*], 15 from rehabilitation [7,26,28^T,33^T,55,65,70,73,74,77,78,81,82,84,105*] and 7 from intensive care studies [42^T,45^T,99*,104*,111*]. These are summarised by potential modifiable, non-modifiable and iatrogenic factors in Supplementary Table 4.

<Supplementary table 4>

Supplementary Table 4 Identified risk factors for Hospital-Acquired Deconditioning

DISCUSSION

The main finding of this scoping review of the peer-reviewed and grey literature on Hospital Acquired Deconditioning is that the condition is poorly defined, aetiological factors and sequelae are far from clear, and the operationalisation of the signs and symptoms of are not fully agreed upon. Hospital-acquired deconditioning has been visited as a physiological phenomenon, a clinical syndrome defined by deterioration, and a source of avoidable harm. These separate approaches to the phenomenon interdigitate and overlap incompletely in the literature. Through this scoping review, we addressed aim two confidently: understand how hospital-acquired deconditioning is understood and operationalised from a clinically informed perspective. The data available indicates a broad range of clinical presentations and trajectories incorporating physiological changes, sequelae, potential causes and contributors and risk factors. Limited data was available to robustly extract to address aim one diagnostic or identification criteria, which was reflected by the presence of only six sources explicitly reporting diagnostic criteria [21,54,55,58,66,83]. The remaining studies employed a range of descriptors to qualify a broad range of signs and symptoms. Furthermore, due to the large overlap of descriptors used to describe a loose cluster of clinical presentations and trajectories, few meaningful conclusions could be drawn from the dataset to differentiate

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between hospital-acquired deconditioning and other immobility-linked syndromes robustly which would have confidently addressed aim three. Of course, ICU-AW remains the exception and has been well conceptualised within the literature, even if variation remains within its diagnostic criteria.

Given the lack of clarity in the published literature, it is tempting to ask whether Hospital Acquired Deconditioning is a useful descriptor that serves a worthwhile function. If it had utility, would it not be better defined by now? , The literature we found was large, but heterogeneous. . It was united by a recognition that the correlation between hospitalisation and deterioration in well-being and functional independence that persists beyond hospitalisation is an important one. It is essential because it may be predictable by the presence of risk factors, preventable through attendance to aetiological factors, and treatable through appropriate and timely intervention. It is not yet clear the extent to which hospital-acquired deconditioning is a consequence of an acute illness sufficiently severe to mandate hospitalisation or a consequence of the limitations that modern hospitalisation imposes on patients. Most authors suggest it is a combination of both.

This work adds to the existing published reviews, which have largely had a narrow focus on papers around interventions [6,7,89] or the natural history of hospital-acquired deconditioning [5], by enabling the full breadth of published literature to be considered as one. This serves to highlight key areas of uncertainty around hospital-acquired deconditioning. One crucial issue that only becomes apparent when viewing the literature in a broad sense is the issue of temporality. There is a clear overlap in the criteria used to diagnose hospital-acquired deconditioning by way of functional deterioration and the criteria used to identify new physical disability of a longer-standing nature as a sequel of deconditioning. But it's not clear when such deterioration is sufficiently established to meet the diagnostic criteria for hospital-acquired deconditioning and when it moves from being hospital-acquired deconditioning into longer-standing disability. These concepts play into issues of primary and secondary prevention and reversibility. There is much subjectivity at play here – a parallel with other oft-mentioned but frequently poorly specified concepts such as rehabilitation potential, which are similarly the subject of broad clinical consensus and complex and contradictory underpinning literature [122].

The strengths of this study lie in the broad search terms, applied systematically, using diverse sources to capture the broadest conceptualisation of Hospital-Acquired Deconditioning. Standardised methodologies were used, and a written protocol was published in advance. Limitations relate to the difficulty of accommodating broad variations in study design, aims, and objectives within a single narrative framework, which led to some

subjectivity of interpretation. The broad overview, which drew in part from abstracts, grey literature and systematic reviews with different search terms, may have sacrificed some depth. Despite the broad search terms, the use of decline and deconditioning as the key terms may have limited the papers retrieved and subsequent conclusions drawn; however, their use reflects current clinical nomenclature. Furthermore, their selection may underpin the limited findings for physical performance measures. However, the deficit in mobility-based measures may be reflective of bed-rest order conventions in the United States where a majority of the included literature was from. Publication bias is always possible, with the bibliographic databases used favouring the English language, physician-led, formally-funded research over less formal work led by other professional groups and published in different languages.

In conclusion, the literature on hospital-acquired deconditioning is large, diverse and incohesive. While authors largely agree on the importance of the phenomenon, they describe it in sufficiently different ways so that it is not entirely clear that they're talking about the same thing. If we are to accept that within the concept of hospital-acquired deconditioning lies an opportunity to predict, prevent and/or intervene to minimise adverse outcomes, then we need first to arrive at a consensus around the definition and diagnostic criteria. This would enable more focused science around the epidemiology and natural history of the condition so that logical and evidence-based prevention and management strategies could be proposed.

AUTHOR CONTRIBUTIONS

All authors (MW, KR, AC, ALG) contributed to the design, undertaking, and writing up of this scoping review manuscript, MW conducted the initial and subsequent searches. LH acted as a second reviewer for title and abstract screening. Meri Westlake (MW) acts as the guarantor.

REFERENCES

1. #EndPJParalysis: the revolutionary movement helping frail older people [Internet]. [cited 2023 Sep 12]. Available from: <https://www.england.nhs.uk/2018/06/endpjparalysis-revolutionary-movement-helping-frail-older-people/>
2. Powers JH. The abuse of rest as a therapeutic measure in surgery. The Journal of the American Medical Association. 1944;125[16]:1079–83.

3. Siebens H. Deconditioning. In: Kemp B, Brummel-Smith K, editors. *Geriatric Rehabilitation*. Boston, MA: College-Hill Press; 1990.

4. Chen Y, Almirall-Sánchez A, Mockler D, Adrion E, Domínguez-Vivero C, Romero-Ortuño R, et al. Hospital-associated deconditioning: Not only physical, but also cognitive. *International Journal of Geriatric Psychiatry* [Internet]. 2022 Mar;37[3]:1–13. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=cul&AN=155474473&site=ehost-live>

5. Loyd C, Markland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of hospital-associated disability in older adults: A meta-analysis. *J Am Med Dir Assoc* [Internet]. 2020 Apr [cited 2022 Jun 6];21[4]:455–461.e5. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7469431/>

6. Hartley P, Keating JL, Jeffs KJ, Raymond MJ, Smith TO. Exercise for acutely hospitalised older medical patients. *Cochrane Database Syst Rev*. 2022 Nov 10;11[11]:CD005955.

7. Smith TO, Sreekanta A, Walkeden S, Penhale B, Hanson S. Interventions for reducing hospital-associated deconditioning: A systematic review and meta-analysis. *Archives of gerontology and geriatrics*. 2020;90[8214379]:104176.

8. Gordon S, Grimmer KA, Barras S. Assessment for incipient hospital-acquired deconditioning in acute hospital settings: A systematic literature review. *Journal of rehabilitation medicine*. 2019;51[6]:397–404.

9. Taylor C. Intensive care unit-acquired weakness. *Anaesthesia & Intensive Care Medicine* [Internet]. 2024 Jan 1 [cited 2024 Sep 16];25[1]:1–4. Available from: [https://www.anaesthesiamjournal.co.uk/article/S1472-0299\[23\]00220-5/fulltext](https://www.anaesthesiamjournal.co.uk/article/S1472-0299[23]00220-5/fulltext)

10. Vanhorebeek I, Latronico N, Van den Berghe G. ICU-acquired weakness. *Intensive Care Med* [Internet]. 2020 [cited 2024 Sep 16];46[4]:637–53. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7224132/>

11. Peters MDJ, Godfrey CM, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping reviews. In: Aromataris E, Munn Z, editors. *JBIM manual for evidence synthesis* [Internet]. JBI; 2020. Available from: <https://synthesismanual.jbi.global>.

12. Mays N, Roberts E, Popay J. Synthesising research evidence. In: *Studying the organisation and delivery of health services: Research methods*. 2004. p. 188–220.

13. Westlake M, Cowley A, Robinson K, Gordon A. Towards a common definition of Hospital Acquired Deconditioning [HAD] [in working-age adults]: A Scoping Review. 2022 Jan 15 [cited 2023 Aug 30]; Available from: <https://osf.io/b5sgw/>

14. Parise G, Yarasheski KE. The utility of resistance exercise training and amino acid supplementation for reversing age-associated decrements in muscle protein mass and function. *Current Opinion in Clinical Nutrition & Metabolic Care* [Internet]. 2000 Nov [cited 2024 Sep 16];3[6]:489. Available from: https://journals.lww.com/co-clinicalnutrition/fulltext/2000/11000/The_utility_of_resistance_exercise_training_and.12.aspx

15. OECD/Eurostat/World Health Organization. Classification of Health Care Providers [ICHA-HP]. In: *A system of health accounts 2011: Revised Edition* [Internet]. Paris:

- OECD Publishing; 2017 [cited 2024 Sep 16]. p. 121–52. Available from: <https://doi.org/10.1787/9789264270985-en>
16. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews* [Internet]. 2016 Dec 5;5[1]:210. Available from: <https://doi.org/10.1186/s13643-016-0384-4>
 17. Peters MDJ, Marnie C, Colquhoun H, Garritty CM, Hempel S, Horsley T, et al. Scoping reviews: reinforcing and advancing the methodology and application. *Systematic Reviews* [Internet]. 2021 Oct 8 [cited 2022 Jul 31];10[1]:263. Available from: <https://doi.org/10.1186/s13643-021-01821-3>
 18. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. *JB I Evidence Implementation* [Internet]. 2021 Mar [cited 2024 Sep 16];19[1]:3. Available from: https://journals.lww.com/ijebh/fulltext/2021/03000/updated_methodological_guidance_for_the_conduct_of.2.aspx
 19. Timmer AJ, Unsworth CA, Browne M. Occupational therapy and activity pacing with hospital-associated deconditioned older adults: a randomised controlled trial [with consumer summary]. *Disability and Rehabilitation* 2020;42[12]:1727-1735. 2020;
 20. Siebens H, Aronow H, Edwards D, Ghasemi Z. A Randomized Controlled Trial of Exercise to Improve Outcomes of Acute Hospitalization in Older Adults. *Journal of the American Geriatrics Society* [Internet]. 2000;48[12]:1545–52. Available from: <https://doi.org/10.1111/j.1532-5415.2000.tb03862.x>
 21. Ortiz-Alonso J, Bustamante-Ara N, Valenzuela PL, Vidán-Astiz M, Rodríguez-Romo G, Mayordomo-Cava J, et al. Effect of a Simple Exercise Program on Hospitalization-Associated Disability in Older Patients: A Randomized Controlled Trial. *Journal of the American Medical Directors Association* [Internet]. 2020 Apr 1 [cited 2024 Sep 24];21[4]:531-537.e1. Available from: <https://www.sciencedirect.com/science/article/pii/S1525861019308369>
 22. Soares SMTP, Nucci LB, Silva MMC. Effects of preoperative exercises on postoperative physical rehabilitation in patients submitted to abdominal surgery. In: *American Journal of Respiratory and Critical Care Medicine* [Internet]. New York: American Thoracic Society; 2012. Available from: http://www.atsjournals.org/doi/pdf/10.1164/ajrccm-conference.2012.185.1_MeetingAbstracts.A4850
 23. Goodman BA, Bonner S, Wright J, Hugill K, Howard P, Danjoux G, et al. Impact of an aerobic rehabilitation programme on fitness and qol in ICU survivors: An exploratory trial [pix study]. In: *Intensive Care Medicine*. Lisbon, Portugal: Springer; 2012. p. S90.
 24. Eyres L, Unsworth CA. Occupational therapy in acute hospitals: The effectiveness of a pilot program to maintain occupational performance in older clients. *Australian Occupational Therapy Journal*. 2005;52[3]:218–24.
 25. Small W, Tasneem S, Bagheri A, Chodosh J, Adelsheimer A, Sutera J, et al. Safety and feasibility of a novel in-bed resistance training device in older inpatients. In: *Journal of the American Geriatrics Society*. Long Beach, CA,: American Geriatrics Society; 2020. p. S134.

26. Raj G, Munir J, Ball L, Carr DB. An inpatient rehabilitation service for deconditioned older adults [corrected]. *Topics in Geriatric Rehabilitation* [Internet]. 2007;23[2]:126–36. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=105970310&site=ehost-live>

27. Corcoran G, Gavaghan G, Lyons C, Moloney E. Timely identification of frailty & comprehensive multidisciplinary assessment on a newly established specialist geriatric ward. In: *International Journal of Integrated Care* [IJIC] [Internet]. Ubiquity Press; 2017. p. 1–2. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=131980975&site=ehost-live>

28. Donnelly G, Jevons G, Wentworth L. Cognitively frail patients can be rehabilitated. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.

29. O’Sullivan NL, Cleffken BI. Does functional ability improve for patients in the intensive care unit [ICU] with a structural physiotherapy indication using the patient mobility framework [PMF] protocol? In: *Intensive Care Medicine Experimental* [Internet]. Paris, France: Springer; 2018. Available from: <https://icm-experimental.springeropen.com/articles/supplements/volume-6-supplement-2>

30. Stapley S, Colley S, Richards K. Development of recreational therapy role within the elderly care department. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.

31. Parkinson P. What are the impacts of a structured exercise class on patients with a longer inpatient stay in elective orthopaedics? In: *Physiotherapy* [United Kingdom]. 2019. p. e83–4.

32. Koh SY, Sridaran MN, Goh ML. Patients performing lower limb exercises in an orthopedic ward: a best practice implementation project. *JBI evidence implementation*. 2020;19[3]:257–67.

33. Suriyaarachchi P, Chu L, Bishop A, Thew T, Matthews K, Cowan R, et al. Evaluating Effectiveness of an Acute Rehabilitation Program in Hospital-Associated Deconditioning. *Journal of geriatric physical therapy* [2001]. 2020;43[4]:172–8.

34. Butler J, Welford T. A Multidisciplinary Team Initiative to End PJ Paralysis Was Successful in Achieving Cultural Change on An Acute Geriatric Ward. In: *Age and Ageing* [Internet]. Online: Oxford University Press; 2021 [cited 2023 Aug 15]. p. i12–42. Available from: 10.1093/ageing/afab030.69

35. Beam G, Gorman K, Kist BS, Giles H, Kiser K, Dumire R. Using the Mobilization of Vulnerable Elders Protocol to Improve Elderly Patient Outcomes in Pennsylvania: A Quasi-Experimental Project. *J Geriatr Med Gerontol* [Internet]. 2022 May 12 [cited 2023 Aug 4];8[1]. Available from: <https://clinmedjournals.org/articles/jgmg/journal-of-geriatric-medicine-and-gerontology-jgmg-8-130.php?jid=jgmg>

36. Pack QR, Miwa S, Engelman R, Lagu T, Visintainer P, Lindenauer P, et al. The impact of an ambulation orderly program on hospital outcomes for patients with recent open heart surgery. In: *Circulation*. 2016.

37. Sayer K, Whiteaway K, Dawson JO, Simpson J, Chu W. Physical activity improvement in elderly hospitalised patients at the Royal London: Exercise as part of a multimodal

- intervention. In: Age and Ageing [Internet]. Online: Oxford University Press; 2020. p. i1–i1. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=149478740&site=ehost-live>
38. Wai G.J., Lu Z., Gill S., Henderson I., Auais M. Impact of the End PJ Paralysis interventions on patient health outcomes at the participating hospitals in Alberta, Canada. *Disabil Rehabil.* 2024;[[Wai, Auais] School of Rehabilitation Therapy, Queen's University, Kingston, Canada]:1–11.
39. Bono G, Reyes R. Keeping granny moving: A quality improvement project to improve mobility in hospitalized medicine and surgical patients. In: *Journal of the American Geriatrics Society*. Long Beach, CA,: American Geriatrics Society; 2020. p. S204.
40. Husain-Qureshi A, Kirkwood R. Critical illness and physical deconditioning-an intervention to improve patient outcomes. In: *Anaesthesia*. 2019. p. 17.
41. Rogerson F, Kendall C. Pyjama paralysis. In: *Age and Ageing*. London, United Kingdom: Oxford University Press; 2019.
42. Drolet^T A, DeJuilio P, Harkless S, Henricks S, Kamin E, Leddy EA, et al. Move to improve: the feasibility of using an early mobility protocol to increase ambulation in the intensive and intermediate care settings. *Physical therapy*. 2013;93[2]:197–207.
43. Engel^T HJ, Tatebe S, Alonzo PB, Mustille RL, Rivera MJ. Physical Therapist-Established Intensive Care Unit Early Mobilization Program: Quality Improvement Project for Critical Care at the University of California San Francisco Medical Center. *Physical Therapy [Internet]*. 2013;93[7]:975–85. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=104215172&site=ehost-live>
44. Friedman M, Mayer RS, Hoyer E, Atanelov L. Reducing post-hospital syndrome: A quality improvement [QI] project. In: *PM and R. Maryland: Wiley-Blackwell*; 2013. p. S145.
45. Booth^T K, Rivet J, Flici R, Harvey E, Hamill M, Hundley D, et al. Progressive Mobility Protocol Reduces Venous Thromboembolism Rate in Trauma Intensive Care Patients: A Quality Improvement Project. *Journal of trauma nursing : the official journal of the Society of Trauma Nurses*. 2016;23[5]:284–9.
46. Ritchie^T R, Wood S, Martin FC, Jones GD. Impact of an educational training program on restorative care practice of nursing assistants working with hospitalized older patients. *Journal of Clinical Outcomes Management [Internet]*. 2017;24[9]:425–32. Available from: http://www.turner-white.com/pdf/jcom_sep17_restorative.pdf
47. Horgan A, Carr M, Murphy A. The Impact of an Early Mobilisation Initiative Evidence from an Acute Care Setting. In: *Age and Ageing [Internet]*. Cork: Oxford University Press; 2019. p. iii17–65. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=138865066&site=ehost-live>
48. Asif A, Taube C, Sivarajah V, Tsironis C, Koizia L. Multidisciplinary team approach to reducing PJ Paralysis and time spent in bed in post-operative patients. In: Winter DC, editor. *British Journal of Surgery [Internet]*. Glasgow: Wiley-Blackwell; 2020. p. 41. Available from: <https://doi.org/10.1002/bjs.12068>

49. Ng YS, Jung H, Tay SS, Bok CW, Chiong Y, Lim PAC. Results from a prospective acute inpatient rehabilitation database: clinical characteristics and functional outcomes using the Functional Independence Measure. *Annals of the Academy of Medicine, Singapore*. 2007;36[1]:3–10.
50. Baztan JJ, Galvez CP, Socorro A. Recovery of functional impairment after acute illness and mortality: one-year follow-up study. *Gerontology*. 2009;55[3]:269–74.
51. Dennis RA, Johnson LE, Roberson PK, Heif M, Bopp MM, Garner KK, et al. Changes in activities of daily living, nutrient intake, and systemic inflammation in elderly adults receiving recuperative care. *Journal of the American Geriatrics Society*. 2012;60[12]:2246–53.
52. Belavy DL, Miokovic T, Armbrrecht G, Richardson CA, Rittweger J, Felsenberg D. Differential atrophy of the lower-limb musculature during prolonged bed-rest. *European journal of applied physiology*. 2009;107[4]:489–99.
53. Silveira L, Pez M, Nogueira P, Furlan S, Colombo A. Physiotherapy indication and accomplishment at ICU. In: *European Respiratory Journal* [Internet]. 2013. Available from: http://erj.ersjournals.com/content/42/Suppl_57/P1358.full.pdf+html?sid=3bab0263-7ace-4098-871d-391440476518
54. Sottile PD, Quan D, McNulty M, Gray L, Higgins C, Moss M. Outcomes in critical illness polyneuropathy and myopathy compared with deconditioning and normal neuromuscular function. In: *American Journal of Respiratory and Critical Care Medicine* [Internet]. San Diego; 2014. Available from: http://www.atsjournals.org/doi/pdf/10.1164/ajrccm-conference.2014.189.1_MeetingAbstracts.A3878
55. Wakabayashi H, Sashika H. Malnutrition is associated with poor rehabilitation outcome in elderly inpatients with hospital-associated deconditioning a prospective cohort study. *Journal of rehabilitation medicine*. 2014;46[3]:277–82.
56. Artaza I, Valera R, San Juan O, Urien M, Fernandez N, Malafarina V. Influence of the deficit of vitamin D in the functional gain of patients admitted to a unit of functional recovery. In: Michel JP, editor. *European Geriatric Medicine*. Lisbon, Portugal: Elsevier; 2016. p. S207–8.
57. Norheim KL, Bautmans I, Kjaer M. Handgrip strength shows no improvements in geriatric patients with persistent inflammation during hospitalization. *Experimental gerontology*. 2017;99:115–9.
58. Petrucci L, Ricotti S, Monteleone S, Ferriero G, Giromini E, Gullace M, et al. Disability after major abdominal surgery: determinants of recovery of walking ability in elderly patients. *European journal of physical and rehabilitation medicine*. 2018;54[5]:683–9.
59. Higgins JT, Frazier SK, Lennie T, Rayens MK, Avila J. Early Ambulation After Injury Is Associated With Increased Muscle Size and Strength. *Biological research for nursing*. 2020;22[4]:527–35.
60. Kovar A, Carmichael H, Jones T, Nichols Robinson T. Postoperative Delirium in Older Adults Is Associated with Prolonged Decreased Mobility. In: *Journal of the American College of Surgeons*. Lippincott Williams & Wilkins; 2020. p. S117–8.

61. Laneuville O, Rocheleau L, Chan Chun Kong D, Pelchat M, Trudel G. Effect of rehabilitation on biologic and transcriptomic responses after hospital-acquired deconditioning: a prospective longitudinal feasibility study. *Disability and rehabilitation*. 2021;[9207179]:1–9.
62. Inouye SK, Wagner DR, Acampora D, Horwitz RI, Cooney LM, Hurst LD, et al. A predictive index for functional decline in hospitalized elderly medical patients. *J Gen Intern Med*. 1993 Dec;8[12]:645–52.
63. Brown CJ, Friedkin RJ, Inouye SK. Prevalence and outcomes of low mobility in hospitalized older patients. *Journal of the American Geriatrics Society*. 2004;52[8]:1263–70.
64. Brown CJ, Roth DL, Peel C, Allman RM. Predictors of regaining ambulatory ability during hospitalization. *Journal of Hospital Medicine* [Internet]. 2006 [cited 2022 Jun 6];1[5]:277–84. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jhm.104>
65. Sánchez-Rodríguez D, Marco E, Miralles R, Fayos M, Mojal S, Alvarado M, et al. Sarcopenia, physical rehabilitation and functional outcomes of patients in a subacute geriatric care unit. *Archives of Gerontology and Geriatrics* [Internet]. 2014 Jul 1 [cited 2022 Aug 15];59[1]:39–43. Available from: <https://www.sciencedirect.com/science/article/pii/S0167494314000272>
66. Pavon JM, Sloane RJ, Pieper CF, Colón-Emeric CS, Cohen HJ, Gallagher D, et al. Accelerometer-Measured Hospital Physical Activity and Hospital-Acquired Disability in Older Adults. *Journal of the American Geriatrics Society* [Internet]. 2020 [cited 2024 Sep 24];68[2]:261–5. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/jgs.16231>
67. Haley R, Sullivan D H, Granger C V, Kortebein P. Inpatient rehabilitation outcomes for older adults with nondebility generalized weakness. *American journal of physical medicine & rehabilitation* [Internet]. 2011 Oct [cited 2022 Jun 6];90[10]. Available from: <https://pubmed.ncbi.nlm.nih.gov/21862907/>
68. Kortebein P, Bopp MM, Granger CV, Sullivan DH. Outcomes of inpatient rehabilitation for older adults with debility. *Am J Phys Med Rehabil*. 2008 Feb;87[2]:118–25.
69. Johnson SP, Swiatek PR, Wang L, Liu M, Chung TT, Chung KC. Risk Factors for Undergoing Elective Abdominal Contouring Surgery Shortly After Hospitalization. *The Journal of surgical research*. 2019;236:51–9.
70. Galloway RV, Karmarkar AM, Graham JE, Tan A, Raji M, Granger CV, et al. Hospital readmission following discharge from inpatient rehabilitation for older adults with debility. *Physical Therapy* [Internet]. 2016;96[2]:241–51. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=112782599&site=ehost-live>
71. Fisher SR, Graham JE, Krishnan S, Ottenbacher KJ. Predictors of 30-Day Readmission Following Inpatient Rehabilitation for Patients at High Risk for Hospital Readmission. *Physical Therapy* [Internet]. 2016;96[1]:62–70. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=112088391&site=ehost-live>
72. Vargo MM, Wilson RD, Fuentes Tirado EM. Functional recovery in surgical and medical deconditioning. In: PM and R. 2012. p. S297.

73. Guy N, Lerman Y, Justo D. Admission Norton scale scores [ANSS] correlate with rehabilitation outcome and length in elderly patients with deconditioning. *Archives of gerontology and geriatrics*. 2012;54[2]:381–4.

74. Siegler EL, Stineman MG, Maislin G. Development of complications during rehabilitation. *Archives of internal medicine*. 1994;154[19]:2185–90.

75. Deshpande SA, MacNeill SE, Lichtenberg PA, Pithadia J, Velez L. Functional outcome differences in acute versus subacute geriatric rehabilitation. *Journal of Rehabilitation Outcomes Measurement* [Internet]. 1998;4[1]:57–64. Available from: https://journals.lww.com/topicsingeriatricrehabilitation/Abstract/1998/06000/Functional_Outcome_Differences_in_Acute_versus.6.aspx

76. Lim SC, Doshi V, Castasus B, Lim JKH, Mamun K. Factors causing delay in discharge of elderly patients in an acute care hospital. *Annals of the Academy of Medicine, Singapore* [Internet]. 2006;35[1]:27–32. Available from: <https://annals.edu.sg/pdf/35VolNo1200601/V35N1p27.pdf>

77. Aizen E, Shugaev I, Lenger R. Risk factors and characteristics of falls during inpatient rehabilitation of elderly patients. *Archives of gerontology and geriatrics*. 2006;44[1]:1–12.

78. Urquiza M., Fernandez N., Arrinda I., Espin A., Garcia-Garcia J., Rodriguez-Larrad A., et al. Predictors of Hospital Readmission, Institutionalization, and Mortality in Geriatric Rehabilitation Following Hospitalization According to Admission Reason. *J Geriatr Phys Ther*. 2024;[[Urquiza, Espin, Garcia-Garcia, Rodriguez-Larrad, Irazusta] Department of Physiology, Faculty of Medicine and Nursing, University of the Basque Country [UPV/EHU], Leioa, Bizkaia, Spain].

79. Manning DM, Frank DL, Keller SA. Home alone: Assessing mobility independence before discharge. *Journal of Hospital Medicine* [Internet]. 2009;4[4]:252–4. Available from: <http://www3.interscience.wiley.com/cgi-bin/fulltext/122351424/PDFSTART>

80. Burkhardt H, Parigger L. How may B-mode sonography help to assess muscle aspects in an acute care setting. In: *European Geriatric Medicine*. 2018. p. S104.

81. Yoshimura Y, Wakabayashi H, Bise T, Tanoue M. Prevalence of sarcopenia and its association with activities of daily living and dysphagia in convalescent rehabilitation ward inpatients. *Clinical Nutrition* [Internet]. 2018;37[6]:2022–8. Available from: <http://www.elsevier-international.com/journals/clnu/>

82. Churilov I, Brock K, Murphy D, Macisaac RJ, Churilov L, Ekinici EI. SARC-F score is negatively associated with functional independence in general rehabilitation patients. In: *Osteoporosis International* [Internet]. 2019. p. S403–4. Available from: <https://doi.org/10.1007/s00198-019-04993-w>

83. Sourdets S, Lafont C, Rolland Y, Nourhashemi F, Andrieu S, Vellas B. Preventable Iatrogenic Disability in Elderly Patients During Hospitalization. *Journal of the American Medical Directors Association* [Internet]. 2015 Aug 1 [cited 2024 Sep 18];16[8]:674–81. Available from: <https://www.sciencedirect.com/science/article/pii/S152586101500225X>

84. Timmer AJ, Unsworth CA, Taylor NF. Occupational therapy inpatient rehabilitation interventions with deconditioned older adults following an acute hospital admission: a Delphi study. *Australian occupational therapy journal*. 2015;62[1]:41–9.

85. Spencer J, Hersch G, Eschenfelder V, Fournet J, Murray-Gerzik M. Outcomes of protocol-based and adaptation-based occupational therapy interventions for low-income elderly persons on a transitional unit. *American Journal of Occupational Therapy*. 1999;53[2]:159–70.
86. Doherty-King B, Bowers BJ. Attributing the responsibility for ambulating patients: A qualitative study. *International Journal of Nursing Studies* [Internet]. 2013;50[9]:1240–6. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=104211818&site=ehost-live>
87. McInerney M, McCarthy M, McCullagh R, Fox S, Timmons S. Patient perception of an augmented prescribed exercise programme during medical inpatient stay. In: *Age and Ageing*. Nottingham, United Kingdom: Oxford University Press; 2018.
88. Guilcher SJT, Everall AC, Cadel L, Li J, Kuluski K. A qualitative study exploring the lived experiences of deconditioning in hospital in Ontario, Canada. *BMC Geriatrics* [Internet]. 2021;21[1]:1–9. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=149149977&site=ehost-live>
89. De Morton NA, Keating JL, Jeffs K. Exercise for acutely hospitalised older medical patients. *Cochrane Database of Systematic Reviews*. 2007;[1]:CD005955.
90. Cabilan CJ, Hines S, Munday J. Prehabilitation for surgical patients: A systematic review protocol. *JBIC Database of Systematic Reviews and Implementation Reports* [Internet]. 2013;11[5]:112–22. Available from: <http://www.joannabriggslibrary.org/jbilibrary/index.php/jbisrir/article/view/517/1236>
91. Timmer AJ, Unsworth CA, Taylor NF. Rehabilitation interventions with deconditioned older adults following an acute hospital admission: a systematic review. *Clinical rehabilitation*. 2014 Nov 5;28[11]:1078–86.
92. Churilov I, Churilov L, MacIsaac RJ, Ekinici EIACI, <http://orcid.org/---> O. Systematic review and meta-analysis of prevalence of sarcopenia in post acute inpatient rehabilitation. *Osteoporosis International* [Internet]. 2018;29[4]:805–12. Available from: <http://link.springer.de/link/service/journals/00198/index.htm>
93. Kortebein P. Rehabilitation for hospital-associated deconditioning. *American journal of physical medicine & rehabilitation*. 2009;88[1]:66–77.
94. Schweickert WD, Kress JP. Implementing early mobilization interventions in mechanically ventilated patients in the ICU. *CHEST* [Internet]. 2011;140[6]:1612–7. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=108208760&site=ehost-live>
95. Covinsky K E, Pierluissi E, Johnston B. Hospitalization-associated disability: “She Was Probably Able to Ambulate, but I’m Not Sure”. *JAMA* [Internet]. 2011 [cited 2022 Jun 6];306[16]:1782–93. Available from: <https://jamanetwork.com/journals/jama/fullarticle/1104539>
96. Hoenig HM, Nusbaum N, Brummel-Smith. Geriatric rehabilitation state of the art. *Journal - American Geriatrics Society*. 1997;45[11]:1371–81.

97. Venturelli E, Crisafulli E, Antoni FD, Trianni L, Clini EM. Rehabilitation in critically ill patients. *Annals of Respiratory Medicine* [Internet]. 2011;1[2]. Available from: http://www.slm-respiratory.com/uploads/media/Rehabilitation_in_Critically_Ill_Patients.pdf
98. Conlin Shaw MM. Pressure ulcers in older persons: a preventive approach. Wound repair and regeneration : official publication of the Wound Healing Society [and] the European Tissue Repair Society. 1996;4[3]:316–20.
99. Rader MC, Vaughen JL. Management of the frail and deconditioned patient. *Southern medical journal* [Internet]. 1994;87[5]:S61-5. Available from: <https://pubmed.ncbi.nlm.nih.gov/8178204/>
100. Killewich LA. Strategies to Minimize Postoperative Deconditioning in Elderly Surgical Patients. *Journal of the American College of Surgeons*. 2006;203[5]:735–45.
101. Silver KHC, Siebens AA. Rehabilitation medicine. *Surgical Clinics of North America* [Internet]. 1994;74[2]:465–88. Available from: <http://www.elsevier.com/inca/publications/store/6/2/3/1/9/6/index.htm>
102. Bailey PP, Miller lli RR, Clemmer TP. Culture of early mobility in mechanically ventilated patients. *Critical Care Medicine*. 2009;37:S429–35.
103. Gosselink R, Needham D, Hermans G. ICU-based rehabilitation and its appropriate metrics. *Current opinion in critical care*. 2012;18[5]:533–9.
104. Mendez-Tellez PA, Nusr R, Feldman D, Needham DM. Early Physical Rehabilitation in the ICU: A Review for the Neurohospitalist. *The Neurohospitalist*. 2012;2[3]:96–105.
105. Wakabayashi H, Sakuma K. Rehabilitation nutrition for sarcopenia with disability: a combination of both rehabilitation and nutrition care management. 2014;5[4]:269–77. Available from: <http://www.springer.com/medicine/internal/journal/13539>
106. Falvey JR, Mangione KK, Stevens-Lapsley JE. Rethinking hospital-associated deconditioning: Proposed paradigm shift. *Physical therapy*. 2015;95[9]:1307–15.
107. Dirkes SM, Kozlowski C. Early mobility in the intensive care unit: Evidence, barriers, and future directions. *Critical Care Nurse* [Internet]. 2019;39[3]:33–42. Available from: <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=136783751&site=ehost-live>
108. Hoenig HM, Rubenstein LZ. Hospital-Associated Deconditioning and Dysfunction. *Journal of the American Geriatrics Society* [Internet]. 1991 [cited 2022 Feb 24];39[2]:220–2. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1532-5415.1991.tb01632.x>
109. Creditor MC. Hazards of hospitalization of the elderly. *Ann Intern Med*. 1993 Feb 1;118[3]:219–23.
110. Inouye SK, Bogardus Jr. ST, Baker DI, Leo-Summers L, Cooney Jr. LM. The Hospital Elder Life Program: A Model of Care to Prevent Cognitive and Functional Decline in Older Hospitalized Patients. Reuben DB, editor. *J Am Geriatr Soc*. 2000;48[12]:1697–706.

111. Graf C. Functional Decline in Hospitalized Older Adults: It's often a consequence of hospitalization, but it doesn't have to be. *AJN The American Journal of Nursing* [Internet]. 2006 Jan [cited 2022 Jun 7];106[1]:58–67. Available from: https://journals.lww.com/ajnonline/Fulltext/2006/01000/Functional_Decline_in_Hospitalized_Older_Adults_.32.aspx
112. Krumholz HM. Post-Hospital Syndrome – A Condition of Generalized Risk. *N Engl J Med* [Internet]. 2013 Jan 10 [cited 2022 Jun 6];368[2]:100–2. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3688067/>
113. Chastin SF, Harvey JA, Dall PM, McNally L, Mavroei A, Skelton DA, et al. Beyond “#endpjaralysis”, tackling sedentary behaviour in health care. *AIMSMEDS* [Internet]. 2019 [cited 2022 Aug 11];6[1]:67–75. Available from: <http://www.aimspress.com/rticle/doi/10.3934/medsci.2019.1.67>
114. Swinnerton E., Price A. Recognising, reducing and preventing deconditioning in hospitalised older people. *Nurs Older People*. 2023;35[2]:34–41.
115. Latronico N. ICU acquired weakness. In: *European Journal of Neurology* [Internet]. Berlin, Germany: Wiley-Blackwell; 2015. p. 870–1. Available from: <https://onlinelibrary.wiley.com/toc/14681331/2015/22/S1>
116. Timmer AJ, Unsworth CA, Browne M. A randomized controlled trial protocol investigating effectiveness of an activity-pacing program for deconditioned older adults. *Canadian journal of occupational therapy Revue canadienne d'ergotherapie*. 2019;86[2]:136–47.
117. Kamper RS, Schultz M, Hansen SK, Andersen H, Ekmann A, Nygaard H, et al. Biomarkers for length of hospital stay, changes in muscle mass, strength and physical function in older medical patients: protocol for the Copenhagen PROTECT study-a prospective cohort study. *BMJ open*. 2020;10[12]:e042786.
118. Beisheim-Ryan E.H., Butera K.A., Hinrichs L.A., Derlein D.L., Malone D.J., Holtrop J.S., et al. Advancing Rehabilitation Paradigms for Older Adults in Skilled Nursing Facilities: An Effectiveness-Implementation Hybrid Type 1 Clinical Trial Protocol. *Phys Ther*. 2023;[[Beisheim-Ryan, Hinrichs, Stevens-Lapsley] VA Eastern Colorado Geriatric Research, Education, Clinical Center [GRECC], VA Eastern Colorado Health Care System, Aurora, CO, United States].
119. Monteleone S, Dalla Toffola E, Emiliani V, Ricotti S, Bruggi M, Conte T, et al. Recovery of deambulation after cardiothoracic surgery: a single center experience. *European Journal of Physical and Rehabilitation Medicine* [Internet]. 2015 [cited 2022 Jun 8];51[6]:763–71. Available from: <https://www.minervamedica.it/en/journals/europa-medicophysica/article.php?cod=R33Y2015N06A0763>
120. Inouye SK, Bogardus Jr. ST, Baker DI, Leo-Summers L, Cooney Jr. LM. MODELS OF GERIATRICS PRACTICE; The Hospital Elder Life Program: A Model of Care to Prevent Cognitive and Functional Decline in Older Hospitalized Patients. Reuben DB, editor. *Journal of the American Geriatrics Society*. 2000;48[12]:1697–706.
121. Sanchez-Rodriguez D, Miralles R, Muniesa JM, Mojal S, Abadia-Escartin A, Vazquez-Ibar O. Three measures of physical rehabilitation effectiveness in elderly patients: a prospective, longitudinal, comparative analysis. *BMC geriatrics*. 2015;15[100968548]:142.

122. Cowley A, Goldberg SE, Gordon AL, Logan PA. Rehabilitation potential in older people living with frailty: a systematic mapping review. BMC Geriatrics [Internet]. 2021 Oct 7;21[1]:533. Available from: <https://doi.org/10.1186/s12877-021-02498-y>

SUPPLEMENTARY INFORMATION

1. Supplementary Table 1: Care focus and clinical specialisms available in “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
2. Supplementary Figure 1: The signs and symptoms and range of descriptors utilised extracted from the included articles available in: “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
3. Supplementary Table 2: Alternative names and descriptors for hospital-acquired deconditioning. available in: “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
4. Supplementary Table 3: Identified causes and contributors to hospital-acquired deconditioning available in: “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
5. Original Protocol: Available to view as a supplementary file “towards a common definition of hospital acquired deconditioning clean”
6. Data Sharing Statement: Data utilised in the results of this scoping review are available in the supplementary file titled: HADDefinitions_Supplementary_Data_File_26.09.2024
7. PRISMA-ScR checklist: Available as a supplementary file titled ScR PRISMA-ScR-Fillable-Checklist_11Sept2019 25.03.2024
8. Search Strategy: The search strategy for each database has been included as appendix A in file “Appendices and Supplementary Files for “Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
9. B Original and Refined Eligibility Criteria Available to view as appendix B in supplementary file “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”
10. Data extraction tool: Available to view as appendix C in supplementary file “Appendices and Supplementary Files for Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”

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Appendices and Supplementary Files for “Towards a common definition of hospital-acquired deconditioning in adults: A scoping review”

Supplementary Information

Supplementary Table 1: Care focus and clinical specialisms

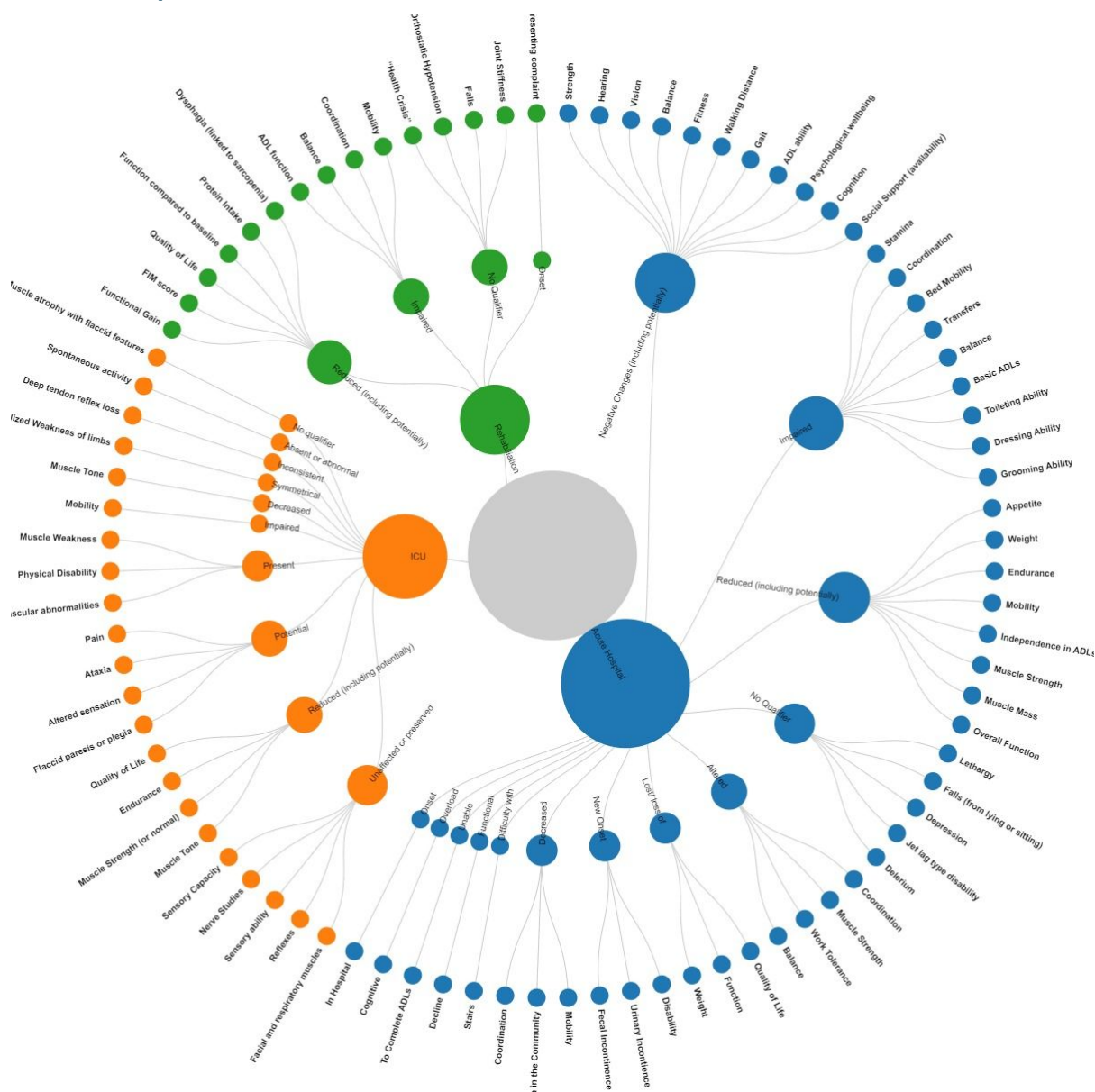
Care Focus (Where Reported)	Specialisms	Number of Sources	Citations
Rehabilitation/ Post Acute Care	Convalescent, Functional, Geriatric Early, Geriatric, Inpatient, Subacute Geriatric, Transitional Unit, Virtual Beds	33	(7,19,26,28 ^T ,33 ^T ,49–51,55,56,61,65,67,68,70–75,77,78,80–82,84,85,91,92,96*,105*,116*,118*)
Acute Care	Medical, Surgical, Orthopaedics, Geriatric Surgery, Major Trauma, Elective Surgery, Cardiac Surgery	53	(6,8,20–22,24,25,27 ^T ,30 ^T ,31 ^T ,32 ^T ,34 ^T ,35 ^T ,36 ^T ,37 ^T ,39 ^T ,41 ^T ,44 ^T ,46 ^T ,47 ^T ,48 ^T ,49,57–60,62–64,66,69,76,79,83,86–89,93*,95*,98*,99*,100*,101*,106*,108*,109*,110*,111*,112*,113*,114*,117*)
Intensive Care	Medical, Surgical, Intermediate Care, Neurology, Neurotrauma,	15	(23,29 ^T ,40 ^T ,42 ^T ,43 ^T ,45 ^T ,53,54,94*,97*,102*,103*,104*,107*,115*)

Care Focus (Where Reported)	Specialisms	Number of Sources	Citations
Other	Prehabilitation, Research	2	(52,90)
<i>Supplementary table 1: The focus of care and specialisms reported from the included sources of evidence.</i>			

Supplementary Table 2: Alternative names and descriptors for hospital-acquired deconditioning.

Alternative names for HAD	Number of occurrences
None given	49
Decline in Function/ Functional Decline/Functional Deficits	29
Debility	7
Disuse atrophy	4
Post-hospital syndrome	4
Hospital-associated functional deficits / functional decline	3
Hospital associated deconditioning	3
Hospital-acquired disability	3
Immobilisation/ immobility syndrome	2
Disuse syndrome	2
Deterioration in Cognitive or Physical function	2
Muscle wasting	2
Asthenia	2
Malaise/fatigue	2
Hospital(isation) associated disability	2
Pyjama paralysis	2
Reduced physiologic capacity	1
Generalised weakness	1
Physical functionality	1
Activity related sarcopenia	1
Medical deconditioning	1
Other	1
State of Frailty	1
Hospital-acquired disability	1
Frailty	1
Hospitalisation disability syndrome	1
Nondebility generalised weakness	1
Muscle weakness	1
Physiological deconditioning	1
Iatrogenic disability	1
<i>Supplementary Table 2 Alternative names and descriptors identified for Hospital-Acquired Deconditioning</i>	

Supplementary Figure 1: The signs and symptoms and range of descriptors utilised extracted from the included articles



Supplementary Table 3: Identified causes and contributors to hospital-acquired deconditioning

Setting	Acute Hospital	Rehabilitation	Intensive Care
Exposure or Cause	Inactivity (relative, bed rest, lack of ambulation) Acute Illness that necessitates bed rest (complications of disease and its management) Disabling insult that limits or precludes mobility Chronic disease that causes a gradual decline in activity Psychological Changes Changes in Social Circumstances Lack of engagement in occupation Surgical Stress Response Prolonged Hospital Stay Acute Hospitalisation (prolonged exposure to medical care) Multi-Factorial - could be anything. Pain Stress of Hospitalization (physiological and psycho-social), overall uncertainty, mentally challenging situations Nutritional Deficits Sleep Disturbances Sedentary Behaviour Social Isolation Stress-related to socioeconomic concerns. Lack of MDT input	Bed Rest Inactivity or Low Levels of Physical Activity (any reason) Inadequate Nutrient Intake/ Poor Nourishment Systemic Inflammation Acute Hospitalisation Pneumonia Exacerbation of CHF Falls Neurosurgery (Emergency & Elective) Laparotomy Infectious or Inflammatory Diseases Acute Coronary Syndrome Acute Renal Failure Peripheral Vascular Procedures Sleep Deprivation/ Circadian Disruption Pain/Discomfort Mentally Challenging Situations Sedentary Lifestyle Prolonged or Complex LOS	Critical Illness ARDS Immobility or Acute Inactivity Mechanical Ventilation Prolonged or Complete Bed Rest Hyperglycemia Critical illness polyneuropathy-thrombotic Ischemic Injury to Neural Tissue Inflammatory States - sepsis, SIRS Malnutrition MODS

Setting	Acute Hospital	Rehabilitation	Intensive Care
	Hospitals built environment [Lack of] social capital resources (family, volunteers, roommates, staff) Interaction of hospitalisation and ageing Poor food Lack of reserved Disrupted daily rhythms Fatigue Ongoing health issues		
Iatrogenic	Medications, eg sedatives, GA side effects, narcotics, polypharmacy, psychoactive reactions Nosocomial Infections Use and consequences of restraint (physical or chemical) Post-operative bed rest or immobility Treatment Effects Adverse Events Indwelling (tethering) interventions e.g. catheters, IV's NBM orders	Medications that affect cognitive or physical function Long-term IV use Dialysis for end-stage renal failure	Neuromuscular blockage use Corticosteroid Use Sedative-related prolonged immobility

Setting	Acute Hospital	Rehabilitation	Intensive Care
Contributors, modifiers or accelerators	Ability to Learn Active Medical Problems BMI Boredom Depression Fatigue Fear of developing a functional decline Fear of strategies to reduce functional decline Financial Resources or Insurance Pain Patient Motivation Patient or Family Preference Post-operative complications Potential for Functional Recovery Pre-hospital function PT/OT intervention Rehab Tolerance Sarcopenia Social Set up	Sarcopenia Subacute rehab population Malnutrition Medical Complexity Physiological Stress	Cardio respiratory Deconditioning Anxiety Depression PTSD

Setting	Acute Hospital	Rehabilitation	Intensive Care
CHF: Chronic Heart Failure, PT/OT: Physical or Physiotherapy/Occupational Therapy, Rehab: Rehabilitation, BMI: Body Mass Index, PTSD: Post Traumatic Stress Disorder, IV: Intravenous, NBM: Nill by Mouth, GA: General Anaesthetic, MDT: Multidisciplinary Team, LOS: Length of Stay, SIRS: Systemic Inflammatory Response Syndrome, MODS: Multiorgan Dysfunction Syndrome, ARDS: Acute Respiratory Distress Syndrome			
Supplementary Table 3 Identified causes and contributors to hospital-acquired deconditioning			

Supplementary Table 4: Identified risk factors for hospital-acquired deconditioning

Risk Factor/Setting	Acute Hospital		Rehabilitation	Intensive Care
Potentially Modifiable	Marginal Activity Acute Illness Illness and Hospital Beliefs (to rest) Pre-hospital functional limitation (IADL, BADL, cognition, mobility aids/devices) Lack of exercise tolerance Reduced Motivation or ability for formal exercise Pain Patient Resistance Frailty (cognitive and physical) - deterioration on admission Sustained inflammation Smoking Delirium Physical Complexity	Long and Difficult Acute Hospitalisation Depression (Impaired motor coordination and longer response time) Anti-hypertensive use Low body mass Malnutrition CV and Gastro Cohorts (lowest Bartel on admission) Cognitive Frailty or Deficits Sarcopenia (exacerbated functional decline and impairs functional restoration) Delirium on Admission Poor Mobility or Aid use BADL or IADL deficits on	Pain Sleep Deprivation Fear Anxiety Lack of Control Nightmares Delirium Frailty Weakness Fatigue Physiologic Instability Obesity Poor Activity Tolerance ICU-AW Hyperglycemia Hypoalbuminemia	

Risk Factor/Setting	Acute Hospital	Rehabilitation	Intensive Care
	Social Complexity (precarious housing, limited caregiver support, financial instability) Premorbid continence, sensory or perceptive issues Pressure injury Cognitive Impairment Low social activity (community participation) Slow gait speed Falls	admission Fear of Falling	
Non-Modifiable	Advancing Age (physical peak at 30, particularly 85+) Caucasian Ethnicity Hx of CVA	Advancing Age Multiple Co-Morbidities	Complex care needs Advancing age Female sex
Iatrogenic	Operation >3 hours duration Hospital Acquired Infections Treatment Side Effects Invasive Procedures	Tethering Interventions Antidepressant Use Hospital Immobility Fasting Medications that affect cognitive or physical function Long-term IV use Dialysis for end-stage renal failure	PTSD from oversedation Tethering Interventions Depth of Sedation Parenteral Nutrition Corticosteroid Use Use of Neuromuscular Blockade
<p><i>Supplementary Table 4 Identified risk factors for Hospital-Acquired Deconditioning</i></p> <p>IADL: Instrumental Activities of Daily Living, BADL: Basic Activities of Daily Living, PTSD: Post Traumatic Stress Disorder, CVA: Cardiovascular Accident CV: Cardiovascular, ICU-AW: Intensive Care Unit Acquired Weakness</p>			

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Original Protocol: Available to view as a supplementary file
named “PROTOCOL Towards a common definition of hospital
acquired deconditioning clean”

Data Sharing Statement: Data utilised in the results of this
scoping review are available in the supplementary file.
HADDefinitions_Supplementary_Data_File_26.09.2024

PRISMA-ScR Checklist available in document titled ScR
PRISMA-ScR-Fillable-Checklist_11Sept2019 15.10.2024

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Appendices

A Search Strategy

Database	Search and Index Terms	Justification	Number of results February 2022 (# of papers = 1865)	Updated results 17/07/2023 (# of papers = 223)	Updated results September 2024 (# of new papers = 202)	Total in review
AMED (OVID) – Allied and Complimentary medicine	As per all OVID searches	Database capturing literature complementary and alternative therapies. Chosen to ensure wider components of HAD are captured from multiple perspectives.	106	0	1	107
CINAHL (Ebsco) Cumulative index of Nursing and Allied Health Literature	Decondition* or decondition* syndrome (decondition* n2 (bed-rest or bedrest)) or (MH “deconditioning”) or (decondition* n4 (physiolog* or pathophysiol* or patholog*)) AND (decondition* n3 (diagnos* or assess*)) or (diagno* or respond* or response* or recogni*) or (present* or “clinical present*”) or “clinical finding*”) or (symptom* n4 *(assess* or evaluat*)) or interven* or (differen* w2	Allied health and nursing literature database capturing health studies from a multidisciplinary perspective. Chosen to show breadth of assessors and meanings depending on professional affiliation.	351	26	6	383

	diagnos*) or (framework or tool or classif*) or (MH "diagnosis+") AND (((inpatient* or hospital) n2 stay*) or "inpatient* stay*") or (rehabilitat* or rehab* cent* or community bed)					
Cochrane Library	hospital* AND (acquire* or associat*) AND decondi*	Database for Cochrane systematic reviews. Chosen to ensure scoping review not already completed recently.	0	1	0	1
EMBASE (OVID)	(Decondition* or Decondition* syndrome) or (decondition* adj2 (bed-rest or bedrest)) or (decondition* adj4 (physiolog* or pathophysiol* or patholog*)) or (decondition* adj3 (diagnos* or assess*)) or exp deconditioning/ or de\$condition*.mp.AND (diagnos* or respond* or response* or assess*)) or (present* or "clinical present*" or "clinical finding*") or symptom* adj4 (assess* or evaluat*) or interven* or (differen* adj2 diagnos*) or (framework or tool or classif*) or exp diagnosis AND (((inpatient* or hospital) adj2 stay*) or "inpatient* stay*") or (rehabilitat* or rehab* cent* or community bed)	Captures international biomedical and pharmaceutical literature. Chosen for cross country comparison of HAD explanations.	831	116	133	1080

GreyLit	Decondition* or functional decline	Covers grey literature (theses, reports, conference proceedings etc). Extends search beyond peer reviewed and traditionally published evidence	0	0 Can no longer search subscription required	0 No longer searchable	0
Medline (OVID)	(Decondition* or Decondition* syndrome) or (decondition* adj2 (bed-rest or bedrest)) or (decondition* adj4 (physiolog* or pathophysiol* or patholog*)) or (decondition* adj3 (diagnos* or assess*)) or de-conditioning.mp or exp deconditioning/ or de\$condition*.mp. AND (diagnos* or respond* or response* or assess*)) or (present* or "clinical present*" or "clinical finding*") or symptom* adj4 (assess* or evaluat*) or interven* or (differen* adj2 diagnos*) or (framework or tool or classif*) or exp diagnosis AND (((inpatient* or hospital) adj2 stay*) or "inpatient* stay*") or (rehabilitat* or rehab* cent* or community bed)	National library of medicine database. Captures biomedicine and health studies in the areas of behaviour sciences, life sciences, chemical sciences and bioengineering. Chosen to capture biological and medical explanations of HAD.	524	66	60	650
OpenGrey – now GreyNet	Decondition*	Covers grey literature (reports, dissertations, conference papers) within a European context.	2	0	0 Shutdown since last accessed	2

PEDro - Physiotherapy Evidence Database	Decondition* and hospital* or inpatient*	Database capturing physiotherapy and allied health literature. Chosen to focus on rehabilitation focused literature.	4	2	0	6
ProQuest dissertations and theses	hospital* AND (acquire* or associat*) AND decondi*	Chosen to search unpublished multidisciplinary theses and dissertations.	0	9	2	11
PsychInfo) (OVID)	As per all OVID searches	Search platform for American Psychological literature. Chosen to capture behavioral and psychological features or experiences of HAD.	47	3	0	50
Conducted in 2022 before undertaking the scoping review to avoid duplication						
Epistimonikos	Decondition* and hospital* or inpatient* and diagnosis*	Chosen to search unpublished work and registered protocols for upcoming or in progress systematic reviews.	3	-	-	-
JB1 Evidence Synthesis	Decondition* and hospital* or inpatient*	Chosen to search unpublished work and registered protocols for upcoming or in progress systematic reviews conducted under the JB1 methodology.	23	-	-	-

Trip – Turning research into practice	Deconditioning	Covers literature (including protocols) that is practice focused	1120	-	-
EThOS	Decondition*	UK thesis repository	18		

B Original and Refined Eligibility Criteria

	Initial Criteria		Revised Criteria	
	Inclusion	Exclusion	Inclusion	Exclusion
Population	Adults over 18	Children under 18	Adults over 18,	Children under 18, animal studies
Context	Inpatient or residential (care homes, rehab facilities) settings	Rehab at home/ community-dwelling studies	Stated Inpatient or residential (care homes, rehab facilities) settings	Rehab at home/ community-dwelling studies, outpatient programs, e.g. pulmonary/cardiac rehab, space flight, no location stated, day hospital, non-residential settings, lab-based studies
Concept	Hospital-acquired deconditioning or other descriptors (e.g. deconditioning, – general, medical, or surgical	Specified health conditions, e.g. cancer, stroke, frailty	Hospital-acquired deconditioning or other descriptors (e.g. deconditioning, sarcopenia, functional decline, iatrogenic disability) – general, medical, or surgical	Specified health conditions, e.g. cancer, stroke, frailty, Low back pain, fibromyalgia, RA, OA,

	Initial Criteria		Revised Criteria	
	Inclusion	Exclusion	Inclusion	Exclusion
Source Type	Any design, grey, peer-reviewed, opinion pieces, posters, conference proceedings, protocol	Nil	Any design, grey, peer-reviewed, opinion pieces, posters, conference proceedings, protocol	By default, case studies will be eliminated as they are a single condition.
Language	Written in English	Non- English language	Abstract or full-text written in English	Abstract or full text in non-English language
Time Frame	Published After 1st Jan 1990	Published before 1st Jan 1990	Published After 1st Jan 1990	Published before 1st Jan 1990

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C Data extraction tool

Source characteristics	
Study citation (authors, year, title, DOI)	
Source type - Study type (qual, quant, mixed) OR literature or background or opinion piece or abstract/poster	
Methods +/- methodology	
Country	
Cohort characteristics (age, gender, occupation if given)	
Setting (inpatient – acute or rehab)	
Study/research aim	
Study outcomes	
Profession of author (eg GP/ geriatrician, physio etc)	
Theme: consequence = occurs as part of hospital care, OR physiological syndrome demonstrated by functional loss, OR adverse event = preventable (usually found in rationale/background)	
Definition or description given for hospital- acquired deconditioning (+ source)	
What is the diagnostic criteria for HAD?	
Cause given	
Physiological changes discussed (?pulled from other populations)	
Stated incidence and prevalence (and citation)	
Assessment/diagnostic criteria (eg loss of ADLs)	
Risk factors for deconditioning – individual traits	
Associated co-morbidities	
Outcome measures utilised	

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How is HAD operationalised?	
Alternative names for HAD	
Clinical course including presenting feature, trajectory, associated consequences	
Contributory factors for HAD – environmental, economic, social, big picture	
Operational parameters (eg functional decline)	
Professionals involved in assessment/management/ prevention/ treatment	
Preventative practices/ strategies	
Intervention and expected outcome (treatment targets)	
How is HAD different to other hospital-acquired syndromes	
Compared syndromes (eg post hospital, ICU, frailty) how is deconditioning differentiated?	
If applicable	
Scale or framework for judging severity of deconditioning	
Rationale for importance of studying HAD	
Other text/ findings of interest	
Reflections/ questions arising	

Authors	year	Source type
Aizen, Shugaev & Lenger Artaza, Valera, San Juan, Urien, Fernandez & Malafarina	2006	Non-Interventional Retrospective
Asif, Taube, Sivarajah, Tsironis & Koizia	2016	Non-Interventional Prospective
Bailey, Miller, Russell & Clemmer.	2020	QI- Mixed
Baztan, Galvez, Cesar, & Socorro	2009	Editorial
	2009	Non-Interventional Prospective
Beam, Gorman, Kist, Giles, Kiser & Dumire Deisner-Ryan, Butera, Hinrichs, Derlein, Malong, Holtrop, Forster, Diedrich, Gustavson, & Stevens- Lapsley	2022	QI - Interventional
Belavy, Miokovic, Armbrecht, Richardson, Rittweger & Felsenberg	2023	Protocol
	2009	Non-Interventional Prospective
Bono & Reyes	2020	QI Non-Interventional
Booth, Rivet, Flici, Harvey, Hamill, Hundley, Holland, Hubbard, Trivedi & Collier	2016	QI- Mixed
Brown, Friedkin & Inouye Brown, Rothe, Peel, & Allman	2004	Non-Interventional Prospective
	2006	Non-Interventional Prospective Non-Interventional Cross
Burkhardt & Parigger	2018	Sectional
Butler & Welford	2021	QI - Interventional
Cabilan, Hines & Munday Chastin, Harvey, Dall, McInally, Mavroeidi & Skelton	2013	Systematic Review
	2019	Editorial
Churilov, Churilov, Brock, Murphy, Macisaac, & Ekinci Churilov, Churilov, MacIsaac & Ekinci		Non-Interventional Cross
	2019	Sectional
	2018	Systematic Review

Conlin Shaw, M	1996 Editorial
Corcoran, Gavaghan, Lyons & Moloney	2017 QI - Interventional
Covinsky, Pierluissi & Johnston	2011 Narrative Literature Review
Creditor	1993 Editorial
De Morton, Keating & Jeffs	2007 Systematic Review
Dennis, Johnson, Roberson, Heif, Bopp, Garner, Padala, Padala, Dubbert & Sullivan	2012 Non-Interventional Prospective
Deshpande, MacNeill, Lichtenberg, Pithadia & Velez	1998 Non-Interventional Retrospective
Dirkes & Kozlowski	2019 Editorial
Doherty-King & Bowers	2013 Secondary Analysis
Donnelly, Jevons and Wentworth	2018 QI - Interventional
Drolet, Dejuilio, Harkless, Henricks, Kamin, Leddy, Lloyd, Waters & Williams	2013 QI- Mixed
Engel, Tatebe, Alonzo, Mustille & Rivera	2013 QI- Mixed
Falvey, Mangione & Stevens- Lapsley	2015 Editorial
Fisher, Graham, Krishnana & Ottenbacher	2016 Non-Interventional Retrospective
Friedman, Mayer, Hoyer & Atanelov	2013 QI- Mixed
Galloway, Karmarkar, Graham, Tan, Raji, Granger & Ottenbacher	2016 Non-Interventional Retrospective
Goodman, Bonner, Wright, Hugill, Howard, Danjoux, Batterham & Howell	2012 Exploratory RCT
Gordon, Grimmer & Barras Gosselink, Neddham, & Hermans	2019 Systematic Review
Graf	2012 Editorial 2006 Editorial
Guilcher, Everall, Cadell, Li, & Kuluski	2021 Qualitative

Guy, Lerman & Justo	2012 Non-Interventional Retrospective
Haley, Sullivan, Granger, & Kortebein	2011 Non-Interventional Retrospective
Hartley, Keating, Jeffs, Raymond & Smith	2022 Systematic Review
Higgins, Frazier, Lennie, Rayens & Avila	2020 Non-Interventional Prospective
Hoenig and Rubenstein	1991 Editorial
Hoenig, H	1997 State-of-the-Art Review
Horgan, Carr & Murphy	2019 QI- Mixed
Husain-Qureshi & Kirkwood	2019 QI Non-Interventional
Inouye, Bogardus, Baker, Leo-Summers & Cooney	2000 Editorial
Inouye, Wagner, Acampora, Horwitz, Cooney, Hurst & Tinetti	1993 Non-Interventional Prospective
Johnson, Swiatek, Wang, Liu, Chung, & Chung	2019 Non-Interventional Retrospective
Kamper, Schultz, Hasen, Andersen, Ekmann, Nygaard, Helland, Wejse, Rahbek, Noerst, Pressel, Nielsen, Finn & Suetta	2020 Protocol
Killewich, L	2006 Editorial
Koh, Sridaran, & Goh	2020 QI - Interventional
Kortebein	2009 Narrative Literature Review
Kortebein, Bopp, Granger & Sullivan	2008 Non-Interventional Retrospective
Kovar, Carmichael, Jones, & Nichols Robsinson	2020 Non-Interventional Prospective
Krumholz	2013 Editorial
Laneuville, Rocheleau, Chan Chun, Pelchat & Trudel	2021 Non-Interventional Prospective
Latronico	2015 Published Conference Materials
Lim, Doshi, Castasus, Lim & Mamun	2006 Non-Interventional Retrospective Non-Interventional Cross
Manning, Keller & Frank	2009 Sectional
McInerney, McCarthy, McCullagh, Fox & Timmons	2018 Qualitative

Mendez-Tellez, Pedro, Nusr,	
Feldman & Needham	2012 Editorial
Ng, Jung, Tay, Bok, Chiong	
& Lim	2007 Non-Interventional Prospective
Norheim, Bautmans & Kjaer	2017 Non-Interventional Prospective
O'Sullivan & Cleffken	2018 QI - Interventional
Pack, Miwa, Engleman,	
Lagu, Visintainer, Lindenauer	
& Woodbury	2016 QI - Interventional
Parksinson	2019 QI - Interventional
Petrucci, Ricotti, Monteleone,	
Ferriero, Giromini, Guillage,	
Ambrosini, & Dalla Toffola	2018 Non-Interventional Prospective
Rader, M & Vaughen, J.	1994 Editorial
Raj, Munir, Ball, & Carr	2007 Interventional - Evaluation
Ritchie, Wood, Martin &	
Jones	2017 QI- Mixed
Rogerson & Kendall	2019 QI Non-Interventional
Sanchez-Rodriguez, Marco,	
Miralles, Fayos, Mojal,	
Alvardo, Vazquez-Ibar,	
Escalada & Muniesa	2014 Non-Interventional Prospective
Sayer, Whiteaway, Dawson,	
Simpson & Chu	2021 QI - Interventional
Schweickert & Kress	2011 Narrative Literature Review
Siebens, Aronow, Edwards,	
& Ghasemi	2000 RCT
Siegler, E. L., Stineman, M.	
G. & Maislin, G.	1994 Non-Interventional Retrospective
Silveira, Pez, Nogueira,	
Furlan & Colombo	2013 Non-Interventional Prospective
Silver & Siebens	1994 Editorial
Small, Tasneem, Bagheri,	
Chodosh, Adelsheimer,	
Sutera & Moroz	2020 Interventional - Feasibility
Smtih, Sreekanta, Walkeden,	
Penhale & Hanson	2020 Systematic Review
Soares, Nucci & Silva	2012 Exploratory RCT

Sottile, Quan, McNulty, Gray, Higgins & Moss	2014 Non-Interventional Prospective
Spencer, J., Hersch, G., Eschenfelder, V., Fournet, J. & Murray-Gerzik, M.	1999 Qualitative
Stapley, Colley & Richards	2018 QI - Interventional
Suriyaarachchi, Chu, Bishop, Thew, Matthews, Cowan, Gunawardene & Duque Swinerton & Price	2020 QI - Interventional 2023 Editorial
Timmer, Unsworth & Browne	2019 RCT
Timmer, Unsworth & Taylor	2014 Systematic Review
Timmer, Unsworth & Taylor Timmer, Unsworth, & Browne	2015 Delpi 2019 Protocol
Unsworth & Eyres Vargo, Wilson, Fuentes & Eliam	2005 Pilot RCT 2012 Non-Interventional Retrospective
Venturelli, Crisafulli, Antoni, Trianni & Clini Wakabayashi & Sakuma	2011 State-of-the-Art Review 2014 Editorial
Wakabayashi & Sashika	2014 Non-Interventional Prospective
Yoshimura, Wakabayashi, Bise & Tanoue, Sourdet, Lafont, Rolland, Nourhashemi, Andrieu & Vellas	Non-Interventional Cross 2018 Sectional Non-Interventional Cross 2015 Sectional
Wai, Lu, Gill, Henderson and /	2024 QI - Interventional
Urquiza, Fernandex, Arrinda, I	2024 Observational - Retrospective
Pavon, Sloane, Pieper, Colon-	2020 Observational - Prospective
Ortiz-Alonso, Bustamante-Ara	2020 Interventional - RCT

Population	Care Focus	Publication Type
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Functional Recovery Unit	Rehabilitation/ Post Acute	Conference Abstract
Surgery	Acute	Conference Abstract
ICU	ICU	Journal Article
Geriatric Medicine	Rehabilitation/ Post Acute	Journal Article
Medical and Surgical	Acute	Journal Article
Skilled nursing facilities	Rehabilitation/ Post Acute	Journal Article
Research Medicine and Surgery Registered Nurses, Patient Care Associates and Residents	Other	Journal Article
	Acute	Conference Abstract
Neurotrauma ICU	ICU	Journal Article
General Medicine	Acute	Journal Article
All	Acute	Journal Article
Geriatric Early Rehabilitation	Rehabilitation/ Post Acute	Conference Abstract
Geriatric Medicine	Acute	Conference Abstract
Surgical Prehabilitation	Other	Journal Article
All	Acute	Journal Article
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Conference Abstract
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article

1			
2	All	Acute	Journal Article
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5	Geriatric Medicine	Acute	Conference Abstract
6			
7	Geriatric Medicine	Acute	Journal Article
8	Geriatric Medicine	Acute	Journal Article
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11	General Medicine	Acute	Journal Article
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15	Recuperation and		
16	Recovery Ward	Rehabilitation/ Post Acute	Journal Article
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20	Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
21	ICU	ICU	Journal Article
22	Medicine and Surgery		
23	Registered Nurses	Acute	Journal Article
24			
25			
26	Geriatric Rehabilitation	Rehabilitation/ Post Acute	Conference Abstract
27			
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31	ICU and Intermediate Care	ICU	Journal Article
32			
33	Medical and Surgical ICU	ICU	Journal Article
34			
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36	Geriatric Medicine	Acute	Journal Article
37			
38			
39	Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
40			
41			
42	General Medicine	Acute	Conference Abstract
43			
44			
45	Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article
46			
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49			
50	ICU	ICU	Conference Abstract
51			
52	Geriatric Medicine	Acute	Journal Article
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55	ICU	ICU	Journal Article
56	Geriatric Medicine	Acute	Journal Article
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59	Acute Medicine Patients,		
60	Caregivers, Providers and		
	Decision Makers	Acute	Journal Article

Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
General Medicine	Acute	Journal Article
Major Trauma	Acute	Journal Article
Geriatric Medicine	Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
General Medicine	Acute	Conference Abstract
ICU	ICU	Conference Abstract
All	Acute	Journal Article
General Medicine	Acute	Journal Article
Surgery	Acute	Journal Article
Acute Medicine	Acute	Journal Article
Geriatric Surgery	Acute	Journal Article
Orthopedics	Acute	Journal Article
All	Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Elective Surgery	Acute	Conference Abstract
All	Acute	Journal Article
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article
ICU	ICU	Conference Abstract
Geriatric Medicine	Acute	Journal Article
General Medicine		
Registered Nurses	Acute	Journal Article
Geriatric Medicine	Acute	Conference Abstract

Neurology ICU	ICU	Journal Article
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine ICU	Acute ICU	Journal Article Conference Abstract
Cardiac Surgery	Acute	Conference Abstract
Orthopedics	Acute	Conference Abstract
Geriatric Surgery	Acute	Journal Article
Orthopedics	Acute	Journal Article
General Medicine	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine Nursing Assistants	Acute and Post Acute	Journal Article
Geriatric Medicine	Acute	Conference Abstract
Subacute Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine ICU	Acute ICU	Conference Abstract Journal Article
Medicine and Surgery	Acute	Journal Article
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article
ICU Surgery	ICU Acute	Conference Abstract Journal Article
General Medicine	Acute	Conference Abstract
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Surgery	Acute	Conference Abstract

ICU	ICU	Conference Abstract
Transitional Unit	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine	Acute	Conference Abstract
Virtual Rehabilitation Beds	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine	Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Occupational Therapists	Rehabilitation/ Post Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Surgery	Acute	Journal Article
Inpatient Rehabilitation	Rehabilitation/ Post Acute	Conference Abstract
ICU	ICU	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Convalescent		
Rehabilitation	Rehabilitation/ Post Acute	Journal Article
Geriatric Medicine	Acute	Journal Article
General Medicine	Acute	Journal Article
Orthogeriatric		
Rehabilitation	Rehabilitation/ Post Acute	Journal Article
General Medicine	Acute	Journal Article
Geriatric Medicine	Acute	Journal Article

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9		Science and Engineering
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#VALUE!	Physiotherapy, Medicine Medicine, Public Health, Health Sciences, Arts Medicine, Sports Nutrition, Biological Scientists

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3 First author background
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Medicine

Physiotherapy

Nursing

Medicine

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60 Physiotherapy

Occupational Therapy

Medicine

Advanced Care Practitioner

Occupational Therapy

Occupational Therapy

Occupational Therapy

Occupational Therapy

Occupational Therapy

Medicine

Medicine

Medicine

Medicine

Physiotherapy

Medicine

Medicine

Authors	Source type	Population
Siegler, E. L., Stineman, M. G. & Maislin, G.	Non-Interventional Retrospective	Inpatient Rehabilitation
Hoenig, H	State-of-the-Art Review	Geriatric Rehabilitation
Conlin Shaw, M	Editorial	All
Rader, M & Vaughen, J.	Editorial	Orthopedics
Timmer, Unsworth & Browne	RCT	Geriatric Rehabilitation
Spencer, J., Hersch, G., Eschenfelder, V., Fournet, J. & Murray-Gerzik, M.	Qualitative	Transitional Unit
Deshpande, MacNeill, Lichtenberg, Pithadia & Velez	Non-Interventional Retrospective	Geriatric Rehabilitation
Unsworth & Eyres	Pilot RCT	Surgery
Killewich, L	Editorial	Geriatric Surgery
Lim, Doshi, Castasus, Lim & Mamun	Non-Interventional Retrospective	Geriatric Medicine
Aizen, Shugaev & Lenger	Non-Interventional Retrospective	Geriatric Rehabilitation
De Morton, Keating & Jeffs	Systematic Review	General Medicine
Raj, Munir, Ball, & Carr	Interventional - Evaluation	General Medicine
Silver & Siebens	Editorial	Surgery
Ng, Jung, Tay, Bok, Chiong & Lim	Non-Interventional Prospective	Inpatient Rehabilitation
Bailey, Miller, Russell & Clemmer.	Editorial	ICU

Baztan, Galvez, Cesar, & Socorro	Non-Interventional Prospective	Geriatric Medicine
Belavy, Miokovic, Ambrecht, Richardson, Rittweger & Felsenberg	Non-Interventional Prospective	Research
Kortebein	Narrative Literature Review Non-Interventional Cross	All
Manning, Keller & Frank	Sectional	General Medicine
Venturelli, Crisafulli, Antoni, Trianni & Clini	State-of-the-Art Review	ICU
Schweickert & Kress	Narrative Literature Review	ICU
Dennis, Johnson, Roberson, Heif, Bopp, Garner, Padala, Padala, Dubbert & Sullivan	Non-Interventional Prospective	Recuperation and Recovery Ward
Goodman, Bonner, Wright, Hugill, Howard, Danjoux, Batterham & Howell	Exploratory RCT	ICU
Gosselink, Neddham, & Hermans	Editorial	ICU
Guy, Lerman & Justo	Non-Interventional Retrospective	Geriatric Rehabilitation
Mendez-Tellez, Pedro, Nusr, Feldman & Needham	Editorial	Neurology ICU
Soares, Nucci & Silva	Exploratory RCT	Surgery
Vargo, Wilson, Fuentes & Eliam	Non-Interventional Retrospective	Inpatient Rehabilitation

Cabilan, Hines & Munday	Systematic Review	Surgical Prehabilitation
Doherty-King & Bowers	Secondary Analysis	Medicine and Surgery
Drolet, Dejuilio, Harkless, Henricks, Kamin, Leddy, Lloyd, Waters & Williams	QI- Mixed	ICU and Intermediate Care
Engel, Tatebe, Alonzo, Mustille & Rivera	QI- Mixed	Medical and Surgical ICU
Friedman, Mayer, Hoyer & Atanelov	QI- Mixed	General Medicine
Silveira, Pez, Nogueira, Furlan & Colombo	Non-Interventional Prospective	ICU
Timmer, Unsworth & Taylor	Systematic Review	Geriatric Rehabilitation
Sottile, Quan, McNulty, Gray, Higgins & Moss	Non-Interventional Prospective	ICU
Wakabayashi & Sakuma	Editorial	Geriatric Rehabilitation
Wakabayashi & Sashika	Non-Interventional Prospective	Geriatric Rehabilitation
Falvey, Mangione & Stevens-Lapsley	Editorial	Geriatric Medicine
Latronico	Published Conference Materials	ICU

Timmer, Unsworth & Taylor	Delpi	Geriatric Rehabilitation
Artaza, Valera, San Juan,		
Urien, Fernandez &		
Malafarina	Non-Interventional Prospective	Functional Recovery Unit
Booth, Rivet, Flici, Harvey,		
Hamill, Hundley, Holland,		
Hubbard, Trivedi & Collier	QI- Mixed	Neurotrauma ICU
Fisher, Graham, Krishnana &		
Ottenbacher	Non-Interventional Retrospective	Geriatric Rehabilitation
Galloway, Karmarkar,		
Graham, Tan, Raji, Granger		
& Ottenbacher	Non-Interventional Retrospective	Inpatient Rehabilitation
Pack, Miwa, Engleman,		
Lagu, Visintainer, Lindenauer		
& Woodbury	QI - Interventional	Cardiac Surgery
Corcoran, Gavaghan, Lyons		
& Moloney	QI - Interventional	Geriatric Medicine
Norheim, Bautmans & Kjaer	Non-Interventional Prospective	Geriatric Medicine
Ritchie, Wood, Martin &		
Jones	QI- Mixed	Geriatric Medicine
Burkhardt & Parigger	Non-Interventional Cross	Geriatric Early
Churilov, Churilov, MacIsaac	Sectional	Rehabilitation
& Ekinici	Systematic Review	Inpatient Rehabilitation
Donnelly, Jevons and Wentworth	QI - Interventional	Geriatric Rehabilitation
McInerney, McCarthy,		
McCullagh, Fox & Timmons	Qualitative	Geriatric Medicine
O'Sullivan & Cleffken	QI - Interventional	ICU
Petrucci, Ricotti, Monteleone,		
Ferriero, Giromini, Guillace,		
Ambrosini, & Dalla Toffola	Non-Interventional Prospective	Geriatric Surgery
Stapley, Colley & Richards	QI - Interventional	Geriatric Medicine

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3	Yoshimura, Wakabayashi,	Non-Interventional Cross	Convalescent
4	Bise & Tanoue,	Sectional	Rehabilitation
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6	Churilov, Churilov, Brock,	Non-Interventional Cross	
7	Murphy, Macisaac, & Ekinici	Sectional	Inpatient Rehabilitation
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12	Dirkes & Kozlowski	Editorial	ICU
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27	Gordon, Grimmer & Barras	Systematic Review	Geriatric Medicine
28			
29	Horgan, Carr & Murphy	QI- Mixed	General Medicine
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32	Husain-Qureshi & Kirkwood	QI Non-Interventional	ICU
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38	Johnson, Swiatek, Wang,		
39	Liu, Chung, & Chung	Non-Interventional Retrospective	Surgery
40	Parksinon	QI - Interventional	Orthopedics
41			
42	Rogerson & Kendall	QI Non-Interventional	Geriatric Medicine
43			
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46	Timmer, Unsworth, &		
47	Browne	Protocol	Geriatric Rehabilitation
48	Asif, Taube, Sivarajah,		
49	Tsironis & Koizia	QI- Mixed	Surgery
50			
51			
52	Bono & Reyes	QI Non-Interventional	Medicine and Surgery
53			
54			
55	Higgins, Frazier, Lennie,		
56	Rayens & Avila	Non-Interventional Prospective	Major Trauma
57			
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Kamper, Schultz, Hasen, Andersen, Ekmann, Nygaard, Helland, Wejse, Rahbek, Noerst, Pressel, Nielsen, Finn & Suetta	Protocol	Acute Medicine
Koh, Sridaran, & Goh	QI - Interventional	Orthopedics
Kovar, Carmichael, Jones, & Nichols Robinson	Non-Interventional Prospective	Elective Surgery
Small, Tasneem, Bagheri, Chodos, Adelsheimer, Sutera & Moroz	Interventional - Feasibility	General Medicine
Smtih, Sreekanta, Walkeden, Penhale & Hanson	Systematic Review	Inpatient Rehabilitation
Suriyaarachchi, Chu, Bishop, Thew, Matthews, Cowan, Gunawardene & Duque	QI - Interventional	Virtual Rehabilitation Beds
Butler & Welford	QI - Interventional	Geriatric Medicine
Guilcher, Everall, Cadel, Li, & Kuluski	Qualitative	Acute Medicine
Laneuville, Rocheleau, Chan Chun, Pelchat & Trudel Sayer, Whiteaway, Dawson, Simpson & Chu	Non-Interventional Prospective	Inpatient Rehabilitation
Siebens, Aronow, Edwards, & Ghasemi	QI - Interventional	Geriatric Medicine
	RCT	Medicine and Surgery
Hoenig and Rubenstein	Editorial	Geriatric Medicine
Creditor Inouye, Wagner, Acampora, Horwitz, Cooney, Hurst & Tinetti	Editorial	Geriatric Medicine
Inouye, Bogardus, Baker, Leo-Summers & Cooney	Non-Interventional Prospective	General Medicine
	Editorial	All

	Brown, Friedkin & Inouye	Non-Interventional Prospective	General Medicine
	Brown, Rothe, Peel, &		
	Allman	Non-Interventional Prospective	All
	Graf	Editorial	Geriatric Medicine
	Kortebein, Bopp, Granger &		
	Sullivan	Non-Interventional Retrospective	Geriatric Rehabilitation
	Covinsky, Pierluissi &		
	Johnston	Narrative Literature Review	Geriatric Medicine
	Haley, Sullivan, Granger, &		
	Kortebein	Non-Interventional Retrospective	Geriatric Rehabilitation
	Krumholz	Editorial	All
	Sanchez-Rodriguez, Marco,		
	Miralles, Fayos, Mojal,		
	Alvardo, Vazquez-Ibar,		Subacute Geriatric
	Escalada & Muniesa	Non-Interventional Prospective	Rehabilitation
	Chastin, Harvey, Dall,		
	McInally, Mavroeidi &		
	Skelton	Editorial	All
	Hartley, Keating, Jeffs,		
	Raymond & Smith	Systematic Review	General Medicine

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Swinerton & Price	Editorial	Geriatric Medicine
Beam, Gorman, Kist, Giles, Kiser & Dumire BISHNATH-Ryan, Dutera, Hinrichs, Derlein, Malong, Holtrop, Forster, Diedrich, Gustavson, & Stevens- Lapsley Sourdet, Lafont, Rolland, Nourhashemi, Andrieu & Vellas	QI - Interventional Protocol Non-Interventional Cross Sectional	Medical and Surgical Skilled nursing facilities Geriatric Medicine
Wai, Lu, Gill, Henderson and	QI - Interventional	General Medicine
Urquiza, Fernandex, Arrinda,	Observational - Retrospective	Orthogeriatric Rehabilitation
Pavon, Sloane, Pieper, Colon	Observational - Prospective	General Medicine
Ortiz-Alonso, Bustamante-Ara	Interventional - RCT	Geriatric Medicine

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Rehabilitation/ Post Acute

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ICU

Rehabilitation/ Post Acute

ICU

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Rehabilitation/ Post Acute

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Acute

Rehabilitation/ Post Acute

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Rehabilitation/ Post Acute

Rehabilitation/ Post Acute

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Acute

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Rehabilitation/ Post Acute

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Acute

Description of HAD identified, where given

None Given

"Deconditioning occurs with a decrease in activity level for any reason; results include, osteoporosis, loss of muscle strength (especially lower extremity) and flexibility." p1376

"Deconditioning, the multiple changes in organ system physiology that are induced by inactivity and reversed by activity in common in elderly persons and occurs with bed rest" p 318

"deconditioning, which results in a state of reduced Functional capacity of a body system or systems, should be considered as a separate condition from the original illness or disease process" p s61

None Given

"Deconditioning, which has been defined as "the physiologic changes occurring with bed rest or inactivity" P 159

None Given

"The multiple changes in organ system physiology that are induced by inactivity and reversed by activity" p219

Acute = changed occurring within days to weeks of a sudden decrease in activity independent of disease

"The multiple changes in organ system physiology that are induced by inactivity and reversed by activity. The types of changes depend on earlier fitness level and degree of superimposed inactivity" p736

"Physiologic Functional capacity" - ability to perform tasks of daily life and the ease with which these tasks can be performed

"loss of function and independence" p 30

None Given - all rehab patients Noccupational therapists, admitted for stroke or hip fracture

None Given

1 or more of the following: Physical, emotional, cognitive, and social conditions that interfere with their independence and quality of life

"Generalized weakness/debility as documented in the chart" p128

None Given

"The presence of deconditioning was also clinically diagnosed by managing team consensus, as no standardised clinical or laboratory criteria exists" p5

"The resulting deconditioning can be independent of the primary disease process and cause physical debility when patients attempt to resume activities of daily living" 19 (check page number

The appearance of Functional deterioration after the patient is hospitalized may be a consequence of directly disabling pathologies such as stroke or hip fracture, but may also be derived from multiple factors associated to hospitalization that interact in elderly patients with manifest or underlying frailty coming in for different medical or surgical conditions, something that has been called 'deconditioning'" p270

None Given

"a significant decline in Functional ability that is unrelated to a specific neurological or orthopedic insult. This generalized Functional decline is frequently, albeit inconsistently, termed deconditioning"

"two meanings a loss of physical fitness due to failure to maintain an optimal level of physical activity or training"

"the multiple changes in organ system physiology that are induced by inactivity and reversed by activity"

as a dx " deconditioning seems to be applied nearly ubiquitously by clinicians of all specialties to succinctly infer that due to the cumulative effect of a prolonged or complicated hospitalization, a patient has experienced a significant functional decline" 1-3 p67

"Hospitalized patients are often debilitated, either from their admitting illness or from the deconditioning that occurs with inactivity" p 252

"a prolonged stay in hospital and the difficult response to medications can often cause severe complications in these patients for muscle weakness, physical deconditioning, recurrent symptoms, mood alterations, and poor quality of life"

None Given

None Given

None Given

None Given - talks about ICU AW

"... prevention and treatment of deconditioning (muscle weakness, joint stiffness, impaired Functional exercise capacity, physical inactivity." p 537

"Hospitalized elderly patients often experience a decrease in muscle mass related to bed rest and acute illness which might be associated with deconditioning, i.e. Functional and mobility decline"

"Decrease in mobility and/or activity due to acute illness and/or bed restriction, but Nonoccupational therapists, including patients with bone fractures, patients following orthopedic procedures, and patients following CVA" Hoenig & Rubenstein 1991, Kortebein 2009,. p382

"The etiology of ICUAW is multifactorial and may include (1) prolonged bed rest and immobility leading to deconditioning and disuse atrophy, (2) critical illness polyneuropathy (CIP), critical illness myopathy (CIM), known as critical illness neuromyopathy (CINM), or (3) prolonged neuromuscular blockade. p97

None Given

None Given

None Given

Functional decline is defined as a loss in ability to perform usual activities or daily living including a loss in ability to ambulate. - no further, unable to find 2 "deconditioning effects of bed rest are one of the most predictable causes of loss of independent ambulation in hospitalized older persons" p1 self gen.

"physical inactivity associated with hospital care for a range of medical conditions can have many unfavourable consequences. They include neuromuscular dysfunction, metabolic disturbances, and other organ system abnormalities that add to disease burden"

None Given

None Given

None Given

"One of these detrimental effects is deconditioning, a complex process of physiological change that can affect multiple systems within the body and often results in Functional decline" p1079

"Intensive care associated weakness (ICU-AW) includes a spectrum of weakness from deconditioning to critical illness polyneuropathy and myopathy"

"Hospital associated deconditioning is characterized by the Functional decline that occurs during acute hospitalization due to illness or injury, or both, and is unrelated to a specific neurological or orthopedic insult, or both."

"Hospital associated deconditioning is characterized by the Functional decline that occurs during acute hospitalization due to illness, injury, and unrelated to a specific neurological and/or orthopedic insult" AC - Functional decline that occurs during hospital admission due to BMI in normal range or those who are underweight

"... older adults with marked deficits in physical function secondary to an acute hospitalization" p1

"This decline in function during acute hospitalization has been labelled as a partially avoidable physical dependence occurring over the course of care, or, more strikingly, as iatrogenic disability. Taken together, this multi-system decline in function has been described as part of a clinical sequela historically termed "medical deconditioning" or "hospital-associated deconditioning", but more recently has evolved into a more formalized "post-hospital syndrome" (PHS). While PHS is a valuable term of increasing importance, we will use the term "hospital-associated deconditioning" (HAD) to describe our condition of interest in this manuscript, as this term better describes deficits seen in physical therapist practice settings." p4/5

"The ICU-acquired weakness (ICUAW), initially defined as ICU-acquired paresis, is a clinically detected syndrome in critically ill patients in whom there is no plausible cause other than critical illness.

"Deconditioning causes physiological changes in the body such as reduced muscle strength. However, it is the resulting Functional decline that may be the most problematic for older adults with an acute illness..." p 42

None Given

"deconditioning occurs rapidly, worsens in severity with bed rest, and places hospitalized patients at increased risk of the poor outcomes associated with immobility" p 284

"In general, they have medically complex conditions and have had prolonged, complicated hospital stays. The resultant debility has been labelled acute "hospital-associated deconditioning" which involved a distinct pathway of Functional decline and decreased independence in activities of daily living" p63

"Debility, also known as deconditioning, involves a decline in Functional mobility or activities or daily living, or both" " Debility as an admission diagnosis is defined as generalized deconditioning not attributable to any other Centres for Medicare & Medicaid Services (CMS) rehabilitation impairment groups, such as stroke or orthopedic conditions"

None Given

None Given

"Hospital associated deconditioning due to a combination of illness and inactivity is a serious problem for elderly adults. ...the systemic level of the inflammatory biomarker C-reactive protein (CRP) is predictive of both length of hospital stay and readmission rates."

"Hospital-associated deconditioning is defined as a significant decline in Functional abilities developed through acute and prolonged exposure to a medical care facility environment, and is independent of that attributed to primary pathologies resulting in acute admission" p425

None Given

None Given

None Given

"older people often experience Functional decline in hospital due to factors including immobilisation and deconditioning"

"There are numerous negative side effects associated with an ICU stay, which include immobility, deconditioning and weakness" p 199

Based on PDSS

None Given

"Hospital-associated deconditioning is unrelated to orthopedic or neurological diseases and was characterized by the Functional decline that occurs during acute hospitalization due to injury, illness or both." p2

None Given

"In older adults, physical inactivity during hospitalization is almost and accepted part of the inpatient experience yet contributes to a host of negative outcomes, including a reduced ability to perform activities of daily living, an increased incidence of readmission and institutionalization" p34

"deconditioning is *"a complex process of physiological change following a period of inactivity, bedrest or sedentary lifestyle"* Pg 397.

"declines in muscle strength, muscle mass, cognitive function, muscle protein synthesis and physical function" pg 398

"loss of mobility (stairs, footpaths) and inability to undertaken activities of daily living (such as sit-to-stand, moving around and cutting toe nails). pg 398

"8 hazards of hospitalization (including bed rest or enforced immobilization) as: decline in muscle strength and aerobic capacity; vasomotor instability; reduced bone density; reduced pulmonary ventilation; altered sensory"continence", appetite and thirst; and urinary incontinence. p 398

"unnecessary bed rest results in a loss of mobility and an increased length of hospital stay"

"physical deconditioning is common in critical care patients resulting in a long rehabilitation process" pg 74

"Krumholz coined the term posthospital syndrome (PHS) to identify this "acquired, transient period of vulnerability" in which patients have Functional decline related to acute hospitalization" pg 52

In addition to the illness requiring medical attention, hospital admissions result in sleep deprivation, malnourishment, polypharmacy (notably narcotics), immobility, cognitive and physical deconditioning, and stress related to socioeconomic concerns.20-22

None Given

None Given

acute hospitalisation is often associated with adverse consequences despite successful management of the medical problem"

"Deconditioning, sometimes referred to as debility, is a complex process of physiological change that can affect multiple systems within the body" pg 137

None Given

None Given

"traumatic injuries and their management often result in reduction in or loss of mobility, which can lead to skeletal muscle deconditioning and degradation and ultimately, sustained disability" pg 527.

None Given

"Following an extended period of inactivity during hospitalization, patients frequently experience hospital acquired deconditioning. Elderly patients experience declines in self-care abilities postdischarge" p 258

None Given

"Deconditioning from prolonged bedrest during hospitalization predisposes older patients to loss of mobility and the need for additional rehabilitation post-discharge" pg S134

"Hospital-associated deconditioning (HAD) is a complex negative consequence following hospitalisation. It is associated with prolonged periods of immobility. The cumulative impact of extended or complicated hospitalisation among older adults typically results in patients experiencing a decrease in muscle mass and significant Functional decline due to a complex process of physiological changes that can affect multiple systems" . Pg1

"The term "hospital-associated deconditioning" (HAD) characterizes the Functional decline that occurs during hospitalization due to illness or injury or both and is unrelated to a specific neurological or orthopaedic insult". p172

"Prolonged bedrest amongst the elderly causes deconditioning leading to; increased hospital length of stay, additional social costs and decreased quality of life! P il

"Preventable harm also includes hospital-associated deconditioning (HAD), also known as post-hospital syndrome or the trauma of hospitalization, which is characterized as a period of generalized risk and stress occurring while a patient is receiving care in hospital from an acute condition" p 2

"Hospital-acquired deconditioning is defined as the Functional decline resulting from acute hospitalization and unrelated to a specific neurological or orthopedic condition" p1

".. Some level of deconditioning during their stay. This can lead to longer length of stays, premature admissions to care homes and loss of function while in hospital" p il

"Deconditioning can be defined as *"the multiple changes in organ system physiology that are induced by inactivity and reversed by activity"*. 7 pg 1545

"In addition to the effects of whatever acute illness brought them to the hospital, older people frequently incur major Functional setbacks stemming from in-hospital treatment and immobilization." p 220

"For many, hospitalization is followed by an often irreversible decline in Functional status and a change in quality and style of life." pg 118

"Functional decline, defined as a deterioration in self-care skills, is a common and often devastating problem for hospitalized elderly patients." p 645

"Functional decline, defined as a decrement in physical and/or cognitive Functional, is the leading complication of hospitalization for older patients." p 1697

None Given

"Functional decline, defined as loss of the ability to care for oneself, commonly occurs during hospitalization, being experienced by up to 65% of older adults", p277

"Deconditioning is the term used to describe the decrease in muscle mass and other physiologic changes that result from either ageing or immobility or both and contribute to overall weakness. Functional decline is the consequence of those physiologic changes - the resulting inability to perform activities that ensure a person's independence, such as rising unaided from a chair." p60
"Clinically, this decrement in function associated with hospitalization is commonly termed *debility* or *deconditioning*, although there are no distinct diagnostic criteria for either of these conditions, and they are used essentially interchangeably." p 119

"In older patients, acute medical illness that requires hospitalization is a sentinel event that often precipitates disability. This results in the subsequent inability to live independently and complete basic activities of daily living (ADLs). This hospitalization associated disability ... may be triggered even when the illness that necessitated the hospitalization is successfully treated." p1782

"...it has long been recognized that hospital-associated debility/generalized weakness (or deconditioning) is a multifactorial syndrome with contributing factors, including "specific medical condition" (i.e. the medical/surgical illness necessitating hospitalization) as well as the bed rest/inactivity, the adverse effects of medications/treatments, compromised nutrition, inflammation, and others." p795
"Patients who were recently hospitalized are not only recovering from their acute illness, but they also experience a transient period of generalized risk for a wide range of adverse health events. Thus, their condition may be better characterized as a post-hospital syndrome, an acquired condition of vulnerability." p1
"patients with sarcopenia have greater disability and functional dependence compared to their peers without the condition" p 39

"Elderly patients admitted to a subacute geriatric care unit have recently suffered and acute experience, generally have high co-morbidity and medical complexity...At this level of hospital care, patients have Functional limitations secondary to an acute medical or surgical intervention that is potentially reversible."

None Given

"Older adults often experience a reduction in functional ability during acute illness or hospitalisation. The degree of loss of function is thought to be dependent on pre-existing physical and cognitive frailty and the severity of the illness. It is suggested that for people admitted to hospital, hospital care itself may impede Functional recovery or even lead to further loss of function. Terms such as hospital-associated Functional decline (and hospital-associated deconditioning) have been used to refer to this phenomenon." p13

documented. One such risk is deconditioning, which can be defined as a decrease in muscle mass caused by complex physiological changes occurring as a result of prolonged immobility and leading to significant Functional decline." p35

"Deconditioning is a decrease in muscle mass and overall function associated with prolonged immobility" p35

"Deconditioning is associated with further immobility, reduced ability to walk, falls, confusion, swallowing difficulties, pressure ulcers, constipation, lack of appetite and venous thromboembolism." p36

"Elderly patients are at substantial risk of functional decline, adverse health outcomes, and prolonged hospital stays due to unnecessary immobilization during hospitalization [1]. Patients, age 65 and older, spend most of their hospital stay in bed instead of walking or being out of bed (OOB) [2]. As a result, muscle loss, venous thromboembolism, pressure injuries, orthostatic hypotension, loss of concentration and motivation, depression, and delirium occur because of immobility [3-7]."

None given

None given

Physiological deconditioning, also referred to as pajamas (Pj) paralysis, describes the adverse physical and psychological effects experienced by patients who spend lengthy periods immobile and lying in bed, often in hospital pajamas or gowns, during hospital admission [1,2]. P1 HAD is defined as a new or additional disability in activities of daily living (ADL) that develops during admission [6–8].

In addition, a significant number of older adults experience functional decline during acute hospitalization in the absence of newly disabling orthopedic or neurologic diagnoses.⁴ These patients are commonly termed as having hospital-associated deconditioning (HAD). Hospital-acquired disability (HAD), functional loss acquired during hospitalization, is common; and a key contributor to this process is immobility.^{1,2} Hospitalization-associated disability [HAD, ie, loss of the ability to perform one or more basic activities of daily living (ADLs) independently at discharge] occurs in more than one-third of hospitalized older adults.

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16	Immobilisation syndrome,
17	disuse syndrome
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36	Functional decline,
37	Reduced "Physiologic
38	Functional capacity"
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41	none given
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44	none given
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46	Functional decline
47	(deterioration in physical or
48	cognitive function)
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53	none given
54	Functional decline
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60	none given

Functional deterioration,
Immobility syndrome

none given

Functional decline,
debility,
muscle wasting/disuse
atrophy*,
asthenia,
malaise/fatigue,
generalised weakness*,
*=considered most
appropriate alt terminology
debility,
Functional decline

none given
none given

Functional decline

none given

none given

none given

disuse atrophy
none given
none given

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3 physical functionality
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10 physical inactivity
11 associated with hospital
12 care for a range of medical
13 conditons
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16 none given
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18 none given
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21 none given
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25 Functional decline
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27 none given
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29 Debility,
30 Disuse syndrome,
31 hospitalisation associated
32 disability,
33 hospital associated
34 deconditioning,
35 Post hospital syndrome,
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37 disuse atrophy same as
38 activity related sarcopenia
39 in HAD.
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49 Medical deconditioning,
50 hospital-associated
51 deconditioning, post
52 hospital syndrome, hospital-
53 acquired phenotype of
54 frailty
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17 debility
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23 debility
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35 none given
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43 none given
44 none given. HAD as a
45 cause of sarcopenia?
46 none given

47 none given - deconditioning
48 as contributor to Functional
49 decline
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29 Functional decline
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38 post hospital syndrome
39 state of frailty
40 none given
41 pyjama paralysis
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48 none given
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52 hospital acquired disability
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Functional decline

Functional decline

none given

none given

Functional decline

Functional decline

none given

Functional decline

Functional decline

none given

Functional decline

Functional decline

Functional decline

Frailty

Functional decline

Functional decline

For peer review only

1
2
3 Functional decline
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5 Functional decline
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11 Functional decline
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13
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15 debility
16
17 shares many characteristics
18 with other hospital acquired
19 issues therefore termed:
20 Hospitalization disability
21 syndrome
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23
24
25 debility, nondebility
26 generalised weakness,
27 muscle wasting and disuse
28 atrophy, muscle weakness,
29 other malaise and
30 fatigue/asthenia
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35 post hospital syndrome
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45 Functional decline
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49 post hospital syndrome
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52 Hospital associated
53 deconditioning, hospital
54 associated Functional
55 decline
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Hospital associated
Functional decline

Functional decline

hospital associated
functional deficits

Hospitalisation-associated disability (Hospitalization-associated disability was defined as a loss of C

Physiological Deconditioning, PJ Paralysis, Hospital-acquired Disability

Hospital-associated Deconditioning

Hospital-acquired disability

Hospital-acquired disability, functional decline

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functional status, iatrogenic disability We defined iatrogenic disability (ID) as the functional cor

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sequence of 1 or several IAEs occurring during hospitalization. An IAE may be any unintended

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ad injury or complication that resulted from health care management issues rather than the un

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underlying disease process. Health care management refers to actions of individual hospital staff

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ff and broader systems and care processes. It includes acts of omission (failure to diagnose or

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r to treat), acts of commission (incorrect diagnosis or treatment, or poor performance), but also

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o appropriate health care.²¹

Authors	Population
Siegler, E. L., Stineman, M. G. & Maislin, G.	Inpatient Rehabilitation

Hoenig, H Geriatric Rehabilitation

Conlin Shaw, M All

Rader, M & Vaughen, J. Orthopedics

Timmer, Unsworth & Browne Geriatric Rehabilitation

Spencer, J., Hersch, G.,
Eschenfelder, V., Fournet, J.
& Murray-Gerzik, M. Transitional Unit
Deshpande, MacNeill,
Lichtenberg, Pithadia &
Velez Geriatric Rehabilitation

Unsworth & Eyres

Surgery

Killewich, L
Lim, Doshi, Castasus, Lim &
Mamun
Aizen, Shugaev & Lenger

Geriatric Surgery
Geriatric Medicine
Geriatric Rehabilitation

De Morton, Keating & Jeffs
Raj, Munir, Ball, & Carr
Silver & Siebens

General Medicine
General Medicine
Surgery

Ng, Jung, Tay, Bok, Chiong
& Lim

Inpatient Rehabilitation

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Bailey, Miller, Russell & Clemmer.	ICU
Baztan, Galvez, Cesar, & Socorro	Geriatric Medicine
Belavy, Miokovic, Armbrecht, Richardson, Rittweger & Felsenberg	Research
Kortebein	All General Medicine
Manning, Keller & Frank	Registered Nurses
Venturelli, Crisafulli, Antoni, Trianni & Clini	ICU
Schweickert & Kress	ICU

Dennis, Johnson, Roberson,
Heif, Bopp, Garner, Padala, Recuperation and
Padala, Dubbert & Sullivan Recovery Ward

Goodman, Bonner, Wright,
Hugill, Howard, Danjoux,
Batterham & Howell ICU
Gosselink, Neddham, &
Hermans ICU
Guy, Lerman & Justo Geriatric Rehabilitation

Mendez-Tellez, Pedro, Nusr,
Feldman & Needham Neurology ICU
Soares, Nucci & Silva Surgery
Vargo, Wilson, Fuentes &
Eliam Inpatient Rehabilitation
Cabilan, Hines & Munday Surgical Prehabilitation

Doherty-King & Bowers Medicine and Surgery
Registered Nurses

Drolet, Dejuilio, Harkless,
Henricks, Kamin, Leddy,
Lloyd, Waters & Williams ICU and Intermediate Care

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Engel, Tatebe, Alonzo, Mustille & Rivera	Medical and Surgical ICU
Friedman, Mayer, Hoyer & Atanelov	General Medicine
Silveira, Pez, Nogueira, Furlan & Colombo	ICU
Timmer, Unsworth & Taylor Sottile, Quan, McNulty, Gray, Higgins & Moss	Geriatric Rehabilitation ICU
Wakabayashi & Sakuma	Geriatric Rehabilitation
Wakabayashi & Sashika	Geriatric Rehabilitation
Falvey, Mangione & Stevens- Lapsley	Geriatric Medicine
Latronico	ICU
Timmer, Unsworth & Taylor Artaza, Valera, San Juan, Urien, Fernandez & Malafarina	Geriatric Rehabilitation Occupational Therapists Functional Recovery Unit
Booth, Rivet, Flici, Harvey, Hamill, Hundley, Holland, Hubbard, Trivedi & Collier	Neurotrauma ICU

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9 Fisher, Graham, Krishnana &
10 Ottenbacher Geriatric Rehabilitation
11 Galloway, Karmarkar,
12 Graham, Tan, Raji, Granger
13 & Ottenbacher Inpatient Rehabilitation
14 Pack, Miwa, Engleman,
15 Lagu, Visintainer, Lindenauer
16 & Woodbury Cardiac Surgery
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19 Corcoran, Gavaghan, Lyons
20 & Moloney Geriatric Medicine
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23 Norheim, Bautmans & Kjaer Geriatric Medicine
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55 Ritchie, Wood, Martin & Geriatric Medicine Nursing
56 Jones Assistants
57 Geriatric Early
58 Burkhardt & Parigger Rehabilitation
59 Churilov, Churilov, Maclsaac
60 & Ekin Inpatient Rehabilitation

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Donnelly, Jevons and Wentworth	Geriatric Rehabilitation
McInerney, McCarthy, McCullagh, Fox & Timmons O'Sullivan & Cleffken	Geriatric Medicine ICU
Petrucci, Ricotti, Monteleone, Ferriero, Giromini, Guillace, Ambrosini, & Dalla Toffola	Geriatric Surgery
Stapley, Colley & Richards	Geriatric Medicine
Yoshimura, Wakabayashi, Bise & Tanoue,	Convalescent Rehabilitation
Churilov, Churilov, Brock, Murphy, Macisaac, & Ekinci	Inpatient Rehabilitation
Dirkes & Kozlowski	ICU

Gordon, Grimmer & Barras	Geriatric Medicine
Horgan, Carr & Murphy	General Medicine
Husain-Qureshi & Kirkwood	ICU
Johnson, Swiatek, Wang, Liu, Chung, & Chung	Surgery
Parkinson	Orthopedics
Rogerson & Kendall	Geriatric Medicine
Timmer, Unsworth, & Browne	Geriatric Rehabilitation
Asif, Taube, Sivarajah, Tsironis & Koizia	Surgery

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Bono & Reyes
Medicine and Surgery
Registered Nurses, Patient
Care Associates and
Residents

Higgins, Frazier, Lennie,
Rayens & Avila
Major Trauma

Kamper, Schultz, Hasen,
Andersen, Ekmann,
Nygaard, Helland, Wejse,
Rahbek, Noerst, Pressel,
Nielsen, Finn & Suetta
Acute Medicine

Koh, Sridaran, & Goh
Orthopedics

Kovar, Carmichael, Jones, &
Nichols Robsinson
Elective Surgery

Small, Tasneem, Bagheri,
Chodosh, Adelsheimer,
Sutera & Moroz
General Medicine

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6 Smtih, Sreekanta, Walkeden,
7 Penhale & Hanson Inpatient Rehabilitation
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10 Suriyaarachchi, Chu, Bishop,
11 Thew, Matthews, Cowan,
12 Gunawardene & Duque Virtual Rehabilitation Beds
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20 Butler & Welford Geriatric Medicine
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51 Acute Medicine Patients,
52 Guilcher, Overall, Cadel, Li, Caregivers, Providers and
53 & Kuluski Decision Makers
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59 Laneuville, Rocheleau, Chan
60 Chun, Pelchat & Trudel Inpatient Rehabilitation

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Sayer, Whiteaway, Dawson,
Simpson & Chu Geriatric Medicine

Siebens, Aronow, Edwards,
& Ghasemi Medicine and Surgery

Hoenig and Rubenstein Geriatric Medicine

Creditor Geriatric Medicine

Inouye, Wagner, Acampora,
Horwitz, Cooney, Hurst &
Tinetti General Medicine

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Inouye, Bogardus, Baker,
Leo-Summers & Cooney All

Brown, Friedkin & Inouye General Medicine
Brown, Rothe, Peel, &
Allman All

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Graf

Geriatric Medicine

Kortebein, Bopp, Granger &
Sullivan

Geriatric Rehabilitation

Covinsky, Pierluissi & Johnston	Geriatric Medicine
Haley, Sullivan, Granger, & Kortebein	Geriatric Rehabilitation
Krumholz	All
Sanchez-Rodriguez, Marco, Miralles, Fayos, Mojal, Alvardo, Vazquez-Ibar, Escalada & Muniesa	Subacute Geriatric Rehabilitation

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Chastin, Harvey, Dall, McInally, Mavroeidi & Skelton	All
Hartley, Keating, Jeffs, Raymond & Smith	General Medicine
Swinnerton & Price	Geriatric Medicine
Beam, Gorman, Kist, Giles, Kiser & Dumire	Medical and Surgical

Beisheim-Ryan, Butera,
Hinrichs, Derlein, Malong,
Holtrop, Forster, Diedrich,
Gustavson, & Stevens-
Lapsley Skilled nursing facilities

Sourdet, Lafont, Rolland,
Nourhashemi, Andrieu &
Vellas Geriatric Medicine

Wai, Lu, Gill, Henderson and / General Medicine

Orthogeriatric
Urquiza, Fernandex, Arrinda, I Rehabilitation

Pavon, Sloane, Pieper, Colon- General Medicine

Ortiz-Alonso, Bustamante-Ara Geriatric Medicine

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Care Focus	cause(s)
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute	decreased level of activity for ar
Acute	inactivity - bed rest
Acute	1- Acute illness necessitating be
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute	bed restInactivity
Rehabilitation/ Post Acute	none given

Acute	bed rest inactivity Lack of engag
Acute	Bed rest inactivity Surgical stress
Acute	none given
Rehabilitation/ Post Acute	prolonged bed rest
Acute	bed rest
Rehabilitation/ Post Acute	prolonged hospital stay
Acute	Post operative bed rest and imm
Rehabilitation/ Post Acute	none given

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ICU	critical illnessARDSImmobilityM
Rehabilitation/ Post Acute	none given
Other	25/3/24 - many patients with me
Acute	acute hospitalisation Bed rest in
Acute	hospitalisationinactivity
ICU	prolonged bed rest
ICU	complete bed rest Hyperglycem

Rehabilitation/ Post Acute	Inadequate nutrient intake, syst
ICU	none given
ICU	Bed restImmobility
Rehabilitation/ Post Acute	Exacerbation of CHF, Pneumon
ICU	prolonged bed restimmobility M
Acute	pain, abdominal surgery
Rehabilitation/ Post Acute	none given
Other	major surgery
Acute	Partly illnessHospital attendanc
ICU	prolonged bed rest

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ICU	prolonged bed rest (89% of the
Acute	none given
ICU	none given
Rehabilitation/ Post Acute	hospitalisation, prolonged bed r
ICU	none given
Rehabilitation/ Post Acute	Sleep deprivation, disruption of
Rehabilitation/ Post Acute	malnutrition + inactivity
Acute	Stress of hospitalisation, prolong
ICU	Prolonged immobility ICUAW ca
Rehabilitation/ Post Acute	InactivityBed rest Sedentary life
Rehabilitation/ Post Acute	none given
ICU	immobility

Rehabilitation/ Post Acute	Prolonged LOS, complex LOS
Rehabilitation/ Post Acute	none given
Acute	prolonged bed rest
Acute	Restricted habitual activity, slee
Acute	Combination of illness and inact
Acute and Post Acute	Acute and prolonged exposure 1
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute	none given

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3	Rehabilitation/ Post Acute	none given
4		
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6	Acute	none given - deconditioning con
7	ICU	none given
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14	Acute	Major surgerySide effects of GA
15		
16	Acute	link between social/ individual a
17		
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20	Rehabilitation/ Post Acute	acute hospitalisation
21		
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24	Rehabilitation/ Post Acute	none given
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57	ICU	Bed restAcute inactivity Immobi
58		
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Acute	Bed rest/Inactivity/sedentary behaviour
Acute	unnecessary bed rest
ICU	none given - lack of rehab information
Acute	hospital admission - illness needs
Acute	reduced physical activity/social
Acute	Lack of MDT input?
Rehabilitation/ Post Acute	acute hospitalisation
Acute	"30% of patients experience low

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Acute

bed rest

Acute

bed rest

Acute

sarcopenia may aggravate Func

Acute

bed rest/ immobility

Acute

none given

Acute

prolonged bed rest

Rehabilitation/ Post Acute	Prolonged immobility
Rehabilitation/ Post Acute	bed rest Multi factorial etiology
Acute	prolonged bed rest - see 4 barriers
Acute	lack of physical, cognitive and social
Rehabilitation/ Post Acute	acute hospitalisation

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Acute

none given

Acute

etiologies unclear - lack of phys

Acute

Manifold - 3 processes, the illne

Acute

Decline cannot be attributed ent

Acute

Treatment side effects Hospitali

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Acute

Frequent use of psychoactive m

Acute

low mobility

Acute

multiple - acute illness and adve

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Acute

Being bedridden in hospital

Rehabilitation/ Post Acute

none given

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Acute	rarely explained by single cause
Rehabilitation/ Post Acute	none given
Acute	hospitalisation, physiological im
Rehabilitation/ Post Acute	sarcopenia a precipitating/ exag

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Acute

sedentary behaviour - sitting, re

Acute

Hospital care, loss of muscle str

Acute

Prolonged immobility, pain, fatigue

Acute

immobility, elderly patients walk

Rehabilitation/ Post Acute	none given
Acute	May be due to illness that led to
Acute	Immobility during hospitalisation
Rehabilitation/ Post Acute	
Acute	Immobility during hospitalisation
Acute	immobility

physiological changes	assessment/diagnostic criteria	Criteria used?
-----------------------	--------------------------------	----------------

none given none given

none given none given

Decreased cardiac reserveBone none given ? Pressure ulcer staging

Deconditioning process associa none given

none given none given

none given none given

none given Deconditioning appears to be a no criteria - compared firm score

none given none specific - loss of independent mobility - study inclusion only

Ageing= Loss of muscle mass, (none given)

none given none given
decreased cardiac output, decline in none given

Loss of muscle strength - 5% per year Loss of independent mobility (with none given
none given 1 or more of the following: Physiological criteria for admission to rehabilitation
Physical inactivity in ageing body none given

none given Anything that's Not Occupational no criteria exist - clinical diagnosis

nutrition resistant lean body mass: Unable to Walk 15m with aid or description of population ability

none given none given

none given none given - tools for ICU AW no
loss of muscle mass none given

decreased protein synthesis, index of ICUAW is clinical presenta criteria for ICU AW
none given none given

none given none given

none given none given

none given none given

skeletal muscle changes within none given

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immobility + catabolic process c	none given
none given	none given
none given	none given
none given	Frailty criteria- ADL disability, fa Criteria is for Frailty
none given	CIPNM - abnormal nerve condu yes
Figure 1 - frailty; sarcopenia with	primary = Age related, or secon criteria for sarcopenia
none given	(No validated criteria exist) Diacyes - but again no validated crit
critical failure in homeostatic prc	none given
none given	generalised weakness not explæ criteria for ICU AW
none given	none given
none given	none given
none given	none given

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10 none given none given

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14 none given none given? - agree

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17 none given none given

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21 none given none given

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23 CI associated with increased LC none given

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56 none given none given

57 none given none given

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59 none given Sanchez-Rodriguez et al in Spacritieria is for sarcopenia, "functi
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3	none given	none given
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7	none given	none given
8	none given	none given
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14	none given	Post operative physical deconditioning scale (PPDS, Monteleon
15		
16	none given	none given
17		
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20	none given	none for HAD
21		
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24	none given	none given
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57	MSK - 1-1.5% strength loss per none given	
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only discussed in creditor summ none given No tool assessed bcNo - assessment points but no c

none given

none given

none given

none given

none given

Hospitalisation in the 90 days pcrriteria is for post hospital syndr

none given

none given

none given

Worsened mob/ transfer, requir measured several components

none given

none given - admitted for reconditioning program

none given

none given

none given

none given

immobility - 1.5% per day loss of none given

described but unsure of relevance none given

25% loss of volume in quads annone given use of falls assesme No set criteria - for falls

none given

none given

none given

none given

none given

none given

reduced protein synthesis, acceptance of AROC impairment code 1 doesn't actually give me the par

none given

none given

none given

none given - no descriptor of who to approach given

bed rest studies - skeletal muscle Hospitalised for over 3 weeks as inclusion criteria for study

New decline occurring in hospita Criteria is for functional decline

none given

none given

none given

decline in any non MOBILITY arthis is the criteria for functional c

none given

recovery ambulation = not confiPrognostic indicators of resumir

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Creditors cascade to dependence, Loss of persons independence, no - no cut off values for HAD v:

none given Functional decline in the absence of Debility - ICD 799.3re iterates la

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22 none given "Hospitalization-associated disability Assessment areas - no set criteria
23
24
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30 none given subjective clinical diagnosis. Subjective clinical diagnosis. No set criteria ICD-9 codes Deb
31
32
33
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37 Sleep - reduced REM and N3 (impaired stamina, coordination) Criteria for PHS, no cut off value
38
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43 none given Functional loss 2nd to a none Study inclusion criteria. criteria (

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none given	PHS - readmission within 30 da	criteria is for post hospital syndr
none given	study inclusion/ exlusion critiria	No cut off values available for S
External stressors which negati	Decrease in muscle mass and ccl	clinical assessment based on d
Patients, age 65 and older, spe	MOVE Grading	Evaluative rather than diagnosti

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none given none given

Hospitalization-associated disability was defined as a loss of 0.5 points or more on the total Katz ADL score between admission and discharge.

none given Hospitalization-associated disability

New or additional disability in ADL that develops during admission

loss of muscle mass and strength New or additional disability in ADL

Patients who experienced a functional decline in the absence of newly disabling orthopedic or neurologic diagnoses were classified as patients with HAD.

none given Clinical assessment

Disability Instrument, Katz

none given The primary outcome was HAD, ADL

Katz ADL 6 (eating, transferring from bed to chair, walking, using the toilet, bathing, and dressing), each of which is scored with 0 or 1 depending on whether the participant is able to perform the activity with or without help, respectively

none given Hospitalization-associated disability

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2
3 contributory factors - big picture
4
5 none given
6
7 Balance of participation versus
8 secondary limitations
9
10
11 Interventions chosen aren't always
12 straightforward eg giving a mobility
13 scooter for difficulty walking may
14 promote deconditioning
15
16
17 putting patients to bed as a
18 traditional approach to care -
19 inactivity, isolation and development
20 of associated complications
21 inactivity generated by:
22
23 1- operation within limited,
24 circumscribed environment
25
26 2- Engagement in restricted anti
27 gravity activity
28
29 3 subject to dependency on others
30 for survival
31
32 none given
33
34 geographical, social and cultural
35 contexts of neighbourhood and
36 community scales
37
38 Emphasis on short term Functional
39 changes in clinic doesn't translate
40 well to home environments, need
41 guidance to apply clinic generated
42 skills
43
44 Daily life circumstances -
45 relationships,
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49 Measurability vs meaningfulness -
50 linear relationship between
51 Functional capacity and QoL
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55 none given
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Characteristics of acute hospitals
which to occupational disruption
(Reduced opportunity or ability to
engage in meaningful and valued
occupations during an acute hospital
admission) which influences:

1. general health and wellbeing.
(Law, Steinwender & Lecalir, 1998,
Whiteford, 2000, Wilcock 1998a
2. Person's ability to change, cope
with or exert control over the
environment (Siebens et al 2000,
Wilcock, 1998b)

Staff attitudes - in hospital to "be sick
and to rest"

Hospital culture- despite
encouragement nurses wouldnt help
SOOB, mob, wear own clothes,
Prioritisation of medical/ surgical
care

Bed rest associated with
hospitalisation and surgery
The surgery itself and associated
stress response, tissue injury and
metabolic changes.

Staying in hospital
none given
Staying in hospital, commonality of
bed based care
none given
none given

Social, cultural, ethical, political and
healthcare considerations impact on
rehab outcomes

ICU culture- tradition of bed rest and
postponement of PT till after ICU
D/C,
Personnel perceptions - tendency to
maintain status quo, resistance to
group change and relinquishing
autonomy, perceived
disproportionality of benefits to input,
insufficiency personal accountability for
practice change, inadequate
knowledge about clinical outcomes.
Team work habits - fragmentation of
care, structure of the system are
current barriers- uncommon for ITU
to D/C plan

none given

none given
not recognised as a distinct entity in
ICD 9, no MeSH heading (there is
now one)
Not one of the 13 diagnoses for
medicare/medicaid 75% rule.

deconditioning poorly documented

none given

respiratory failure - life threatening =
traditional, intuitive strategy to focus
on physiologic stabilisation of
deterioration. Sicker patients =
taking over for the patient becomes
the norm = complete control of
ventilation, perfusion, fluid balance
which needs a docile patient which
means deep sedation and paralysis.
Prioritisation of short term goal
(survival) over long term impacts on
cognitive and NM function

social, psychological, physiological 3

none given
risk of moving the critically ill vs the
risks of immobility
none given

ICU culture - deep sedation, safety
concerns, local beliefs and values,
lack of staffing or expertise
Patient barriers - delirium,
instability, obesity
none given

none given

none given

Bed rest orders, role of PTs, fear of
falls, back injury to themselves,
tethers - catheters and IV lines, staff
shortages, lack of aids, patient
acuity, perceived risk and unit
expectations, patient labeling

tradition - impression that bed rest
(83% of time spent in bed, 73%
considered able to walk didn't) is
therapeutic and physical activity is
harmful in the presence of illness,
barriers = patient monitoring, life
support, lack of resource, time, ease
of omitting ambulation, belief activity
is another professional's job, worries
about falls,

1 Established practice patterns and
2 beliefs about safety of early
3 mobilisation
4
5 Lack of mobilisation guidelines/
6 criteria for referral to PT
7
8 Late referral to PT - end of stay and
9 infrequent
10
11 Weekly staff change
12
13 Scepticism
14
15 Perceived lack of evidence to
16 mobilise
17
18 Lack of resources - PT and
19 equipment
20 Lack of prior training for nurses in
21 safe mobilisation (45%)
22 Lack of equipment (78%)
23 Perception of patient resistance
24 (86%)
25
26 Attention directed at deconditioning
27
28 Acute care setting
29
30
31 none given
32 none given
33 none given
34
35 Changing landscape of value driven
36 care
37
38 Undertreatment driven by therapists
39 perceptions of safe treatment
40
41 Absence of PT input into transitional
42 care model
43 none given
44 Interaction of process of ageing, the
45 illness itself and the adverse effects of
46 treatment
47
48
49
50 none given
51
52 Multispeciality care
53
54 Complexity - need additional staff
55 resources
56
57
58
59
60

Policy reporting change in 2014,
CMS adopted all cause unplanned
readmission within 30 days of D/C
as a quality metric, reduced funding
if higher than expected.

Generalized deconditioning not part
of the 13 rehab diagnoses

none given

Hospitals failing to provide enough
ambulation
lack of standardised pathways,
coordination and patient focussed
processes

none given

Shift in nomenclature from
rehabilitation (reacquisition of function
through MDT assessment and
professional therapeutic input in
attainment of set goals) to

"restorative care" (slash function
focused care)(philosophy of care
that encourages, enables, and
motivates individuals to maintain and
restore function, thereby optimizing
independence, 9- Resnick 2012)

p425. Custodial care = meeting
ADLs without any therapeutic value.

Presence of motivated human
resource (NAs) Complex relationship
between care approaches, reactive
often the model of choice.

Economics - 4rs of saving money =
reablement, reactivation,
rehabilitation and restorative care
(13 Sims Gould et al 201) Demand
on staff time to complete PADLs =
high risk of social or clinical
iatrogenesis and HAD. Fear of
patients falling, lack of emphasis on

none given

No commonly accepted definition of
sarcopenia either

1 discrimination against cognitive
2 frailty
3
4
5 Facilitator factors, motivation, fear,
6 self perceived level of frailty
7 none given
8 TO prevent HAD - increase in
9 healthcare resource use. Difficult
10 recoveries contribute to LOS and
11 disability at D/C -> high personal and
12 social costs
13 Possible loneliness and lack of
14 access to distractions
15
16
17
18
19 none given
20
21
22
23 none given
24 Knowledge translation gap
25 Perception patients are "too sick"
26 Presence of tethers
27 Communication and care
28 coordination issues
29 Knowledge deficits
30 Workload concerns
31 Documentation burdens
32 Safety concerns - risk of falls,
33 patients weakness, weight, illness
34 severity, discomfort, length of time in
35 bed, poor vascular tone/ use of
36 pressors, dislodgement of lines,
37 sedation, haemodynamic instability,
38 risk of injury if NURSING
39 assessment wrong for staff and
40 patient
41 Early mob requires biggest culture
42 and process shift
43 Scope of professional practice -
44 nurses not qualified to make
45 judgement to mobilise
46 Staffing - no dedicated PT (influence
47 of country, most uk ITU's have pt but
48 only 34% of US ones do)
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No standard definition of HAD, no agreement on common elements, or assessment practices. - inhibits ability for all HCP to recognise and assess for HAD (currently instruments vary by profession and body system, inconsistent sharing practices)
Increased pressure on acute beds - chronic disease, longer life spans
Economic and social demand for safe, effective and efficient discharge home (therefore HAD must be prevented and to prevent readmission) - focus instead on resolving acute concern.

poor application of knowledge that mobilisation prevents deconditioning
Poor communication between staff at MDT - doctor centred/ medical centred
Surgical readiness - more older people are undergoing esthetic procedures, most risky cosmetic surgery therefore worse outcome rates

social isolation - away from families (complex surgery needs), single rooms, lack of common room.
Physically inactive - ensuite rooms, meals bought to patients, no incentive to leave rooms

Positive - active and independent living program

social admissions that would need more support regardless of MDT input due to general trend of decline

none given

ward culture, lack of knowledge

see survey results
more work, not enough staff/
equipment knowledge gap (family
resistance), lack of orders
History - periods of immobility
prescribed to preserve energy and
promote healing in injured
individuals.

lack of staff for mobilisation, lack of
time

Nurses don't routinely engage
patients in exercises or mobility
despite level of direct interaction with
patient

Culture of doing things for patients
Nurses unfamiliar with
documentation

Additional workload

Fear around falling or exercise with
medical conditions

Volume of patients

Urgent patients

heavy workload

patients more willing to exercise

when motivated by clinicians - but

limited time, esp PT

patients expectations to remain on

bed rest without exercise till d/c but

understood the consequences (27-

De Klein 2019, Gravlin 2010,

Maloney 2015)

none given

Perception patients don't want to
exercise

Perception that high intensity
resistance training is unsafe for older
adults or hospitalised patients

cost of on going care as a driver to
prevent
staff fear - falls risk prioritised over
activity
inflexibility of healthcare system to
implement new practices

No specific rehab protocols exist for
HAD

4 barriers

1. Risk aversion

2. unknown level of function

3, widespread "bed is safe" culture

4. lack of equipment

High stress hospitals

Literature focus on risk factors, tools,
interventions to assess or limit
deconditioning

1- level of activity in acute care =
boredom, lack of physical activity
(lack of staff resource, workload,
prioritisation, not seen while waiting
for next stage), depression, lack of
motivation

2- tensions around patient identity
changes and care transitions
uncertainty

3- physical and social context - role
of roommates, volunteers and
providers- sub optimal environment
(lack of sleep in shared rooms,
impact of being sleepy from meds
the next day)

perceived lack of value in social
programs - cut from budgets
heavy emphasis on walking but lack
of promotion of independence and
lack of intensity

Lack of sensitive biological markers
for processes and pathways affected
by HAD to categorise its severity and
monitor rehabilitation to tailor
intervention

1
2
3 none given
4 hospital systems not good at
5 providing physical activity
6 sedentary behaviour of older adult
7 cohort
8
9
10 patients tend to get being unwell,
11 and treatment side effects but
12 deconditioning unanticipated and
13 particularly disabling and disturbing
14 figure 1
15
16 - Unable to implement usual
17 strategies to toilet to avoid
18 incontinence (high bed, unfamiliar
19 environment, unclear path to toilet,
20 tethers like IV lines, nasal canual,
21 catheters, use of psychotrophics can
22 cause reduced perception).
23
24 - Sensory deprivation or
25 overstimulation - 29% of young
26 people in simulated hospital room
27 developed subjective sensory
28 distortions after 2.5hrs
29
30 - Lack of familiarity with hospital
31 food/ dislike of specialised diets,
32 difficulty of eating in bed (bed rails,
33 restraints), delay in food delivery,
34 lack of usual dentures
35
36
37
38
39
40 Actual and percieved disability from
41 illness/ injury
42
43
44 Medicare/ funding imposed restraints
45 on LOS driving d/c to NH
46
47
48 Model of hosptial care - short LOS +
49 high tech contributions to loss of self-
50 care
51
52
53
54 Functional decline likely to be
55 accelerated by adverse factors like
56 treatment side effects, invaqsive
57 proceedures and HAIs
58
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60

2 general models to prevent decline
- geriatric consultation services or
specialised geriatric units. Both
suffer capacity issues, consultation
advice may not be carried out due to
lack of expertise. Difficult to assess
adherence of both.

Non adherence to program = lack of
staff/ volunteers (32%), patient
refusal (26%), medical
contraindication (22%), patient
unavailable. (13%)

Staff turn over , weekend staffing,
absenteeism

Bedrest ordered in 33% of patients
at some point during stay - may be
related to use of restraint and
immobilising devices not linked to
admission cause. Placed on bedrest
at admission, and stay there without
valid medical reason, Not specified
by any clinical staff or correlate with
death or treatment

use of catheters and restraints

1 Hospital care focus = acute illness
2 and ignoring physical and cognitive
3 function. Lack of financial resource for
4 staffing, environmental modification
5
6

7
8 Hospital environment designed for
9 caregivers not for patients (high
10 beds, shiny floors, clutter, lack of
11 orientation cues) = fear of falling.
12
13

14
15 Acute illness and uncomfortable
16 environments can worsen
17 depression compounding Functional
18 decline
19
20

21 Practice of leaving older adults in
22 chair or bed - deconditioned,
23 dehydrated, malnourished from lack
24 of intake/NMB orders
25
26 Delirium - acute illness, medical SE,
27 sensory deprivation/isolation, lost
28 glasses or hearing aids -> falls,
29 dependency, restraints, infections
30 and family rejection
31
32 Bed rest orders
33
34

35
36 unclear which location best to rehab
37 patients (most cost effective and
38 appropriate)
39
40 lack of specific diagnostic criteria for
41 debility, may get coded as
42 generalised weakness, also not part
43 of 75% rule diagnoses
44
45 expectation bias - harsher admission
46 assessment and more generous at
47 discharge for outcomes
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Hospital care - iatrogenic risks, lack of adaptations, environment, mobility restriction, enforced dependence, little encouragement of independence
Silo'd health care - PT/occupational therapists, / geri's rather than MDT approach

little research into who with HAD will benefit most from rehab - given age bracket it may be irreversible and disease related decline, therefore approach dual with palliative care

Debility not an accepted diagnosis under 60% (prev 75%) rule which allows providers to state they do inpatient rehab. (% of patients must have 1 of 13 diagnoses)
still not introducing selves and roles, confusing orders and schedules

bed pressure to reduce LOS - less time to get it right

none given

1 immobilisation not used a therapeutic
2 tool but is still widespread in
3 healthcare - most patients in hospital
4 still sedentary.

5
6 Traditional care limits movement -
7 concerns of falls, -> impact on
8 behaviour and after d/c

9
10 Lack of staff, lack of time,
11 organisational risk aversion>
12 function focussed rehab and activity
13 Putting emphasis on individual
14 (BioMed model) lets systems off the
15 hook. Sed behav is a "wicked"
16 problem - more complex than
17 anticipated, interplay of factors
18
19

20
21
22
23 How to best measure sed -
24 observation gold standard but time,
25 cost and privacy, patients under
26 report and biased, accelerometers
27 do movement not positional
28 changes, pedometers aren't accurate
29 in altered gaits, GPS can't be used
30 indoors, RFID, bluetooth or LED light
31 tracking and time stamps may work
32
33

34
35
36 ;PPB,

37
38 Lack of opportunity to mobilise due
39 to insufficient hospital resources,
40 nursing time constraints, safety
41 concerns, patient non adherence
42
43

44
45 Reliance on standard practice that
46 nurses will mobilise all patients -
47 unable to due to rising patient acuity,
48 resource shortages and covid 19
49 pandemic (limitations in PPE + trying
50 to reduce infection = clustered care
51 practices, reduction in F2F time,
52 more external and travel nurses on
53 staff, impact of negative PCR testing
54 for discharge - 10 day isolation if
55 positive)
56
57
58
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Contextual factors which create
barriers to intervention effectiveness
= organisational and team dynamics,
perception of intervention
effectiveness, risk-averse culture)

Health service poorly adapted to aging and frail populaion, elderly patients don't systematically g

none given

lack of a reliable and clinically meaningful way to measure mobility in the inpatient setting.

lack of space, purchase and storage of weight training equipment

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get appropriate care during hospitalisation

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Hoenig, H	Geriatric Rehabilitation
Conlin Shaw, M	All

Rader, M & Vaughen, J. Orthopedics

Timmer, Unsworth & Browne Geriatric Rehabilitation

Spencer, J., Hersch, G.,
Eschenfelder, V., Fournet, J.
& Murray-Gerzik, M. Transitional Unit

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Deshpande, MacNeill,
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Unsworth & Eyres Surgery

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Schweickert & Kress	ICU
Dennis, Johnson, Roberson, Heif, Bopp, Garner, Padala, Padala, Dubbert & Sullivan	Recuperation and Recovery Ward
Goodman, Bonner, Wright, Hugill, Howard, Danjoux, Batterham & Howell Gosselink, Neddham, & Hermans Guy, Lerman & Justo	ICU ICU Geriatric Rehabilitation
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Graham, Tan, Raji, Granger
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Pack, Miwa, Engleman,
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Corcoran, Gavaghan, Lyons
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Norheim, Bautmans & Kjaer Geriatric Medicine
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Burkhardt & Parigger Rehabilitation

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& Ekinici Inpatient Rehabilitation

Donnelly, Jevons and Wentworth Geriatric Rehabilitation

McInerney, McCarthy,
McCullagh, Fox & Timmons Geriatric Medicine
O'Sullivan & Cleffken ICU

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Petrucci, Ricotti, Monteleone,
Ferriero, Giromini, Guillage,
Ambrosini, & Dalla Toffola Geriatric Surgery

Stapley, Colley & Richards Geriatric Medicine

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Smtih, Sreekanta, Walkeden,
Penhale & Hanson Inpatient Rehabilitation

Suriyaarachchi, Chu, Bishop,
Thew, Matthews, Cowan,
Gunawardene & Duque Virtual Rehabilitation Beds

Butler & Welford Geriatric Medicine

Guilcher, Overall, Cadel, Li,
& Kuluski Acute Medicine Patients,
Caregivers, Providers and
Decision Makers

Laneuville, Rocheleau, Chan
Chun, Pelchat & Trudel Inpatient Rehabilitation

Sayer, Whiteaway, Dawson,
Simpson & Chu Geriatric Medicine

Siebens, Aronow, Edwards,
& Ghasemi Medicine and Surgery

Hoenig and Rubenstein Geriatric Medicine

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Creditor	Geriatric Medicine
Inouye, Wagner, Acampora, Horwitz, Cooney, Hurst & Tinetti	General Medicine
Inouye, Bogardus, Baker, Leo-Summers & Cooney Brown, Friedkin & Inouye	All General Medicine
Brown, Rothe, Peel, & Allman	All
Graf	Geriatric Medicine
Kortebein, Bopp, Granger & Sullivan	Geriatric Rehabilitation

Covinsky, Pierluissi &
Johnston

Geriatric Medicine

Haley, Sullivan, Granger, &
Kortebein

Geriatric Rehabilitation

Krumholz

All

Sanchez-Rodriguez, Marco,
Miralles, Fayos, Mojal,
Alvardo, Vazquez-Ibar,
Escalada & Muniesa

Subacute Geriatric
Rehabilitation

Chastin, Harvey, Dall,
McInally, Mavroeidi &
Skelton

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Hartley, Keating, Jeffs,
Raymond & Smith General Medicine

Swinerton & Price Geriatric Medicine

Beam, Gorman, Kist, Giles,
Kiser & Dumire Medical and Surgical

Beisheim-Ryan, Butera,
Hinrichs, Derlein, Malong,
Holtrop, Forster, Diedrich,
Gustavson, & Stevens-
Lapsley Skilled nursing facilities

Sourdet, Lafont, Rolland,
Nourhashemi, Andrieu &
Vellas Geriatric Medicine

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Wai, Lu, Gill, Henderson and / General Medicine

Orthogeriatric
Urquiza, Fernandex, Arrinda, I Rehabilitation

Pavon, Sloane, Pieper, Colon- General Medicine

Ortiz-Alonso, Bustamante-Ara Geriatric Medicine

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Care Focus

clinical course incl presenting
feature, trajectory, complications

Rehabilitation/ Post Acute

more likely to have complications
that interrupt rehab
those with lower bartel scores, more
comorbidities more likely to develop
complications

Rehabilitation/ Post Acute

consequences: osteoporosis, loss of
muscle strength (esp lower limbs)
and flexibility
The most deconditioned
demonstrate the largest percentage
improvement from even a modest
degree of fitness training. (moved to
clinical course 18/10/22)

Acute

Rapid deconditioning can lead to a
loss of ability to walk and transfer.
Deconditioning can place many
elderly persons at high risk for the
development of pressure ulcers
consequences of bed rest: sensory
deprivation, mental lethargy, balance
problems, dec CO, increased risk of
resp problems, loss of muscle mass
and strength, bone loss, DVT, PE,
constipation, renal stones and PU.
Elderly specific: falls, PU,
incontinence, cognitive decline,
difficulty walking, orthostatic
hypotension
Takes approx. 4-6 weeks to reverse
3 wks of bed rest

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	Clinically in an elderly individual –
	becomes dull and demonstrates
	diminished intellectual capabilities.
	The deconditioned patient may be
	depressed, anxious, lethargic,
	dependent, and withdrawn from
	family and others. Prone to
	staggering and falls 2nd to muscular
	weakness and decreased
	coordination. Diminished appetite,
	often selectively for protein rich
	foods is common. Double
	incontinence are frequently present
	Estimated to take 3x as long to
	regain strength as period of
	immobilisation. (moved to CC 18/10)
	High risk of mortality within 6-12
	months (no stat given)
	Contributes to decision to
	institutionalise elderly
	S+S associated with bed rest -
	pressure sores, muscular weakness
Acute	and atrophy, weight loss,
Rehabilitation/ Post Acute	none given
	presenting feature not defined
	("health crisis" p165). Of the 8, 4
	returned home, 4 moved to new
	settings (2 NH), 3 needed more
	support on D/C
Rehabilitation/ Post Acute	CCE + CAPA conversations

1		
2		(Changed to clinical course from
3		prevention 17/10/22) Predictors of
4		doing well:
5		Higher admission FIM- lower likely to
6		go to NH (both)
7		Acute only- younger and white more
8		likely to D/C to community
9		(Moved to CC 18/10/22 from I&E)
10		Acute sample had shorter LOS,
11		fewer Dx, high FIM at admission and
12		D/C and more likely to D/C to
13		community therefore less sick, high
14		function, and able to benefit more
15		from rehab.
16		
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22		Subacute - sicker, more frail,
23		Functional ly disabled people who
24		had longer LOS, lower FIM overall
25		and higher rates of re-admission.
26	Rehabilitation/ Post Acute	
27		
28		deconditioning may last beyond
29		acute hospitalisation and may not be
30		readily reversed.
31	Acute	
32		
33		Downward spiral, deconditioning is
34		the result of inactivity but itself
35		produces more inactivity, producing
36		more deconditioning, inactivity and
37		ultimately bed-ridden or wheelchair
38		bound status and possible NH
39		placement or even death.
40		Reduced cognitive function, QoL,
41		and independence
42		6 months of rehab failed to
43		normalise changes in LL from bed
44		rest
45	Acute	
46		
47		
48	Acute	none given
49		
50		
51		
52		associated with falls from sitting or
53		lying down, second week of rehab,
54		weakly associated with
55		antidepressent use
56		
57	Rehabilitation/ Post Acute	Orthostatic intolerance
58		
59		
60	Acute	none given

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	increased LOS, higher hospital costs, increased risk of institutional d/c, readmission (21%). Most predictive factor for D/C home was baseline FIM. Ave hospital stay was 9 days.
Rehabilitation/ Post Acute	Difficult or impossible to reverse - can lead to permanent institutionalisation following a downward spiral, onset after a few days
Acute	
Rehabilitation/ Post Acute	associated with a reduced FIM score on D/C and less gain over all none given - usually not considered in ITU
ICU	
Rehabilitation/ Post Acute	Worse Functional status associated with higher short and long term mortality. Adjusted HR = 1.79 (CI 1.08-2.98). 1 year mortality = 31.6% some atrophy due to effects of injury itself, little info available on pattern of atrophy onset
Other	
	Older patients it is associated with higher rates of institutionalisation Younger patients with prolonged stays in critical care which can have a prolonged deleterious effect on functional abilities.
	Lower extremities most affected Functional impairment depends on severity - limited ambulation endurance, difficulty with stairs Deficits in bed mobility, transfers, basic ADLs falls - orthostatic hypotension, impaired balance overall loss of independence VTE
Acute	Functional decline appears in a hierarchical pattern
Acute	
ICU	none given

1		at 1 year post ARDS - loww or
2		muscle bulk, proximal muscle
3		weakness, fatigue, 50%
4		unemployment in young adults,
5		persisted at 5 years
6	ICU	
7		
8		
9		
10		compromised walking score - 56%
11		walked <15m with assistance or aid,
12		41% eating less than 50% of rec
13		protein, 81.8% had albumin below
14		normal range, 70.2% had CRP
15		above the reference range. On D/C -
16		42% improved Katz adl, 58%
17		improved walking, 25% had worse
18		nutrition and albumin. Improvement
19		in function correlated (+2 points) with
20		albumin, prealbumin and protein
21		intake, also reduced CRP and
22		proinflammatory cytokines
23	Rehabilitation/ Post Acute	
24		survival of ICU leads to imparied
25		physical reserve, and a reduced
26		QoL. Cardio respiratory
27		deconditioning, anxiety and
28	ICU	depression and PTSD all contribute
29		
30		
31		
32		
33	ICU	none given
34		not really discussed
35	ICU	
36	Rehabilitation/ Post Acute	
37		
38		
39		
40		Rapid and severe - onset within days
41		of hospitalisation, may last years
42		Disuse atrophy - muscle wasting
43		with flacid features, normal or
44		reduced strength with significant loss
45		of endurance, no sensory deficits,
46		preserved reflexes, normal nerve
47		studies, abnormal/absence of
48		spontaneous activity
49	ICU	
50		
51		
52		
53		
54		Following abdo surgery patients
55		have lowered mobility and limited
56		symptoms to perform ADLs due to
57		pain and deconditioning muscle.
58	Acute	
59		
60	Rehabilitation/ Post Acute	none given

Other	none given
Acute	associated with falls during and post D/C, NH admission, increased LOS, increased mortality. 30% don't get better after d/c
ICU	deconditioning leads to impaired mobility, potential for longer hospital stays, persistent physical and neuropsychiatric disabilities (in ICU), deconditioning led to cancellation of discharges, or needing transfer to rehab
ICU	none given
Acute	none given
ICU	none given
Rehabilitation/ Post Acute	Onset within 2-3 days of hospitalisation, cumulative and multifactorial nature. Improvements can happen from discharge up to one year post
ICU	none given
Rehabilitation/ Post Acute	May be triggered independent of successful treatment of admission cause. Malnutrition and sarcopenia complicate clinical course
Rehabilitation/ Post Acute	Disuse syndrome - step wise or gradual decline in functioning, can be triggered even when recovered from admission cause

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Acute

ICU

Rehabilitation/ Post Acute

Rehabilitation/ Post Acute

ICU

Primary dx of deconditioning have poorer rehab outcomes, higher readmission, lower rates of d/c to community, higher mortality rate. General loss of physical reserve+ Functional reserve - unable to handle additional stressors without loss of independence

Slow gait speed, muscular weakness, decreased stamina, diminished appetite, fatigue and decreased ability to carry out ADLs (common cluster of symptoms)

Identified at discharge - Functional deficits and ADL disability, develops rapidly over days (suggestion that older adults with HAD = hospital-acquired frailty)

presents with symetric, generalised weakness, acute onset, unrelated to critical illness, affects limbs and NM respiratory, facial muscles spared, decreased muscle tone, inconsistent deep tendon reflex loss, severe cases = flaccid paresis/plegia, may also present with altered sensation, ataxia and pain at long term follow up

Functional decline occurs within 2-3 days
low vit D associated with worse Functional recovery, lower admission bartel and longer LOS in rehab

Airway, pulmonary and vascular complications

	deconditioned and medically
	complex older adults have highest
	30 day readmission rate in the 6
	largest rehabilitation impairment
	categories. Admitting diagnosis of
	debility - 77.1% readmission rate,
	Functional gain is the strongest
	predictor (less than 12.5 = more
	likely readmission), followed by a
	short LOS (9.5 days), and then
Rehabilitation/ Post Acute	discharge FIM
	11-14% discharge back to acute
	hospital. Ave of 11.9 days in rehab.
	Protective motor items against re/ad
	on FIM- locomotion, stairs (60),
	lower body dressing (remained
	protective), eating (30), bowel (30)
	and bladder control (60). Lower
	motor score, multi morbidity and
	being unmarried most indicative of
Rehabilitation/ Post Acute	readmission.
Acute	none given
Acute	none given
Acute	none given
Acute and Post Acute	none given
Rehabilitation/ Post Acute	none given
	none given - sarcopenia associated
	with falls, disability and osteoporosis,
	may be increased by periods of
Rehabilitation/ Post Acute	hospital immobility and fasting
	none given - often refused on basis
Rehabilitation/ Post Acute	of cognitive frailty or poor motivation
Acute	none given
ICU	none given

1		recovery of walking ability not
2		influenced by pre op function in this
3		model - only PPDS and VAS at last
4		rehab session predict of regaining
5		walking. Hence - possible to predict
6		walking recovery and d/c dest after a
7		few days
8		Functional deterioration starts in the
9		first 48hrs after surgery (15- this is
10		Kwon 2012)
11	Acute	- at odds with Kwon et al -
12		
13	Acute	none given
14		
15		in HAD sarcopenia appears to be a
16		majorly linked to dysphagia and
17		ADL limitations but the causal
18	Rehabilitation/ Post Acute	relationship is unclear
19		
20	Rehabilitation/ Post Acute	none given
21		NM abnormalities found in as little as
22		10 days in ITU patients.
23		Weakness and physical disability
24		can persist for years on d/c in ITU
25		pop (context dependent)
26		MV over 21 days = prolonged
27		Functional limitation, improved lung
28		vol at 6 months but only 38%
29		returned to work and 32% in full
30	ICU	capacity
31		Noted at DC when it stops
32		successful DC. Older people can
33		have irreversable loss of function,
34		and development of frailty,
35		decreased life expectancy and QoL.
36		Occurs within days. Insideous onset,
37	Acute	can cause discharge delays.
38	Acute	none given
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40	ICU	none given
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Global period of functional decline, correlated with poor medical outcomes (20-22) (Krumholz, Kortebein, Brownlee) Brownlee - PHS at time of elective hernia repair = independent risk factor for post op complications

Acute none given

Acute none given

Acute anectodally change noticable after 10 days rehabilitation

Rehabilitation/ Post Acute

Acute none given
HAD leads to decreased mob and participation in community years after hospital. Assocaited with increased LOS
long term Functional limitations may persist over 12 months post discharge (44%)

Acute

Acute none given
prolonged bed rest -> muscle mass loss and weakness associated with loss of gait speed -> falls
none given

Acute

Acute Short op (<180 mins), recovers quickest, followed by long op, delerium = longest recovery trajectory

Acute prolonged bed rest -> deconditioning
-> need for rehab services post discharge

Acute

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Rehabilitation/ Post Acute

Rehabilitation/ Post Acute

Acute

Acute

May result in delayed discharge,
increased readmission (3x risk in 30
days compared to medically complex
older adults with higher physical
function), admission to community
beds

physiological stress post discharge
due to reduction in function ->
increased risk of complications not
directly related to adm during
recovery from acute illness

Negative impact on well-being and
QoL

Enhanced care recipients - greater
expectations of ability to self
manage, or treatment effect of
increased self-efficacy that doesnt
translate well

bed rest changes - reduced muscle
strength, esp LL. CV -> loss of
reflexes -> orthostatic hypotension -
> syncope and falls. NM - joint
stiffness, impaired balance,
coordination -> falls and fractures

Arthritis pts showed best
improvement, delerium showed
worst
increased LOS, extra social costs,
decreased QoL

identity- things different due to
deconditioning
sense of being pushed out before
ready
fearful of developing Functional
decline but fearful of doing
somehting about it

1 Occur within a few days, delay
 2 discharge, increase risk of
 3 readmission, and mortality
 4 +inc health car costs
 5 Routine care - 1-2hrs PT over 2
 6 sessions daily (strength, endurance,
 7 mobility, ambulation)
 8 1-2 hrs occupational therapists, -
 9 transfers, ind ADLs
 10 Psychology
 11 Rehab nursing - 3hrs per day
 12 usual LOS - 4+ weeks, some (3
 13 patients) over 6 weeks (moved to
 14 CC from I&E 19/10/22)
 15
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 19 Rehabilitation/ Post Acute
 20
 21
 22 Acute
 23 longer LOS, premature care home,
 24 loss of function in hospital
 25 acute = changes occurring days to
 26 weeks , occuring from bed rest.
 27 Changes seen in mood, coordination
 28 , muscle strength, work tolerance
 29 and balance
 30 mob loss restored within 1 week post
 31 d/c in 66% of cases
 32 loss of adl - 40% remained
 33 dependent in 1+ at 3 months post
 34 d/c
 35 Acute
 36 recovery of CV changes may take
 37 several weeks in healthy young men
 38 after prolonged bed rest
 39 HR changes and VO2 peak - one
 40 month
 41 - MSK changes - 5+ weeks post cast
 42 removal
 43
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 48 Deconditioning/ loss of ex tol
 49 assessed in hallway before d/c / if
 50 problems are apparent during
 51 hospital course
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Acute

Acute

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Rehabilitation/ Post Acute

Functional decline starts from day 2 compared to baseline.

Reconditioning takes longer than deconditioning time period
falls due to loss of strength - esp if climbing over rails on high hospital bed
- loss of vertebral bone mass after 10 days BR took 4 months to restore
Figure 1 - if it all goes to pot/cascade to dependency = d/c to NH

associated with higher mortality, rates of institutionalisation, greater health expenditure
Median onset - day 3, most commonly lost 1 ADL (53%), most often toileting (23/188) followed by dressing and grooming (21/188)

Higher rates of institutionalisation, rehab needs, home care, greater health expenditure
Onset day 3 and beyond

Occurs within days of admission, few recover ability by discharge, loss of ambulation is significantly associated with decline in other ADLs
Functional decline strong predictor of LOS, NH placement and death

Can occur as early as day 2.
Functional decline leads to increased risk of illness and death, less autonomy, greater dependence, reduced QoL, occasional institutionalisation, increased LOS and readmission rates.
many unable to return home - need rehab

Ave time to dx = 15.3 days to note primary dx of debility

Insideous onset - gradually adding issues till unable to do ADL. Picked up at discharge when noted patients cant care for themselves

1 year after d/c fewer than 50% of older adults have returned to their pre morbid baseline. 41% died at 12 months, 29% disabled at 12 months, 30% return to pre morbid baseline

Acute prognosis - table 2.

to trigger assessment of barriers to rehab

mortality low but transfer back to acute care is high. Who benefits most from intense rehab vs post acute care?

Rehabilitation/ Post Acute jet lag type disability, weight loss, delerium and cognitive overload,

Acute impact on ability to comply with post hospital self management and follow up appointments

more risk for disability, 80% for severe sarcopenia

Longer LOS, higher rate of readmission and mortality

PwSarcopenia - worse on adm, recover similar but don't continue to recover after d/c

Rehabilitation/ Post Acute people with MSK or other acute or chronic illness in hosp tend to be more sedentary and this stays after d/c Even if full recovered and medically stable.

Immobility = potential chest infections, msucle degeneration, blood clots

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Acute

hospital-associated Functional decline defined as an increased dependence in activities of daily living (ADL). However, many also experience a reduction in Functional mobility , cognition , and quality of life. Furthermore, hospital-associated Functional decline is associated with length of hospital stay, new-institutionalisation , readmission , progressive disability and mortality.

Acute

Deconditioning is associated with further immobility, reduced ability to walk, falls, confusion, swallowing difficulties, pressure ulcers, constipation, lack of appetite and venous thromboembolism (BGS 2020).

Acute

hospital stay elderly develop muscle loss, VTE, PU, orthostatic hypotension, loss of concentration, motivation, and development of depression and delirium. Extended bed rest = prolonged LOS, HAP, PU, Falls

Rehabilitation/ Post Acute

Skilled nursing facility rehabilitation is commonly required to address hospital associated deconditioning among older adults with medical complexity.

Acute

Loss of independence in ADL regardless of need for pre-admission assistance, increased risk of mortality, re-hospitalisation, need for formal and informal home services, institutionalisation

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Health scholars have established that a chain of events, including immobility during hospitalization, induces physiological deconditioning that leads to functional decline and, subsequently, hospital-acquired disability (HAD) [3–5]. HAD is defined as a new or additional disability in activities of daily living (ADL) that develops during admission [6–8].

The functional recovery of patients with HAD is often influenced by reduced physiologic reserve,⁵ whereas in those patients with OG conditions, it is related to the orthopaedic injury or prosthetic surgery. To our knowledge, there is a lack of information about the predictive factors of hospital readmission and institutionalisation in patients attending GR with OG or HAD conditions, which are very common reasons for admission to GR. Inpatients with HAD, higher comorbidity assessed by ACCI predicted hospital readmission and mortality, whereas lower SPPB scores predicted institutionalisation and mortality. Finally, inpatients with HAD, lower MMSE scores, poorer social resources assessed by the OARS Scale, and being male were related to a higher risk of institutionalisation. presents as change to ADL independence, caused by immobility in principle

Rehabilitation/ Post Acute

Acute

presents as change to ADL independence at discharge, associated with long term disability, institutionalisation and death

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Authors	Population
Siegler, E. L., Stineman, M. G. & Maislin, G. Hoenig, H	Inpatient Rehabilitation Geriatric Rehabilitation
Conlin Shaw, M	All
Rader, M & Vaughen, J.	Orthopedics
Timmer, Unsworth & Browne	Geriatric Rehabilitation
Spencer, J., Hersch, G., Eschenfelder, V., Fournet, J. & Murray-Gerzik, M. Deshpande, MacNeill, Lichtenberg, Pithadia & Velez	Transitional Unit Geriatric Rehabilitation
Unsworth & Eyres	Surgery

Killewich, L	Geriatric Surgery
Lim, Doshi, Castasus, Lim & Mamun	Geriatric Medicine
Aizen, Shugaev & Lenger	Geriatric Rehabilitation
De Morton, Keating & Jeffs	General Medicine
Raj, Munir, Ball, & Carr	General Medicine
Silver & Siebens	Surgery
Ng, Jung, Tay, Bok, Chiong & Lim	Inpatient Rehabilitation
Bailey, Miller, Russell & Clemmer.	ICU

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Baztan, Galvez, Cesar, &
Socorro Geriatric Medicine
Belavy, Miokovic, Armbrecht,
Richardson, Rittweger &
Felsenberg Research

Kortebein All
 General Medicine
Manning, Keller & Frank Registered Nurses
Venturelli, Crisafulli, Antoni,
Trianni & Clini ICU

Schweickert & Kress ICU

Dennis, Johnson, Roberson,
Heif, Bopp, Garner, Padala, Recuperation and
Padala, Dubbert & Sullivan Recovery Ward

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Goodman, Bonner, Wright, Hugill, Howard, Danjoux, Batterham & Howell Gosselink, Neddham, & Hermans	ICU ICU
Guy, Lerman & Justo	Geriatric Rehabilitation
Mendez-Tellez, Pedro, Nusr, Feldman & Needham Soares, Nucci & Silva Vargo, Wilson, Fuentes & Eliam	Neurology ICU Surgery Inpatient Rehabilitation
Cabilan, Hines & Munday Doherty-King & Bowers	Surgical Prehabilitation Medicine and Surgery Registered Nurses
Drolet, Dejuilio, Harkless, Henricks, Kamin, Leddy, Lloyd, Waters & Williams	ICU and Intermediate Care
Engel, Tatebe, Alonzo, Mustille & Rivera Friedman, Mayer, Hoyer & Atanelov Silveira, Pez, Nogueira, Furlan & Colombo	Medical and Surgical ICU General Medicine ICU
Timmer, Unsworth & Taylor Sottile, Quan, McNulty, Gray, Higgins & Moss	Geriatric Rehabilitation ICU

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Wakabayashi & Sakuma Geriatric Rehabilitation

Wakabayashi & Sashika Geriatric Rehabilitation

Falvey, Mangione & Stevens-
Lapsley Geriatric Medicine

Latronico ICU

 Geriatric Rehabilitation
Timmer, Unsworth & Taylor Occupational Therapists
Artaza, Valera, San Juan,

Urien, Fernandez &
Malafarina Functional Recovery Unit

Booth, Rivet, Flici, Harvey,
Hamill, Hundley, Holland,
Hubbard, Trivedi & Collier Neurotrauma ICU

Fisher, Graham, Krishnana &
Ottenbacher Geriatric Rehabilitation

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- Galloway, Karmarkar,
Graham, Tan, Raji, Granger
& Ottenbacher Inpatient Rehabilitation
Pack, Miwa, Engleman,
Lagu, Visintainer, Lindenauer
& Woodbury Cardiac Surgery
- Corcoran, Gavaghan, Lyons
& Moloney Geriatric Medicine
- Norheim, Bautmans & Kjaer Geriatric Medicine
Ritchie, Wood, Martin &
Jones Geriatric Medicine Nursing
Assistants
- Burkhardt & Parigger Geriatric Early
Churilov, Churilov, MacIsaac
& Ekinci Rehabilitation
Donnelly, Jevons and Wentworth Inpatient Rehabilitation
Geriatric Rehabilitation
- McInerney, McCarthy,
McCullagh, Fox & Timmons Geriatric Medicine
O'Sullivan & Cleffken ICU
- Petrucchi, Ricotti, Monteleone,
Ferriero, Giromini, Guillace,
Ambrosini, & Dalla Toffola Geriatric Surgery
- Stapley, Colley & Richards Geriatric Medicine
- Yoshimura, Wakabayashi, Convalescent
Bise & Tanoue, Rehabilitation

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Churilov, Churilov, Brock,
Murphy, Macisaac, & Ekinci Inpatient Rehabilitation

Dirkes & Kozlowski ICU

Gordon, Grimmer & Barras Geriatric Medicine
Horgan, Carr & Murphy General Medicine

Husain-Qureshi & Kirkwood ICU

Johnson, Swiatek, Wang,
Liu, Chung, & Chung Surgery
Parksinon Orthopedics
Rogerson & Kendall Geriatric Medicine
Timmer, Unsworth, &
Browne Geriatric Rehabilitation

Asif, Taube, Sivarajah,
Tsironis & Koizia Surgery
 Medicine and Surgery
 Registered Nurses, Patient
 Care Associates and
Bono & Reyes Residents

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Higgins, Frazier, Lennie, Rayens & Avila	Major Trauma
Kamper, Schultz, Hasen, Andersen, Ekmann, Nygaard, Helland, Wejse, Rahbek, Noerst, Pressel, Nielsen, Finn & Suetta	Acute Medicine
Koh, Sridaran, & Goh	Orthopedics
Kovar, Carmichael, Jones, & Nichols Robinson	Elective Surgery
Small, Tasneem, Bagheri, Chodosh, Adelsheimer, Sutera & Moroz	General Medicine
Smtih, Sreekanta, Walkeden, Penhale & Hanson	Inpatient Rehabilitation
Suriyaarachchi, Chu, Bishop, Thew, Matthews, Cowan, Gunawardene & Duque Butler & Welford	Virtual Rehabilitation Beds Geriatric Medicine

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Guilcher, Overall, Cadel, Li, & Kuluski	Acute Medicine Patients, Caregivers, Providers and Decision Makers
Laneuville, Rocheleau, Chan Chun, Pelchat & Trudel Sayer, Whiteaway, Dawson, Simpson & Chu	Inpatient Rehabilitation Geriatric Medicine
Siebens, Aronow, Edwards, & Ghasemi	Medicine and Surgery
Hoenig and Rubenstein	Geriatric Medicine
Creditor	Geriatric Medicine
Inouye, Wagner, Acampora, Horwitz, Cooney, Hurst & Tinetti	General Medicine
Inouye, Bogardus, Baker, Leo-Summers & Cooney Brown, Friedkin & Inouye	All General Medicine
Brown, Rothe, Peel, & Allman	All

Graf	Geriatric Medicine
Kortebein, Bopp, Granger & Sullivan	Geriatric Rehabilitation
Covinsky, Pierluissi & Johnston	Geriatric Medicine
Haley, Sullivan, Granger, & Kortebein	Geriatric Rehabilitation
Krumholz	All
Sanchez-Rodriguez, Marco, Miralles, Fayos, Mojal, Alvarado, Vazquez-Ibar, Escalada & Muniesa	Subacute Geriatric Rehabilitation
Chastin, Harvey, Dall, McNally, Mavroeidi & Skelton	All
Hartley, Keating, Jeffs, Raymond & Smith	General Medicine

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Swinerton & Price Geriatric Medicine

Beam, Gorman, Kist, Giles,
Kiser & Dumire Medical and Surgical
Beisheim-Kyan, Butera,
Hinrichs, Derlein, Malong,
Holtrop, Forster, Diedrich,
Gustavson, & Stevens-
Lapsley Skilled nursing facilities
Sourdet, Lafont, Rolland,
Nourhashemi, Andrieu &
Vellas Geriatric Medicine
Wai, Lu, Gill, Henderson and / General Medicine

 Orthogeriatric
Urquiza, Fernandex, Arrinda, I Rehabilitation

Pavon, Sloane, Pieper, Colon- General Medicine

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Ortiz-Alonso, Bustamante-Ara Geriatric Medicine

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Care Focus	risk factors (individual)
Rehabilitation/ Post Acute	long and difficult acute hospitalisations
Rehabilitation/ Post Acute	preceding transfer to rehab p2189
	none given
Acute	Being elderly, marginally active, acute illness, bed rest
	increasing age - although not predictive in itself, severe degenerative or debilitating conditions (aids, cancer, cardiopulmonary disease)
	Individual most at risk = those with stroke due to clinical manifestations of stroke compounded by disuse atrophy, cardioresp deconditioning, cerebral and coronary arteriosclerosis which may limit the rate and degree of recovery. On top of concurrent PVD, kidney and liver dysfunction cause further limitations. Therefore the deconditioned older patient cannot be "pushed" to the same degree as a patient who was fit prior to the stroke.
Acute	
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute	none given
Acute	Older age - comparatively more sedentary in hospital, more susceptible to clinical effects of inactivity during illness
	Patient attitudes - perception of being in hospital "to rest"

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|CU

none given

none given

ageing
Pre hospital functioning - aids, IADL,/BADL,
cognition

none given

none given

none given

ICU	none given
ICU	none given
	Low body mass (associated with poor outcome)
Rehabilitation/ Post Acute	
ICU	
Acute	pain
Rehabilitation/ Post Acute	none given
Other	none given
Acute	patient resistance frailty weakness pain fatigue
ICU	tethering - catheters, lvs
ICU	none given
Acute	none given
ICU	none given
Rehabilitation/ Post Acute	none given
ICU	none given

malnutrition (87.6%, 12.4% at risk in authors cohort) - associated with poorer Functional outcomes and QOL on d/c. Obese do better than underweight/ normal BMI

Rehabilitation/ Post Acute

being underweight - worst rehab outcomes,
91% of HAD cohort were malnourished, CV
and gastro diseases had worst bartel on
admission

Rehabilitation/ Post Acute

none given

Acute

Critical illness, SIRS, MODS/failure, S&V, ICU delirium, hyperglycemia, corticosteroids, NM blockade, medication, ventilation, sedation

|CU

Age

Rehabilitation/ Post Acute

none given

Rehabilitation/ Post Acute

depth of sedation, physiologic instability,
complex care needs - trauma, neurotrauma

|CU

none given

Rehabilitation/ Post Acute

	Co-morbidities most associated with readmission = Chronic pulm disease (30), CHF, fluid/electrolyte disorders, PVD, weight loss, solid tumor no mets, lymphoma, liver diseases. AGE WEIRDLY PROccupational therapists,ECT- maybe survivor bias, those that stay out more robust.
	Incr re/ed: non white, not married.
	Low body weight, low BP- increased mortality (different study?)
Rehabilitation/ Post Acute	
Acute	none given frailty
Acute	cognitive/ Functional deterioration at admission
Acute	Inflammation - sustained elevated CRP - associated with being weaker and less fatigue resistant, no improvements in muscle function despite reduced inflammation,
Acute and Post Acute	none given
Rehabilitation/ Post Acute	none given
Rehabilitation/ Post Acute Rehabilitation/ Post Acute	none given cognitive frailty
Acute ICU	none given none given
Acute	Influencers - depression, bloods, BMI, post op complications.
Acute	none given Malnutrition
Rehabilitation/ Post Acute	Sarcopenia appears to be a major cause of ADL limitations (weak independent association)

1		
2		
3		Higher SARC-F score associated with lower
4	Rehabilitation/ Post Acute	FIM and QOL
5		Age- less to start with and accelerated loss of
6		muscle mass
7		Obesity (although poses more challenge to
8		staff)
9		pain
10		delerium
11		Poor activity tolerance
12		ICU-AW
13		Female sex
14		hyperglycemia
15		hypoalbuminemia
16		parenteral nutrition
17	ICU	corticosteroid use
18		
19		
20		
21		
22		
23		
24		
25		
26		
27	Acute	Older age but can occur at any age
28	Acute	none given
29		
30	ICU	none given
31		
32		
33		
34		
35		
36		Raised elixhauser score (8+) (comorbidity
37		score, 31 different conditions, higher = worse
38		health states)
39		Advancing age - 2.1% per year over 45
40		(lowest incidence) drops from age 18 peak
41		Smoking
42		
43		
44	Acute	
45	Acute	none given
46	Acute	none given
47		
48		
49	Rehabilitation/ Post Acute	none given
50		
51		
52	Acute	none given
53		
54		
55		
56		
57	Acute	none given
58		
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60		

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	worse pre injury function. Baseline function predictive of post strength and muscle bulk and in hospital ambulation
Acute	poor pain control - confounding variable
Acute	sarcopenia makes Functional decline worse, attenuates recovery 3 months after discharge
Acute	dependency on nurse for ambulation and ADLs
Acute	preseence of delerium associated with longer recovery to baseline ambulation
Acute	none given
Rehabilitation/ Post Acute	Increased age Delerium on admission Multiple co-morbidities Cognitive deficits Poor mobility/ use of aid Deficits in BADL or IADL at adm/dc or both Fear of falling use of tethering intervention - catheters/ lines
Rehabilitation/ Post Acute	Delerium - lowest FIM scores noted on admission
Acute	The patients who showed the best treatment response were those who had exacerbation of arthritis (mean FIM gain: 22) none given

1		Older age
2		Physical complexity
3		Social complexity - precarious housing,
4		financial instability, limited caregiver support
5		(often spouse or child)
6		
7		
8		
9	Acute	
10		
11		
12	Rehabilitation/ Post Acute	none given
13		
14		
15	Acute	none given
16		
17		
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25		patients with lower education levels more
26	Acute	likely to have a lower dose of exercise
27		Functional status on admission predictive of
28		function at d/c (single best early predictor of
29		d/c location)
30		
31	Acute	Older age
32		
33		Usual ageing process
34		Being at threshold of Functional disability
35		Pre existing continence issues
36		
37	Acute	Pre existing sensory/ perceptive issues
38		
39		Cognitive impairment RR 1.7 CI 0.9- 3.1
40		Functional impairment RR 1.8 CI 1-3.3.
41		Low social activity RR 2.4 CI 1.2 - 5.1
42		older>younger
43		(5 initial axes - demographic, physical
44		function, cognitive function, biomedical and
45		psychosocial- table 2)
46	Acute	Older patients - multiple chronic conditions,
47		physiological impairments, decreased reserve,
48		
49		
50	Acute	polypharmacy
51	Acute	none given
52		Age over 65, white, use of walking aid,
53		Functional impairment pre hosp
54		
55		
56		Severity of illness, bed rest orders, use of
57	Acute	tethering devices
58		
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Acute	age, cognitive impairment
Rehabilitation/ Post Acute	none given
Acute	Age (85+), Being frail, having slow gait speed, cognitive impairment, psychosocial - depression, limited social support, immobility, polypharmacy, falls, incontinence, delirium, use of walking aid.
Rehabilitation/ Post Acute	none given
Acute	none given
Rehabilitation/ Post Acute	Sarcopenia exacerbates Functional decline and impairs restoration of function
Acute	Stroke 8% upright time in rehab Geri rehab 70 mins +/-50, 70% time standing or walking in less than 5 min bits. Psychological -"I'm sick" mindset
Acute	none given

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Acute	Catheterisation, falls, delirium, decreased muscle size, decreased strength, balance difficulties, increased breathlessness or tachycardia on physical exertion or mobilisation, age over 65, people with frailty, obesity, acute injury or illness which affects ability to mobilise
Acute	Not necessarily risk but influential factors which affect mobility in elderly = comorbidities, prior health history, baseline mobility, complications from hospitalisation
Rehabilitation/ Post Acute	none given
Acute	Increasing age, cognitive impairment
Acute	Increasing age
Rehabilitation/ Post Acute	patient's comorbidities, physiologic reserve, severity of acute illness, and hospital care processes.
Acute	none given

Acute

none given

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associated co-morbidities or conditions compared syndromes

none given	none given
none given	none given

bed rest, pressure ulcers
Deconditioning is a contributory
factor to the development of
pressure ulcers

none given	diagnosis of "failure to thrive"
Frailty	Mentions patients often frail but doesn't delineate further

Hip fracture, falls, exacerbation of chronic disease (cardiac, diabetes, pulmonary, CVA), hypothyroidism, malnutrition, amputation, degenerative joint disease, ataxia, PVD, bipolar disorder, personality disorder, depression, adjustment disorder none given

none given

none given

1
 2
 3
 4
 5
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 7
 8
 9 Hip fracture, PVD-> limb threatening
 10 ischemia
 11 Frailty
 12 Unsteadiness and risk of falls none given
 13
 14
 15 none given none given
 16
 17
 18
 19
 20 none given none given
 21
 22
 23
 24
 25
 26
 27
 28
 29 cancer none given
 30 Osteoporosis
 31 Polypharmacy - 9+ meds
 32 Delirium
 33 Depression (geriatric depression screen)
 34 Pressure sores (Braden scale)
 35 Unintentional weightloss
 36 Vit D deficiency
 37 Pain (VAS)
 38 Frailty
 39 CV risk factors
 40 Lots none given
 41
 42
 43
 44
 45
 46
 47
 48
 49
 50
 51
 52 surgery none given
 53 Long term IV anti biotic use due to chronic
 54 infections, dialysis for end stage renal
 55 failure none given
 56
 57
 58 PTSD from oversedation none given
 59
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1	hip fracture	
2	Stroke	
3	Intracranial injury	
4	Hip and pelvis injury	
5	Rhabdomyolysis	
6	Congestive heart failure	
7	PVD	
8	Venous and pulmonary embolism	
9	Pneumonia	
10	Acute respiratory infections	
11	COPD	decreased Functional reserve =
12	UTI	frailty, potentially reversible and
13	Surgical interventions	recovery can influence a reduction
14	Endocrine and metabolic diseases	of long term mortality
15	MSK diseases	Stroke mortality -17%, Ortho
16	Neurology disorders	mortality - 14.1%
17		
18	none given	none given
19	Sarcopenia (age related)	
20	Cancer	
21	severe heart failure	
22	cardiac transplant	
23	chronic renal insufficiency	
24	severe COPD	
25	survived critical illness (CIM/CIP	
26	associated with systemic corticosteroids,	
27	dx with EMG)	
28	Anemia	CIP/CIM - associated with ITU and
29	pain	systemic corticosteroids which
30	sleep deprivation	increase catabolism, dx with EMG/
31	fatigue	nerve conduction
32		
33	none given	none given
34	pneumonia	none given
35		
36		ICU -AW (common complication of
37	ARDS	critical illness)- associated with
38	Sepsis	systemic conditions eg sepsis.
39	Septic shock	causes severe Functional
40	multisystem organ failure	impairment, profound NM weakness
41		
42		cachexia - end stage organ disease
43		- bed rest, raised inflammatory
44		markers and anorexia,muscles
45		atrophy regardless of nutrition?
46	none given	

none given	none given
none given	ICU AW - deconditioning + weaning failure?
hypertension	
Ischemic heart disease	
Diabetes t 2	
Depression, demntia, PAF/CAF, CHF, cancer, CVD, hypothyroidism, PD, COPD	pressure ulcers - increased risk of mortality and morbidity
	for ICU AW - EMG, nerve conduction studies - sensorimotor axonopathy with reduced compound muscle action potentials and sensory nerve action potentials
SIRS, sepsis, multiorgan dysfunction	none given
none given	none given
premorbid disability	none given
major surgery	none given
none given	none given
none given	none given
hypertension, chronic arterial disease, chronic joint pain/ neuropathy, haematological cancer, AF, hyperlipidemia, COPD, CVA, OA, end-stage liver disease, diabetes, substance misuse, GORD	none given
none given	none given
none given	none given
none given	ICU AW - CIPNM

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CVA, lower limb fracture or joint replacement, debility, neurological disorders, brain dysfunction

HF, ruptured AA, MI, elective CABG, other CV disease, cancers - bile duct, oesophageal, colon, liver, prostate, lymphoma, leukemia, myeloma, lung, pneumonia + interstitial, ileus, depression, delirium, acute/chronic renal failure,

none given

none given

none given

none given

none given

none given

sarcopenia - syndrome characterised by progressive and generalised loss of skeletal muscle mass and strength, increased risk of disability, poor QoL and death. ICU-AW is clinically detected weakness with no etiology other than critical care
iatrogenic disability - partial or wholly avoidable physical dependence associated with Functional decline
Frailty - 3/5 muscle weakness, slow movement, self reported exhaustion, low physical activity, unintentional weight loss. insidious onset over months to years

May mimic GBS, ALS and MG - acute resp failure

none given

none given

none given

none given

Primary dx may be- debility, generalized weakness, infection or multisystem pathology (lots of codes). HF, septicimia, kidney/UTI. Table 2- top 5 = HTN, COPD, CHF, Diabetes no complications, Deficiency anemia none given

none given none given
 Frailty - HAD a risk in hospital environment but frail older adult already deconditioned

none given already deconditioned

Respiratory/ Infectious disease
 MSK disease and injury
 GU and Digestive diseases
 Endocrine and Immunological
 Cardiovascular and Neurological diseases none given
 Vague reference to social or clinical iatrogenesis

none given

none given they were admitted due to pneumonia, fluid imbalance heart failure none given
 sarcopenia - but HAD as the diagnosis
 sarcopenia diagnosis
 dementia none given

none given none given
 none given none given
 complications

Surgically treated, age related cancers eg bowel

Presence of pain at last rehab session predicts walking for oncology used CCI to measure this

PDDS predicts for all other groups none given

none given none given

people with sarcopenia tended to be older, more malnourished and more severe co morbidities none given

sarcopenia

none given

Critical illness or sepsis

none given

Frailty - large overlap in symptom profiles. HAD appears to occur more rapidly (hours), frailty more insidious - over a longer period of time

none given

none given

none given

none given

none given

DVT (23% had PHS)

Coronary artery disease (16.1% had PHS)

Hypertension

Obesity

See table 4

Females most like to develop PHS

following acute post op pain, post term

pregnancy

none given

none given

none given

"social admissions"

none given

none given

none given

none given - associated with hospital
acquired infections vaguely

none given

delerium,

none given

combo of trauma and immobility -
decrease skeletal muscle strenght by
28%, trippled loss of mass none given

sarcopenia none given
HAD contributes to lower limb weakness
and increases falls risk through prolonged
bed rest none given

dementia none given

none given none given

none given

sarcopenia - syndrome
characterised by progressive and
generalised loss of skeletal muscle
mass and strength, with risk of
physical disability, poor QoL and
death. (low grip strength and gait
speed)
sarcopenia
frailty Frailty - state of reduced
pain physiological reserve associated
with increased susceptibility to
disability (3/5 weak grip, slow gait,
most common adm dx exhaustion, weight loss, low energy
falls - 61 patients expenditure)
UTI/ chest infection - 28 patients
none given none given

	multi morbidity - dementia, heart disease,	
	diabetes, cancer, kidney failure	
		none given
	multimorbidity	none given
	none given	none given
	Resp - 20%	
	Circulatory - 7.3%	
	HPB+ pancreas- 6.3%	
	Male reproductive- 5.3%	
	Skin, subcut or breast - 4.7%	
	Kindey/UTI - 4.7%	
	Female reproductive - 4.7%	
	other - 17.6%	none given
	pneumonia?	none given
	hip fracture	none given
	none given	none given
	pneumonia, chronic lung disease,	
	cogestive heart failure, ischemic heart	
	disease, GI disease	none given
	none given	none given
	Hip fracture, hypotension, DVT, CVA	
	without weakness, major surgery, hx of	
	hemiparesis regardless of cause, TIA,	
	PD, seizures	none given

Stroke, cancer, CCF, pneumonia, coronary heart disease, hip fracture	Frailty - an evolving geriatric continuum where frailty is a mid point between independence and death.
inpatient falls, fractures, drug reactions, nosocomial infections, use and consequence of physical/ chemical restraint = longer LOS, cognitive changes, reduced ability to do ADLs	3+ of unintentional weight loss past year, weak grip, slow walking, low physical activity. May encompass concepts like failure to thrive, anorexia, sarcopenia, dementia
Diabetes, CHF, AF, GU disease (everything except kidney disease), infection, depression, hypertension, degenerative joint disease, CAD, post surgical, anemia, hemiparesis, COPD, sleep disorder, hypothyroidism	analogue to early description of frailty - you know it when you see it.
Pneumonia, CHF, renal/ GU issues	Range of geriatric syndromes - falls, delirium and incontinence
pneumonia	none given
none given	PHS - readmission rate in 30 days, deconditioning a feature of PHS
resp or urinary infections, heart or renal failure	sarcopenia as an exaggerating influence on HAD severity
none given	sed behaviour possible cause of PHS
Infections, Heart Failure, Kidney/Renal Failure, GI Bleeding, Vertigo	HA-Functional Decline = increased dependence in ADL. But also decline in Functional mobility, cognition, quality of life

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Sarcopenia = a progressive loss of skeletal muscle mass linked to ageing. Characterised by loss of fast twitch fibers, increased fatty deposits in muscles, and ageing of cellular mitochondria leading to decline in over all function of muscle tissue. Associated with reduced strength, closely related to falls and frailty in older people.

Frailty - deconditioning increases the risk of developing frailty , Sarcopenia, Dysphagia, Oral infections, Delerium (Pain, Infection, Nutrition, Constipation, Hydration, Medication, Environment), Dementia

Frailty = a clinical syndrome characterised by marked vulnerability due to a decline in physiological function and function signifcant overlap of older people with both

Most common diagnosis = Fracture (strutural issues, pain), Sepsis/ Infection and osteoarthritis (also acute pain, ambulatory dysfunction, benign neoplasm, bowel obstruction, CVD, cholecystitis, cirrohosis, electrolyte disturbance, GI bleed, malignant neoplasm, pancreatitis, procedural complications, renal failure, respiratory failure, syncope)

None given

none given

none given

none given

none given

Falls, Pressure Injury
Patients with hospital-acquired deconditioning more likely to live alone,

none given

have higher co-morbidity failure to thrive in 39% (n = 18), gastrointestinal in 22% (n = 10), cardiac in 11% (n = 5), neurological in 11% (n = 5), infectious in 9% (n = 4), and other in 9% (n = 4)

none given

none given

dementia, depression, falls, chronic pain,
malnutrition, urinary incontinence, frailty
phenotype, incident delirium,
polypharmacy

none given

For peer review only

Towards a common definition of Hospital Acquired Deconditioning (HAD) [in working-age adults]: A Scoping Review Protocol

Authors

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Abstract

Objective: The objective is to identify the key components used to define hospital-acquired conditioning in adults from previous literature.

Introduction: Hospital-acquired-deconditioning (HAD) is becoming increasingly recognised as a complication of inpatient care. The prevalence is estimated to be approximately 30% in older adults, but it has not been assessed in working-age adults (1). Much of the literature describes a non-standardised description HAD (1-5). Therefore, delineating the criteria used to outline HAD provides a better platform to inform future practice and research.

Inclusion criteria: all literature that investigates or discusses HAD in working-age adults (18+), including the aim of assessing and/or managing HAD within the inpatient setting (acute, sub-acute hospital or rehabilitation settings). Opinion pieces, grey literature, qualitative, quantitative, and systematic review designs will be included. Literature that does not define or describe HAD will be excluded.

Methods: The scoping review will follow the Joanna Briggs Institute scoping review methodology (6). All sources which provide a definition or description of HAD assessment and/or management will be included. Literature must be written in English. Eight electronic

databases and grey literature platforms will be searched from 1st January 1990 to 31st January 2022 (MEDLINE OVID, CINAHL (EbscoHost), EMBASE, AMED (OVID) PsychInfo(OVID), PEDro, OpenGrey, GreyLit). Citation searching of selected studies will be conducted using Web of Science. Titles, abstracts, and full-text screening will be completed independently by two reviewers. Data will be descriptively summarised and presented using tables and diagrams. Reporting will follow the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist(7).

Introduction

Deconditioning is a variably defined term that describes the loss of physiological and cognitive capacity as measured by a loss of independent function in basic activities of daily living. Hospital-acquired disability proves furthermore elusive in its specificity as a diagnosable condition. Furthermore, deconditioning has also been implicated in other conditions like non-specific lower back pain (8), postural orthopaedic tachycardia syndrome (5) and spinal cord injury (9). Deconditioning is thought to arise from extended periods of immobility, inactivity, or reduced activity(10). Dock described the "Evil Sequelae of Bed Rest" as grievous unintended effects from the traditionally prescribed lengthy periods of enforced bed rest during and following illness (11). Kortebein 2009 discusses the variety of meanings attributed to deconditioning (12), alluding to the complexity and difficulty in qualifying succinctly what deconditioning means in a multi-stakeholder system and an acute environment. Kortebein also noted substantial variation in the use of HAD as a concept. Since this paper was published in 2009, there have been no subsequent publications to update the literature on HAD definitions(12)."

There have been several distinct but overlapping conceptual approaches to the definition of HAD or deconditioning. Some authors focus on the observable consequences of reduced activity, whilst others have emphasised the underlying physiological mechanisms (e.g. changes in muscle morphology or orthostatic intolerance) (13, 14). Three broad understandings have emerged in the literature thus far. These are 'deconditioning as a consequence, 'deconditioning as a physiological phenomenon demonstrated by functional losses, and 'deconditioning as an adverse event' (5, 15). These broad categories will be used as *a priori* categories for data analysis. To overcome risk of predefined bias, these categories

will be iterative in nature and will be assessed by two independent reviewers. A strength of this approach is streamlined sorting of a large dataset.

Deconditioning as a consequence:

Perhaps due to the nature of the search terms, limited, strictly physiological explanations and definitions have been observed. Bender in 2018 defined deconditioning as a consequence of inactivity and bed rest characterised by alterations in mental status, continence, ADLs and mobility(16). This definition aligns to Creditors 1993 eight hazards of bed rest: loss of muscle strength, loss of aerobic capacity, vasomotor instability, reduced bone density, reduced pulmonary ventilation, altered sensory continence (delirium features), and loss of appetite and thirst, and finally urinary incontinence. Oda et al. in 2021 state “hospitalised older adults often experience deconditioning manifested as cognitive and physical function decline” p7. Suggesting that deconditioning is fallout from poor oral care practices and linked to sarcopenia and aspiration pneumonia through poor nutritional status(17).

Deconditioning as a physiological phenomenon demonstrated by functional loss:

Jones, in 2006 divided their definition of deconditioning into physiological and functional strands reflecting the dynamic between pathology and observed outcome(13). Timmer, 2014 also adopted the separation of physiology and function. In finding limited literature for deconditioning specific interventions for older adults, they operationalised the effect of deconditioning functionally. They specified hospital-acquired deconditioning (HAD) as “functional decline resulting from acute hospital admission for a general medical condition” (14) p1081. Falvey, in 2015 highlighted physiology first in stating deconditioning to mean “declines in muscle strength, muscle mass, cognitive function, muscle protein synthesis and physical function” p 1308(3). They further translate these physiological effects into functional loss in ADLs.

It is more common to see function or outcome focussed definitions, including those shared by Kortebein, Convinsky, Fox and Loyd, which emphasise the loss of independence in basic activities of daily living, which include bathing, transferring, eating/drinking, room-based ambulation and toileting (1, 12, 18, 19).

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Deconditioning as an adverse event.

As a preventable consequence of inpatient medical care, HAD is a recently emerging theme, despite being discussed in early enhanced recovery after surgery work completed in 1944 by authors such as Powers(10). Qualitative research by Guilcher in 2021 defines HAD as preventable harm, also known as a post-hospital syndrome or the trauma of hospitalisation(20). They emphasise the increased period of risk for adverse events following inpatient care. The post-hospital syndrome was discussed by Caraballo in cardiac patients and identified a seven-week window where the risk of all-cause re-admission is highest following discharge(21). Falvey further discusses HAD as partially avoidable and links HAD to the category of 'iatrogenic disability' (15). They suggest that HAD is increasingly referred to as Post Hospital syndrome but focus on HAD because it is a more clinically relevant term to physical therapists(3).

Research focusing on deconditioning as avoidable harm emphasises the psychological, cultural, organisational and environmental stressors and barriers that reduce patient independence and facilitate the development of dependence. Gordon's review of outcome measures in 2019 highlights the expectation that patients will not leave the hospital worse than on admission(4). Moersch, 2020 in their thesis, explored the experience of a common HAD intervention, early mobilisation, and how older adults experience deconditioning; however, the full text of this thesis is unavailable currently(22).

Taking all three categories together, it can be concluded that deconditioning is a multi-system event that can be examined and understood from several different features and paradigms. Furthermore, HAD appears dynamic with past, present and future implications for care and health. To date, no models have been found to explain the interaction of factors involved in the definition or acquisition of HAD.

Loyd et al. assessed the prevalence of HAD in 2020, where they conducted a systematic review and meta-analysis. They found that 30% of older adults developed deconditioning following an acute medical event necessitating hospital admission (1). This is a significant figure given the burden of reduced functional ability, including the economic cost of care

packages, discharge to residential facilities, loss of quality of life, the potential for mood disorders and carer strain. In American populations, this financial burden is 10% of the Medicare budget (2, 3). The Medicare budget, for context, covers treatment for over 65's with some exceptions relating to inpatient care, including residential care facilities and rehabilitation (23, 24).

A scoping review has been chosen to clarify what is meant by the term Hospital-Acquired-Deconditioning. Furthermore, the clinical presentation, assessment, responsible parties and management hinge on a shared understanding of what is meant when deconditioning is presented as a diagnosis. Scoping reviews are appropriate for concept clarification when there is variability or uncertainty in the literature (6).

A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, PROSPERO, Epistemonikos and *JBIC Evidence Synthesis*, was conducted. No current or underway systematic reviews or scoping reviews on the topic were identified.

In conclusion, this review will aim to capture the core features of HAD in adults with a specific focus on those of working age if possible.

Review question

What are the defining components/features of hospital-acquired deconditioning in [working age adults]?

- What is the diagnostic criteria for HAD?*
- How is HAD understood and operationalised?*
- How is it separate from other syndromes linked to reduced activity, e.g. frailty, Intensive care acquired weakness (ICU-AW), sarcopenia, hospital-associated disability, post-hospital syndrome?*

Keywords

Adverse Event; Assessment; Deconditioning; Inpatient; Scoping Review

Inclusion criteria

Participants

Adults over 18 included who are being assessed or treated for HAD. Children under 18 will be excluded.

Concept

Evidence which gives a definition or description of HAD and/or other descriptors, including strategies to assess, prevent, manage and descriptions of the experience of HAD. Literature discussing deconditioning because of a specific health condition will be excluded (e.g. cancer, neuromuscular disorders or frailty).

Context

The literature will be included from those reporting from any setting inpatient hospital or inpatient rehabilitative settings (e.g. care homes, inpatient facilities, interim beds) but not rehabilitation at home for HAD. There will be no geographical exclusion. However, studies will need to be written in English for inclusion.

Types of sources

This scoping review will consider both experimental and quasi-experimental study designs, including but not limited to randomised controlled trials, non-randomised controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control

studies and analytical cross-sectional studies will be considered for inclusion. This review will also consider descriptive observational study designs, including case series, individual case reports and descriptive cross-sectional studies for inclusion.

Qualitative studies will also be considered that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.

In addition, systematic reviews that meet the inclusion criteria will also be considered, depending on the research question.

Text and opinion papers will also be considered for inclusion in this scoping review.

Methods

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews (6). Reporting will be guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist (7).

Search strategy

The search strategy will aim to locate both published and unpublished studies. A three-step search strategy will be utilised in this review. The search will be abductive in nature and may evolve as the reviewers' knowledge of the evidence base develops (6, 25, 26). First, an initial limited search of MEDLINE OVID and CINAHL (EBSCO) was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the articles will be used to develop a complete search strategy for MEDLINE (OVID), CINAHL (EBSCO), EMBASE (OVID), AMED (OVID) PsychInfo (OVID), PEDro, OpenGrey and GreyLit (see Appendix 1). These databases were chosen to reflect the breadth of stakeholders in defining and utilising HAD. The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. Finally, the reference list of all included sources of evidence will be screened for additional studies by hand and in Web of Science. Only studies published in English will be included because the translation of non-English studies is

beyond the resources available to conduct this review. Studies published before 1st January 1990 will be excluded.

Study/Source of evidence selection

Following the search, all identified citations will be collated and uploaded into EndNote version 9.0 (2021) and duplicates removed using the Covidence software. Following a pilot test, titles and abstracts will then be screened by two or more independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full and their citation details imported into Rayyan for the title and abstract screening (27). The full text of selected citations will be assessed in detail against the inclusion criteria by two or more independent reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review PRISMA-ScR flow chart. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion or with an additional reviewer/s if a consensus cannot be reached.

Data extraction

Data will be extracted from papers included in the scoping review by two or more independent reviewers using a data extraction tool developed by the reviewers for the purpose of this review. The data extracted will include specific details about the participants, concept, context, study methods and key findings relevant to the review question/s. The data extraction tool will be piloted by the first author on five studies and then reassessed by the second reviewer for clarity and consistency.

A draft extraction form is provided (see Appendix 2). The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included evidence source. Modifications will be detailed in the scoping review. Any disagreements that arise between the reviewers will be resolved through discussion or with an additional reviewer/s. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Data analysis and presentation

Initial screening of the literature will be presented in a PRISMA-ScR flow chart to report the selection process(7). Study characteristics including participant age range, geographical location, study context, purpose and design will be tabulated. Findings will be categorised around a *priori* criteria based on HAD as an adverse event, HAD as a physiological phenomenon, HAD as a consequence and emergent findings from the literature. Further categories for analysis will include a definition or description of HAD and/or other descriptors, including strategies to assess, manage and the experience of HAD.

Common words used in defining HAD will be presented in a word diagram to emphasise significant and less significant concepts and frequency. Overlap with other hospital-acquired syndromes will be presented in a Venn diagram to demonstrate commonality and distinct features. A body chart may be included to demonstrate physiological descriptors of HAD and/or identified assessments for the specific component. A narrative summary will accompany the results and describe how the results relate to the review objective and question/s.

Acknowledgements

The production of this scoping review contributes to the award of Doctor of Philosophy in Ageing and Rehabilitation through the University of Nottingham for MW.

Funding

This review is independent and funded by the National Rehabilitation Centre (NRC). The views expressed in this publication are those of the author(s) and do not necessarily reflect those of the NHS, NRC or the University of Nottingham.

Declarations

MW, KR, AC, LH and FH are physiotherapists in the United Kingdom with experience of working with adult inpatients in both acute and rehabilitative settings of the NHS. AG is a Professor in Rehabilitation and Ageing and a practising Geriatrician.

Conflicts of interest

There is no conflict of interest in this project.

References

1. Loyd C, Markland AD, Zhang Y, Fowler M, Harper S, Wright NC, et al. Prevalence of Hospital-Associated Disability in Older Adults: A Meta-analysis. *Journal of the American Medical Directors Association*. 2020;21(4):455-61.e5.
2. Smith TO, Sreekanta A, Walkeden S, Penhale B, Hanson S. Interventions for reducing hospital-associated deconditioning: A systematic review and meta-analysis. *Archives of Gerontology and Geriatrics*. 2020;90:104176.
3. Falvey JR, Mangione KK, Stevens-Lapsley JE. Rethinking Hospital-Associated Deconditioning: Proposed Paradigm Shift. *Physical Therapy*. 2015;95(9):1307-15.
4. Gordon S, Grimmer KA, Barras S. Assessment for incipient hospital-acquired deconditioning in acute hospital settings: A systematic literature review. *Journal of rehabilitation medicine*. 2019;51(6):397-404.
5. Joyner MJ. Standing up for exercise: should deconditioning be medicalized? *The Journal of Physiology*. 2012;590(15):3413-4.
6. Peters MDJ, Godfrey CM, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping reviews. 2020. In: JBI manual for evidence synthesis [Internet]. JBI. Available from: <https://synthesismanual.jbi.global>.
7. Tricco AC, Lillie E, Zarin W, O'Brien K, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine*. 2018;169(7):467-73.
8. Tagliaferri SD, Armbrrecht G, Miller CT, Owen PJ, Mundell NL, Felsenberg D, et al. Testing the deconditioning hypothesis of low back pain: A study in 1182 older women. *European Journal of Sport Science*. 2020;20(1):17-23.

9. Maher JL, McMillan DW, Nash MS. Exercise and Health-Related Risks of Physical Deconditioning After Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation*. 2017;23(3):175-87.
10. Powers JH. The abuse of rest as a therapeutic measure in surgery. *The journal of the american medical association* [Internet]. 1944; 125(16):[1079-83 pp.].
11. Dock W. The evil sequelae of complete bed rest. *Journal of the American Medical Association*. 1944;125(16):1083-5.
12. Kortebein P. Rehabilitation for hospital-associated deconditioning. *American journal of physical medicine & rehabilitation*. 2009;88(1):66-77.
13. Jones CT, Lowe AJ, MacGregor L, Brand CA, Tweddle N, Russell DM. A randomised controlled trial of an exercise intervention to reduce functional decline and health service utilisation in the hospitalised elderly. *Australasian journal on ageing*. 2006;25(3):126-33.
14. Timmer AJ, Unsworth CA, Taylor NF. Rehabilitation interventions with deconditioned older adults following an acute hospital admission: a systematic review. *Clinical rehabilitation*. 2014;28(11):1078-86.
15. Martínez-Velilla N, Herrero AC, Cadore EL, Sáez de Asteasu ML, Izquierdo M. Iatrogenic Nosocomial Disability Diagnosis and Prevention. *Journal of the American Medical Directors Association*. 2016;17(8):762-4.
16. Bender D, Holyoke P. Why some patients who do not need hospitalization cannot leave: A case study of reviews in 6 Canadian hospitals. *Healthcare Management Forum*. 2018;31(4):121-5.
17. Oda K, Montayre J, Parsons J, Boyd M. Oral Care in Hospital Settings: Breaking the Vicious Circle of Older Adult Deconditioning. *Journal of Gerontological Nursing*. 2021;47(6):7-12.
18. Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-Associated Disability: "She Was Probably Able to Ambulate, but I'm Not Sure". *JAMA*. 2011;306(16):1782-93.
19. Fox MT, Sidani S, Persaud M, Tregunno D, Maimets I, Brooks D, et al. Acute Care for Elders Components of Acute Geriatric Unit Care: Systematic Descriptive Review. *Journal of the American Geriatrics Society (JAGS)*. 2013;61(6):939-46.
20. Guilcher SJT, Overall AC, Cadel L, Li J, Kulski K. A qualitative study exploring the lived experiences of deconditioning in hospital in Ontario, Canada. *BMC Geriatrics*. 2021;21(1):169.

21. Caraballo C, Dharmarajan K, Krumholz HM. Post hospital syndrome: Is the stress of hospitalization causing harm? *Revista española de cardiología* (English ed). 2019;72(11):896-8.
22. Moersch LS. The Experience of Early Mobility after One Week of Hospital-Acquired Deconditioning [Ph.D.]. Ann Arbor: University of Missouri - Saint Louis; 2020.
23. U.S. Centers for Medicare and Medicaid Services. Inpatient rehabilitation care 2021 [Available from: <https://www.medicare.gov/coverage/inpatient-rehabilitation-care>.
24. Mong S, N. Taking care of our own: When family caregivers do medical work. New York, USA: Cornell University Press 2021.
25. Andreewsky E, Bourcier D. Abduction in language interpretation and law making. *Kybernetes*. 2000;29(7/8):836-45.
26. Jetli P. Abduction as the mother of all argumentation. *Argument Cultures: Proceedings of OSSA 09*; University of Windsor 2009. p. 1-10.
27. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*. 2016;5(1):210.

Appendices

Appendix I: Initial search strategies

Medline (Ovid)

#	Query	Results from 4 Jan 2022
1	(decondition* or decondition* syndrome).mp. [mp=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]	2443
2		64

	(decondition* adj2 (bed-rest or bedrest)).mp	
3	decondition*.mp.	2443
4	(decondition* adj4 (physiolog* or pathophysiol* or patholog*)).mp. [mp=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]	74
5	(decondition* adj3 (diagnos* or assess*)).mp.	26
6	(diagnos* or respond* or response* or recogni*).mp. [mp=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]	9213494
7	(present* or "clinical present*" or "clinical finding*").mp. [mp=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,	4763551

	synonyms]	
8	(symptom* adj4 (assess* or evaluat*)).mp.	64850
9	Interven*.mp. [mp=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]	1244408
10	(differen* adj2 diagnos*).mp. [mp=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]	549644
11	(framework or tool or classif*).mp. [mp=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]	2033448
12	exp Diagnosis/	9088124
13	((inpatient* or hospital) adj2 stay*) or "inpatient* stay*").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-	103196

	heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
14	(rehabilitat* or rehab cent* or community bed).mp. [mp=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]	351137
15	1 or 2 or 3 or 4 or 5	2443
16	6 or 7 or 8 or 9 or 10 or 11 or 12	17306748
17	13 or 14	449844
18	15 and 16 and 17	513

CINAHL (Ebsco Host)

Major concepts, subject headings

#	Query	Results as of 4 Jan 2022
1	decondition* or decondition* syndrome	1070
2	(decondition* n2 (bed-rest or bedrest))	17
3	(MH "Deconditioning")	411
4	(decondition* n4 (physiolog* or pathophysiol* or patholog*))	35
5	(decondition* n3 (diagnos* or assess*))	18
6	(diagnos* or respond* or response* or recogni*).	1747294

7	(present* or "clinical present*" or "clinical finding*").	877451
8	(symptom* n4 (assess* or evaluat*)).	26285
9	Interven*	533829
10	(differen* w2 diagnos*)	25527
11	(framework or tool or classif*).	727241
12	(MH "Diagnosis+")	2033875
13	((inpatient* or hospital) n2 stay*) or "inpatient* stay*")	64801
14	(rehabilitat* or rehab cent* or community bed).	196826
15	S13 OR S14	256561
16	S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12	3723860
17	S1 OR S2 OR S3 OR S4 OR S5	1074
18	S15 AND S16 AND S17	310

Appendix II: Data extraction instrument

Source characteristics	
Study citation (authors, year, title, DOI)	
Study type (qual, quant, mixed)	
Methods +/- methodology	
Country	
Cohort characteristics (age, gender, occupation if given)	
Setting (inpatient – acute or rehab)	
Study aim	

Study outcomes	
Data/Results	
Definition given for hospital acquired deconditioning	
Stated prevalence (and citation)	
Operational parameters (eg functional decline)	
Compared syndromes (eg post hospital, ICU, frailty) how is deconditioning differentiated?	
Assessment/diagnostic criteria (eg loss of ADLs)	
Risk factors for deconditioning	
Clinical course including presenting feature, trajectory, natural progression	
Professionals involved in assessment/management	
Intervention and expected outcome	
Outcome measures utilised	
HAD presented as (a) an adverse event (avoidable harm), (b) a consequence of hospitalisation or (c) a physiological event demonstrated by functional loss.	
If applicable	
Scale or framework for judging severity of deconditioning	
Rationale for importance of studying HAD	

For peer review only