

Bruyère Reports

Issue No.

Inter-professional patient-centred models of care for geriatric rehabili- tation. A Bruyère Rapid Review

REPORT AUTHORS

Elizabeth Ghogomu

Bahareh Ghaedi

Manosila Yoganathan

Vivian Welch

Anne Harley

Veronique French

Catherine McCumber

INSTITUT DE RECHERCHE

Bruyère 
RESEARCH INSTITUTE

Contents

Key messages	3
Executive summary	4
Background	5
Objectives	6
Methods	6
Evidence review	7
Synthesis of findings	15
Discussion	17
Recommendations	18
References	18
Appendices	20
Acknowledgements	25

Key messages

The Bruyere geriatric rehabilitation team sought guidance on best practices in providing multidisciplinary or inter-professional patient-centred models of care for geriatric rehabilitation and to identify knowledge gaps that could help guide research investment of the team.

The following recommendations are based on the findings of the rapid review.

Practice recommendations

- Optimal evidence-based geriatric rehabilitation care is provided by multidisciplinary or inter-professional care teams whose diverse members participate in regular team meetings to set shared goals and plan a common strategy of care for their patients.
- Multidisciplinary geriatric inpatient rehabilitation is more effective compared to usual care for short-term function, nursing home admission and mortality in patients with post-acute admission for medical illnesses, hip fracture and/or dementia following hip fracture. It also leads to a shorter length of stay in patients with mild or moderate dementia.

Research recommendations

- There is a need for research on family caregiver involvement in rehabilitation; standardized measures of effectiveness as well as evidence on the effectiveness of different models of care for different patient populations.

Executive summary

This rapid review was undertaken to assess the evidence on the effectiveness of multidisciplinary or inter-professional patient-centred models of care for geriatric rehabilitation on length of stay, patient and family satisfaction, function, discharge location and readmission to hospital. In addition, the Bruyere geriatric rehabilitation team asked for evidence about guidance on choosing restorative or compensatory approaches for different patient populations.

There is an increasing need for appropriate models of care for geriatric rehabilitation to address the needs of an aging population such as disability, cognitive impairment, comorbidities and frailty.

Geriatric Rehabilitation is defined as a multidisciplinary set of evaluative, diagnostic, and therapeutic interventions whose purpose is to restore functional ability or enhance residual functional capability in elderly people with disabling impairments. Optimal evidence-based geriatric rehabilitation care is provided by multidisciplinary or inter-professional care teams whose diverse members communicate with each other regularly and collaborate in the care of their patients. The process of care is most effective when all members of the multidisciplinary or inter-professional care team including the patient and family are involved in goal setting and care planning through team meetings. Geriatric rehabilitation is often provided after acute hospitalization of the elderly and various strategies have been used including post-acute inpatient rehabilitation, and geriatric day hospitals.

We searched for relevant systematic reviews and guidelines in Trip Database, the Cochrane Library and PubMed from inception to December 16, 2016. We identified 11 systematic reviews and seven clinical practice guidelines that met our inclusion criteria.

Practice recommendations

- Clinical guidelines recommend the involvement of a multidisciplinary or inter-professional team for

optimal geriatric rehabilitation and regular team meetings for individual patient goal setting.

- Multidisciplinary geriatric inpatient rehabilitation is more effective compared to usual care for short-term function, nursing home admission, patient satisfaction and mortality in patients with hip fracture, medical illnesses, and/or dementia following hip fracture. It also leads to shorter length of stay in patients with mild or moderate dementia.

Research recommendations

- There is a need for research on family caregiver involvement in geriatric rehabilitation.
- There is need for standardized measures of effectiveness. Studies of geriatric rehabilitation need to include measures of patient experience including patient and family satisfaction and quality of life.
- There is need for more conclusive evidence on the effectiveness of inpatient geriatric rehabilitation and different models of care for different patient populations.
- There is need for evidence about the effectiveness of different characteristics of the models of care such as frequency, intensity, and duration of interventions as well as the delivery of the interventions and care by different members of the multidisciplinary team.

Background

The issue

There is an increasing demand for appropriate models of care for geriatric rehabilitation to address the needs of an aging population such as disability, cognitive impairment, comorbidities and frailty [1]. Geriatric Rehabilitation is defined as a multidisciplinary set of evaluative, diagnostic, and therapeutic interventions whose purpose is to restore functional ability or enhance residual functional capability in elderly people with disabling impairments [1, 2]. Restorative approaches involve interventions that enable a patient to develop their lost function while compensatory approaches involve interventions that help the patient overcome impairment with the use of aids and tools. Optimal evidence-based geriatric rehabilitation care is provided by a multidisciplinary or inter-professional care team whose diverse members communicate with each other regularly and collaborate in the care of their patients [3]. The process of care is most effective when all members of the multidisciplinary or inter-professional care team including the patient and family are involved in goal setting and care planning through team meetings [4]. Geriatric rehabilitation is often provided after acute hospitalization of the elderly [2, 4, 5] and various strategies have been used including post-acute inpatient rehabilitation [6], and geriatric day hospitals [7]. Some dedicated multidisciplinary geriatric rehabilitation

programs are inpatient geriatric assessment units (GAUs) and the geriatric rehabilitation units (GRUs). In a GAU, there is more emphasis on medical treatment and evaluation, and the rehabilitation goals are usually short term. GAUs reduce hospital-associated deconditioning which is common in multimorbid patients [1, 5, 8]. Deconditioning is functional decline experienced as a result of hospitalization. In a GRU, there is a greater emphasis on rehabilitation and achieving maximal function.

The context

EBH provides the only inpatient geriatric rehabilitation service in the Ottawa region and is faced with challenges to provide the best possible care. Some challenges include complying with the recommended provincial length of stay target and the choice of models of care to facilitate return to pre-admission residence or community setting, restore functional loss and long-term wellbeing. The elderly population is often affected by co-morbidities that prolong hospital stay and lead to poorer rehabilitation outcomes [4, 9]. The Rehabilitation Performance Metrics Report Q1 2016-2017 showed that EBH has met the provincial length of stay target and surpassed the provincial target for discharge to the community (see Table 1 and Figure 1).

Table 1: Rehabilitation Performance Metrics Report Q1 summary 2016-2017

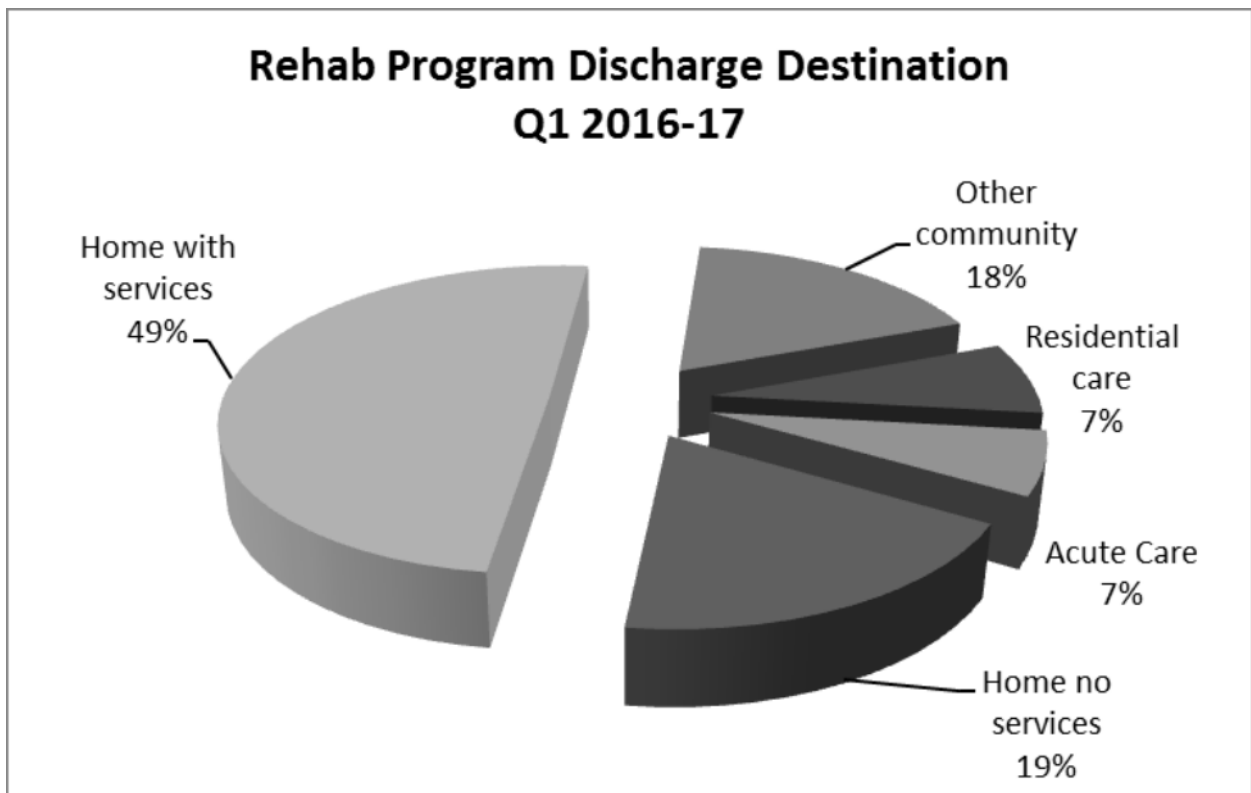
Indicator	Source	Quarterly Target	Bruyère Q1	Results
Rehab patient days	H-SAA	6,133	6,325	Met
Rehab weighted cases	H-SAA	344	291	Not met
Rehab separations	H-SAA	224	218	Not met

	Source	Days	Bruyère	Ontario peers	Results
Medically Complex RPG 3100	Internal Target ¹	27	26.7	25.5	Met
Non Traumatic Brain Injury RPG 1300		49	37.5	n/a ²	Met
Fracture Lower Extremity RPG 2200		30	28.0	28.3	Met
Neurological RPG 1410		30	26.7	27.5	Met

¹ Based on actual average LOS achieved by all Ontario Rehab facilities submitting to CIHI in 2014-2015
² Ontario peer average not available due to a CIHI reporting problem RPG=Rehab patient group;

% Discharged to the community (home with/without services or other community destination)	Bruyère	Ontario Peers
Stroke Rehab Group	87%	80%
All other Rehab Groups	86%	84%

Figure 1: Rehabilitation program discharge destination Q1 2016-2017



This rapid review was undertaken to provide evidence-based support that might help inform decision making about providing inter-professional patient-centred models of care for geriatric rehabilitation and inform

the design of research studies at EBH.

Objectives

To assess the evidence on the effectiveness of multi-disciplinary or inter-professional patient-centred models of care for geriatric rehabilitation on length of stay, patient and family satisfaction, function, discharge location and readmission to hospital.

A secondary objective was to assess guidance and models of best practice on choosing between compensatory and restorative approaches, and models of providing geriatric rehabilitation such as types of providers and frequency and involvement of caregivers.

Methods

We defined the question by consulting with the geriatric rehabilitation team at EBH. We agreed on an a priori question and methods prior to starting.

Eligibility and selection criteria

We included guidelines and systematic reviews if they met the following eligibility criteria:

Population: people receiving geriatric rehabilitation (e.g. people with post-hip fracture, frailty, delirium or cognitive impairment).

We excluded post-arthroplasty and post-stroke patients.

Intervention: inpatient inter-professional patient-centred models of care for geriatric rehabilitation - including goal-setting, level of participation, family involvement, restorative or compensatory goals.

We excluded day hospital interventions.

Comparison: other models of care, before/after, program evaluation

Outcomes: length of stay, patient and family satisfaction, function, discharge location (e.g. home or nursing home), and readmission to hospital.

Outcomes were considered in relation to function pri-

or to the acute event which precipitated admission to acute care since all patients in Bruyere geriatric rehabilitation arrive following admission for acute care.

Literature search

We searched for relevant systematic reviews and guidelines in Trip Database and the Cochrane Library from inception to December 16, 2016 and identified 752 articles (See Appendix 1 for the full search strategy). We did a related article search in PubMed as well as screened references of relevant articles.

We also searched the National Guideline Clearinghouse database for guidelines and websites for individual exemplar models.

Relevance assessment

The search results were screened and reviewed by two authors. We identified seven relevant guidelines and 11 systematic reviews that met our inclusion criteria.

Critical appraisal

We assessed the quality of the included reviews and guidelines using AMSTAR [10] and AGREE II [11] respectively (see Appendix 2). The quality of the systematic reviews ranged from moderate to high and the

clinical practice guidelines were of low to high quality.

We also graded the quality of the evidence for each outcome using the GRADE approach [12, 13] (see Appendix 3). These ranged from very low to moderate (See Tables 4-9).

Evidence review

We included seven clinical practice guidelines and 11 systematic reviews.

The included guidelines for inpatient geriatric rehabilitation were diverse: one Australian and New Zealand guideline [14] and two UK guidelines for the management of hip fractures [15, 16], four Canadian guidelines – the Ontario MOHLTC Assist and Restore guidelines

[17], the British Columbia Guidelines for Elderly Mental Health Care Planning for Best Practices for Health Authorities [18] and the Greater Toronto Area (GTA) rehab network's Inpatient Rehab/LTLD Referral Guidelines [19] and the GTA rehab network's Inpatient Rehab Hip Fracture Clinical Pathway [20]. See Table 2.

Table 2: Characteristics of included guidelines

Guideline	Country	Model recommended	Components of multidisciplinary team (MDT)
NICE guidelines for the management of hip fracture	UK	Acute orthogeriatric or orthopedic ward based hip fracture program (GORU, MARU, HFP, ESD).	Not described
SIGN guidelines for the management of hip fracture in older people	UK	GORU	Medical and nursing staff, physiotherapist and occupational therapist
ANZHFR guidelines	Australia and New Zealand	Orthogeriatric ward based hip fracture program (MARU, ESD)	specialists (emergency medicine physicians, anesthesiologists, surgeons, geriatricians, general physicians and rehabilitation physicians) as well as nurses and allied health professionals.

Guideline	Country	Model recommended	Components of multidisciplinary team (MDT)
Ontario MOHLTC Assist and Restore guidelines	Canada	Facility-based assess and restore interventions: sub-acute complex interventions, Geriatric rehabilitative interventions, Active recuperative interventions	Health service providers (geriatric and psychiatry specialists, a range of medical, nursing, pharmacy, dietary and psychiatric professionals and other team assistants) and regulated health professionals (physiotherapists, occupational therapists, speech language pathologists, rehabilitation nurses, therapy assistants); and unpaid caregivers
British Columbia Guidelines for Elderly Mental Health Care Planning for Best Practices for Health Authorities	Canada	Psychosocial rehabilitation models	Psychiatric and geriatric specialists, physicians, nurses, social workers, rehabilitation therapists
Greater Toronto Area (GTA) rehab network's Inpatient Rehab/LTLD Referral Guidelines	Canada	High tolerance short duration or low tolerance long duration (LTLD i.e. slow stream) inpatient rehabilitation	Not described
GTA rehab network's Inpatient Rehab Hip Fracture Clinical Pathway	Canada	Inpatient rehabilitation Hip fracture clinical pathway	Not described
GORU=geriatric orthopedic rehabilitation unit; MARU=mixed assessment rehabilitation unit; HFP=hip fracture program; ESD=early supported discharge			

All 11 systematic reviews assessed inpatient multidisciplinary rehabilitation in geriatric populations [6, 21-29]. In four reviews, patients were treated for hip fracture [21, 23, 25, 28]; medical illnesses in four reviews [24, 26, 27, 29]; medical illnesses or surgical conditions in two reviews [6, 22]. One review considered people post-hip-fracture surgery with dementia [30].

Different controls were assessed: usual care in nine reviews [6, 23-30] and home-based rehabilitation in one review [22]. In another review different controls were assessed including usual care or orthopedic units [21]. The included studies were done in different countries: Australia, Canada, Germany, Finland, Norway, Spain, Sweden, Taiwan, Thailand, UK, and USA. Three reviews did not indicate the countries where the

studies were carried out [22, 25, 27]. See Table 3.

All the included reviews considered the effectiveness of models of geriatric rehabilitation and none considered patient experience and geriatric rehabilitation.

Table 3: Characteristics of included systematic reviews

Included review	Number of studies, and participants	Countries	Participants	Range or mean age of participants in years	Intervention	Follow-up
Wang 2015	15 studies; 3458 participants	Australia, Canada, Finland, Norway, Spain, Sweden, Taiwan, UK,	elderly patients with hip fracture	46 to 101	comprehensive geriatric care vs usual post-operative surgical care	3 to 12 months
Smith 2015	5 studies; 316 participants	Australia, Finland, Sweden, Taiwan, USA	People with dementia following hip fracture surgery	65 or older	Enhanced interdisciplinary inpatient rehabilitation and care models vs conventional rehabilitation and care models	From discharge to 12 months
					Enhanced interdisciplinary inpatient and home-based rehabilitation and care models vs conventional rehabilitation and care models	from discharge to 24 months
					Geriatrician-led inpatient management vs orthopaedic-led inpatient management	During hospital stay
Timmer 2014	4 studies; 2041 participants	USA, UK	Deconditioned older adults (Medical illness)	78.6	Multidisciplinary geriatric rehabilitation vs usual care	from discharge to 12 months
Ellis 2011	22 studies; 10315 participants	Australia, Canada, Germany, Norway, Sweden, USA,	Medical illness (medical, psychological, functional or social problems)	65 or older	Comprehensive geriatric assessment vs usual care	From discharge to 12 months

Included review	Number of studies, and participants	Countries	Participants	Range or mean age of participants in years	Intervention	Follow-up
Stolee 2011	12 studies; 1596 participants	NR	Hip fracture or medical illness	63 or older	Inpatient rehabilitation in acute care or post-acute care vs home-based rehab	NR
Bachmann 2010	17 studies; 4780 participants	UK, USA, Finland, Norway, Australia, Canada, Thailand, Spain, Sweden	Acute medical or surgical illnesses	74.2 to 86	General geriatric rehabilitation or vs usual care	from discharge to 12 months
					Orthopedic geriatric rehabilitation vs usual care	from discharge to 12 months
Baztan 2009	11 studies	USA, Australia, Canada, Sweden, Peru	Adults aged 65 or more admitted to hospital for acute medical disorders	65 or older	Acute geriatric units compared with conventional care units	from discharge to 12 months
Handoll 2009	6 studies; 1295 participants	UK, Sweden, Canada	hip fracture	78 to 84	Multidisciplinary rehabilitation vs conventional care	4 to 12 months
Halbert 2007	11 studies; 2177 participants	NR	Hip fracture	65 to 95	multi-disciplinary rehabilitation vs usual orthopedic care	3 to 12 months
Cameron 2000	21 studies; 5335 participants	UK, Sweden, Australia	Hip fracture	55 to 98	GORU vs orthopedic unit	NR
					GHFP vs standard orthopedic unit care	NR
					ESD vs hospital rehab	NR
					Clinical pathways vs standard care programs	NR
Parker 2000	11 studies	NR	Older people after acute and during sub-acute illness	65 or older	Geriatric assessment units vs usual care	from discharge to 12 months

GORU= Geriatric orthopedic rehabilitation unit; GHFP=Geriatric hip fracture program; ESD=Early support discharge; NR=not reported

Synthesis of findings

Findings from systematic reviews

There was an overlap of some included studies across the reviews but because of the diversity in study designs, types of interventions assessed and outcomes reported a quantitative analysis was only done in five reviews [6, 21, 26, 29, 30]. The professions of the multidisciplinary teams were provided in all except one systematic review [27]. The elements of the interventions or models were not described in detail in the included systematic reviews. Different models of inpatient geriatric rehabilitation were assessed in different patient populations in the systematic reviews. See Tables 4a and 4b for details.

Multidisciplinary teams in included reviews

The multidisciplinary teams included the following professions in different combinations: geriatrician, nurse, physiotherapist, occupational therapist, psychologist, social worker, speech therapist, dietician, nutritionist, podiatrist, support workers, orthopedic surgeon, internist, general practitioner, and pharmacist.

Caregivers were not part of the multidisciplinary teams in any of the reviews. However, weekly team meetings were held and collaboration between the caregivers and the team was encouraged in one study in one of the reviews [30].

Populations in included reviews

The populations were older adults who were either post-acute hospital admission for medical illness (including heart failure, pneumonia, urinary tract infection, delirium, sepsis, COPD, etc.) or post-hip fracture. One review included patients with dementia following hip fracture. The age range of populations was usually >65. Seven reviews mainly included studies with a mean age of 75 or older [6, 21, 23-25, 27, 28].

Interventions in included reviews

The interventions included different health professionals and processes of care, as indicated in Table 3. Four

systematic reviews [6, 26, 29, 30] described components of the process of care which included one or more of the following:

multidimensional geriatric assessment (15/17 studies; 11/11 studies; 22/22 studies)

team meetings for goal setting- (weekly or biweekly or thrice weekly) (14/17; 8/11; 18/22)

discharge planning or follow-up after hospital discharge (6/17; 8/11; 4/5; 9/22)

Other components included:

assignment to therapy (10/17)

continuity of care (3/11)

daily medical review (4/11)

staff training and strong communication across multidisciplinary teams (4/5)

heightened surveillance for common postoperative complications following hip fracture in older people (5/5)

goal setting (11/22)

assessment tools (11/22)

protocols (3/22)

ward environment (3/22)

Additional components for people with dementia were strategies with an emphasis on orientation to the environment, cues, reminiscence and structured, familiarized routines.

None of the reviews assessed variations in effectiveness based on inclusion of different combinations of these components.

Outcomes assessed

Outcomes assessed included length of stay (9 out of 11 reviews), patient and/or family satisfaction (2 out of 11 reviews), functional status (10 out of 11 reviews), discharge location (10 out of 11 reviews) and readmis-

sion to hospital (6 out of 11 reviews).

Function was assessed using different scales including the Katz index, Barthel index, ADL score, personal self-maintenance scale, Functional independence measure (FIM), Newcastle Independence Assessment Form

(NIAF), Berg balance scale, Timed up and go, sit to stand, and various other scales.

Table 4a: Findings from the systematic reviews

Included review	Population	Processes of care		Team professions
		Intervention	Comparison	
Wang 2015	Elderly patients with hip fracture	Comprehensive geriatric care: high variability in type and duration of care	Usual postoperative surgical care	Geriatrician, general practitioner, internist, orthopedic surgeon, senior ward nurse, physiotherapist, occupational therapist and a social worker
Smith 2015	Patients with dementia following hip fracture surgery	Enhanced interdisciplinary inpatient rehabilitation and care models varied content and frequency of rehab services provided	conventional rehabilitation and care models: Rehabilitation was not interdisciplinary with no continuity of care between healthcare professionals	Geriatrician internist, a specially trained general practitioner, nurses with training in the care of older people, a social worker, a neuropsychologist, an occupational therapist, and physiotherapists.
		Enhanced interdisciplinary inpatient and home-based rehabilitation and care models varied content and frequency of rehab services provided	conventional rehabilitation and care models: specialist orthopaedic ward or Standard treatment	a physician, nurse and occupational therapist and physiotherapist
		Geriatrician-led inpatient management varied content	orthopaedic-led inpatient management: Pre- and postoperative management by the orthopaedic team with reactive internal medicine or geriatric consultation rather than on a proactive basis as per the geriatrician-led recovery group	Geriatrician and orthopaedic team

Included re-view	Population	Processes of care		Team professions
		Intervention	Comparison	
Timmer 2014	Deconditioned older adults (medical illness)	Multidisciplinary geriatric rehabilitation: varied content	Usual care	Geriatrician, Nurse, Social worker, Occupational therapist,
Ellis 2011	adults 65 years or older admitted to hospital care as an emergency with medical, psychological, functional or social problems	Comprehensive geriatric assessment in an inpatient setting: varied content	Usual care: general medical ward care	Geriatrician, Nurse, Social worker, Occupational therapist, physiotherapist, speech pathologists, dietician, pharmacist, audiologist, dentist, psychologist
Stolee 2011	Elderly patients with hip fracture or medical illness	Inpatient rehabilitation in acute care or post-acute care: varied content and frequency of rehab services provided	Home-based rehab care: varied content and frequency of rehab services provided	Occupational therapist or physiotherapist, speech pathologists, nurses/nurses' aides, social workers and podiatrists, physicians, support workers
Bachmann 2010	Geriatric patients with acute medical illness	General geriatric rehabilitation: comprehensive geriatric assessment, assignment to therapy, team meeting for goal setting, follow-up after discharge	Usual care	Geriatrician, Nurse, Physiotherapist, occupational therapist, psychologist, social worker, speech therapist, dietician
	Geriatric patients post-hip fracture	Orthopedic geriatric rehabilitation comprehensive geriatric assessment, assignment to therapy, team meeting for goal setting, follow-up after discharge	Usual care	Geriatrician, Nurse, Orthopedic surgeon, physiotherapist, occupational therapist, social worker, psychologist

Included review	Population	Processes of care		Team professions
		Intervention	Comparison	
Baztan 2009	Geriatric patients with acute medical disorders	Acute geriatric units: comprehensive geriatric assessment of patients, use of standardised instruments for measurements, weekly multidisciplinary meetings, and early planning of discharge.	Conventional care units not described or with similar medical staff but less time devoted by nursing and dedicated physiotherapist, occupational therapist, and social worker	Registered nurse, social worker, physiotherapist, occupational therapist, physician, nutritionist/dietician, pharmacist
Handoll 2009	Older people with hip fracture	Multidisciplinary rehabilitation: varied content	Conventional care: usual orthopedic surgical ward or alternative rehab program that usually starts later, and is less intensive and coordinated	Multiple health disciplines, for example physiotherapists, occupational therapists, social workers, nurses and doctors (geriatrician and orthopedic surgeon)
Halbert 2007	Older people with hip fracture	Multidisciplinary rehabilitation	Usual orthopedic care	a multidisciplinary team with supervision by a geriatrician or rehabilitation physician
Cameron 2000	Older people with hip fracture	Geriatric Orthopedic Rehabilitation Unit	Standard orthopedic rehab	Post-acute care multidisciplinary. Decisions generally taken for individual patients following multidisciplinary consensus
	Older people with hip fracture	Geriatric Hip Fracture Program	Standard orthopedic unit care	multidisciplinary professional expertise encompassing acute care and rehabilitation

Included re-view	Population	Processes of care		Team professions
		Intervention	Comparison	
Cameron 2000	Older people with hip fracture	Early Support Discharge	Hospital rehab	Usually multidisciplinary, requires expertise in discharge planning, community care and rehabilitation
	Older people with hip fracture	Clinical pathways	Standard care programs	An explicit, time-dependent framework involving the expertise of multiple disciplines drives decision taking
Parker 2000	Older people after acute and during subacute illness	Geriatric assessment units: not described	Usual care	Not described

ADL=activity of daily living; CI=confidence interval; MD=mean difference; NA=not assessed; NR=not reported; OR=odds ratio; RR=relative risk

Table 4b: Findings from the systematic reviews

Included re-view	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Wang 2015	Comprehensive geriatric care: high variability in type and duration of care in Elderly patients with hip fracture	Non-significant improvement (MD 1.60, 95% CI -2.18 to 6.01).	NA	Improved ADL performance (OR 1.76, 95% CI 1.11 to 2.78, P<0.01) (43.9% vs 30.2% at 3 months) and improved walking ability (OR 2.17, 95% CI 1.52 to 3.10, P<0.01) (71.3% vs 53.2% at 3 months)	To the same place of residence as before the fracture (OR 1.67, 95% CI 0.80 to 3.37, P=0.0003).	NA

Included review	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Smit h 2015	Enhanced interdisciplinary inpatient rehabilitation and care models varied content and frequency of rehab services provided in Patients with dementia following hip fracture surgery	Non-significant improvement (MD 12.30 days, 95%CI: -24.66 to 0.06, 1 trial, n = 64);	NA	Non-significant improvement in ADL (OR 4.62, 95% CI 0.18 to 119.63, 1 trial)	Non-significant improvement in discharge to the same place of residence prior to hospitalization (Home or Nursing home) (OR 0.41, 95% CI 0.06 to 2.73, 1 trial, n = 47).	NA
	Enhanced interdisciplinary inpatient and home-based rehabilitation and care models varied content and frequency of rehab services provided in Patients with dementia following hip fracture surgery	Shorter median length of stay for participants with both mild and moderately severe cognitive impairment, randomized to enhanced care group than for those in the conventional care group (mild dementia P = 0.002, 1 trial, n = 77; moderate dementia P = 0.04, 1 trial, n = 36). The hospital length of stay was not significantly different between the interventions for people with severe cognitive impairment (P = 0.902, 1 trial, n = 28)	NA	better ADL performance at 12 months (MD 25.40, 95% CI 10.89 to 39.91, 1 trial, n =36)	More effective at 3 months (OR 0.46, 95% CI 0.22 to 0.95, 2 trials, n = 184) but not at 12 months (OR 0.90, 95% CI 0.40to 2.03, 2 trials, n = 177).	NA

Included re-view	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Smith 2015	Enhanced interdisciplinary inpatient rehabilitation and care models varied content and frequency of rehab services provided in Patients with dementia following hip fracture surgery	No difference (median hospital length of stay 5 days for each group)	NA	NA	NA	NA
Timmer 2014	Multidisciplinary geriatric rehabilitation: varied content in Deconditioned older adults (medical illness)	NA	NA	Positive improvement in completing basic ADL in 2 studies	Home	NA
Ellis 2011	Comprehensive geriatric assessment in an inpatient setting: varied content in adults 65 years or older admitted to hospital care as an emergency with medical, psychological, functional or social problems	For the ward subgroup length of stay ranged from a mean reduction of -9.20 days to 9.00 days more, and for the team subgroup length of stay ranged from a mean difference of -0.79 days to an increase of 3.60 days for CGA.	NA	No significant difference between groups for ADL (SMD 0.06, 95% CI -0.06 to 0.17)	Home (OR 1.16, 95%CI 1.05 to 1.28. significant difference from the effect of CGA wards (OR 1.22, 95% CI1.10 to 1.35, whereas mobile CGA teams were not associated with a benefit, OR 0.75, 95% CI 0.55 to 1.01)	No significant difference existed between the groups OR 1.03, 95% CI 0.89 to 1.18,

Included review	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Stole 2011	Inpatient rehabilitation in acute care or post-acute care: varied content and frequency of rehab services provided in Elderly patients with hip fracture or medical illness	Home group had a shorter length of stay than the inpatient group	The home group had better scores in level of satisfaction and preference of rehabilitation setting	Home group had scores equal to or better than the hospital group for functional improvement	Home	NA
Bachman 2010	General geriatric rehabilitation: comprehensive geriatric assessment, assignment to therapy, team meeting for goal setting, follow-up after discharge in Geriatric patients with acute medical illness	Longer in patients allocated to general geriatric rehabilitation (24.5v15.1 days)	NA	Improved function (OR 1.34, 95% CI 1.12 to 1.60) at discharge	Nursing home (RR 0.53, 95% CI 0.33 to 0.86)	NA

Included review	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Bachmann 2010	Orthopedic geriatric rehabilitation comprehensive geriatric assessment, assignment to therapy, team meeting for goal setting, follow-up after discharge in Geriatric patients with acute medical illness	Shorter in those allocated to orthopedic rehabilitation (24.6v28.9 days).	NA	Improved Function (OR 2.33, 95% CI 1.62 to 3.34) at discharge	Nursing home (RR 0.72, 95% CI 0.56 to 0.91)	NA
Baztan 2009	Acute geriatric units: comprehensive geriatric assessment of patients, use of standardised instruments for measurements, weekly multidisciplinary meetings, and early planning of discharge in Geriatric patients with acute medical disorders	Reduced length of stay, of 6-39%	NA	A lower risk of functional decline (OR 0.82, 95% CI 0.68 to 0.98)	Home (OR 1.30, 95% CI 1.11 to 1.52)	no statistically significant difference between intervention and control groups (OR 1.11, 95% CI 0.92 to 1.35)

Included review	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Handoll 2009	Multidisciplinary rehabilitation: varied content in Older people with hip fracture	Conflicting results shorter in 3 and longer in 3 studies	NA	No improvement in 2 studies, no effect in 1 study	NA	no statistically significant difference between intervention and control groups
Halbert 2007	Multidisciplinary rehabilitation in Older people with hip fracture	shortened total hospital length of stay	NA	Function improved in 5 studies	Home	no difference between the groups

Included re-view	Intervention/ Population	Outcomes assessed				
		Length of stay	Patient and family satisfaction	Function	Discharge location	Readmission to hospital
Cameron 2000	Geriatric Orthopedic Rehabilitation Unit in Older people with hip fracture	Same effect	greater patient satisfaction	No effect in 2 studies; improvement in 1 study	Home	Reduction in number of readmissions in 1 study (OR 0.59, 95% CI 0.36–0.95)
	Geriatric Hip Fracture Program in Older people with hip fracture	reduction in length of hospital stay (average of 9 days) in 4/5 studies	NA	Improved mobility	Home	no significant difference in 1 study (OR 1.49, 95% CI 0.66–3.36)
	Early Support Discharge in Older people with hip fracture	reduction in length of stay	NA	No effect in 2 studies	Home	non-significant increase in readmissions in 3 studies (OR 1.74, 95% CI 0.79–3.82)
	Clinical pathways in Older people with hip fracture	shorter length of hospital stay (mean reduction of 5.3 days)	NA	NA	Home	no significant difference in readmissions in 1 study (OR 0.77, 95% CI 0.20–2.98)
Parker 2000	Geriatric assessment units: not described in Older people after acute and during subacute illness	NR	NR	NR	Higher levels of return to home in intervention groups	lower rates of readmissions in intervention groups

ADL=activity of daily living; CI=confidence interval; MD=mean difference; NA=not assessed; NR=not reported; OR=odds ratio; RR=relative risk

We summarized the findings for each patient group and model of geriatric rehabilitation using summary of findings tables and graded the quality of the evidence by outcomes with the GRADE approach [12, 13].

For patients with post-acute admission for medical illness:

Five reviews [6, 24, 26, 27, 29], with 56 included studies that assessed some type of geriatric multidisciplinary rehabilitation compared to conventional or usual care. Usual care was not described in most studies. It consisted of similar medical staff but less time devoted by nursing and dedicated physiotherapist, occupational therapist, and social worker in one study in one of the five reviews [26].

Overall, multidisciplinary rehabilitation was more effective than usual care in improving function, reducing the length of hospital stay, increasing the rate of returning home after discharge. There were similar or lower rates of readmission to hospital. Patient and/or family satisfaction was not assessed.

In general, variation in outcomes, interventions and populations prevented pooling of data. One review [6] which did pool data found large effects at discharge for functional improvement (odds ratio 1.34, 95% confidence interval 1.12 to 1.60), more nursing home admission (relative risk 0.53, 95%CI 0.33 to 0.86), and lower mortality (relative risk 0.76, 95%CI 0.54 to 1.06). See Table 5.

Table 5: Summary of findings from one review Bachmann 2010 [6]

Multidisciplinary inpatient geriatric rehabilitation for patients with post-acute admission for medical illness at discharge				
Patient or population: geriatric patients with post-acute admission for medical illness Setting: geriatric rehabilitation unit Intervention: multidisciplinary inpatient geriatric rehabilitation Comparison: usual care				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	N ^o of participants (studies)	Quality of the evidence (GRADE)	What it means
Function	Three studies included in the meta-analysis with an odds ratio of 1.34 [95% CI 1.12 to 1.60].	2927 (8 studies)	⊕⊕⊕○ moderate ¹	Multidisciplinary inpatient geriatric rehabilitation may improve function in patients with post-acute admission for medical illness
Length of hospital stay	Not assessed	2927 (8 studies)	-	We do not know whether Multidisciplinary inpatient geriatric rehabilitation has an effect on length of hospital stay in patients with post-acute admission for medical illness

Multidisciplinary inpatient geriatric rehabilitation for patients with post-acute admission for medical illness at discharge				
Patient or population: geriatric patients with post-acute admission for medical illness Setting: geriatric rehabilitation unit Intervention: multidisciplinary inpatient geriatric rehabilitation Comparison: usual care				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	N ^o of participants (studies)	Quality of the evidence (GRADE)	What it means
Discharge to nursing home	Four studies included in the meta-analysis with a risk ratio of 0.53 [95% CI 0.33 to 0.86].	2927 (8 studies)	⊕⊕⊕○ moderate ¹	Multidisciplinary inpatient geriatric rehabilitation may increase admission to nursing homes after discharge in patients with post-acute admission for medical illness
Patient and/or family satisfaction	Not assessed	2927 (8 studies)	-	We do not know whether Multidisciplinary inpatient geriatric rehabilitation has an effect on length patient and/or family satisfaction in patients with post-acute admission for medical illness
Readmission to hospital	Not assessed	2927 (8 studies)	-	We do not know whether Multidisciplinary inpatient geriatric rehabilitation has an effect on readmission to hospital in patients with post-acute admission for medical illness
Mortality	Four studies included in the meta-analysis with a risk ratio of 0.76 [95% CI 0.54 to 1.06	2927 (8 studies)	⊕⊕⊕○ moderate ¹	Multidisciplinary inpatient geriatric rehabilitation may reduce mortality in patients with post-acute admission for medical illness

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded for high risk of bias

At 3-12 months post-discharge, effects were smaller with functional improvement (odds ratio 1.02, 95%CI: (0.86 to 1.21), lower nursing home admission (relative risk 0.90, 95%CI: 0.71 to 1.13), and less mortality (relative risk 0.88, 95%CI: 0.75 to 1.04).

Subgroup analyses demonstrated that the programs which included an orthopedic component for patients with hip fracture were more effective for function (but not nursing home admission or mortality), had similar effects regardless of age (<80 or >80 years), whether there was outpatient follow-up (yes or no), whether there was an initial multidimensional geriatric assessment (yes or no), whether patients were assigned to goal setting (yes or no). These analyses were limited by lack of data.

Another review [29] with subgroup analyses that considered two models of CGA (CGA delivered in a discrete specialist (geriatric) ward and CGA delivered by a mobile or peripatetic team who conduct a multidisciplinary assessment of a patient in the general medical setting they are admitted to), showed a significant difference in patients living at home at the end of follow-up from the effect of comprehensive geriatric assessment (CGA) wards (OR 1.22, 95% CI 1.10 to 1.35) whereas mobile CGA teams were not associated with a benefit (OR 0.75, 95% CI 0.55 to 1.01). No significant differences existed between the groups for length of stay, function, or readmission.

For patients with hip fracture:

Five reviews [6, 21, 23, 25, 28], with 48 included studies that assessed some type of geriatric orthopedic multidisciplinary rehabilitation compared to conventional or usual care. Usual care consisted of standard or usual orthopedic or surgical ward care or alternative rehab program that usually starts later, and is less intensive and coordinated.

Geriatric orthopedic rehabilitation unit (GORU) was more effective than usual care in improving patient satisfaction, reducing the length of hospital stay, increasing the rate of returning home after discharge, and reducing readmission to hospital [6, 21]. Patient satisfaction was assessed in one review by residence status at discharge; discharge to home improved satisfaction [21]. There were conflicting findings for function across the reviews that assessed GORU in patients with hip fracture. There was no difference in mortality. See table 6 for the findings from one review that pooled data [21].

Table 6: Summary of findings table from one review Cameron 2000 [21]

Geriatric orthopedic rehabilitation for patients with post-acute admission for hip fracture at discharge				
Patient or population: geriatric patients with post-acute admission for hip fracture Setting: geriatric rehabilitation unit Intervention: geriatric orthopedic rehabilitation Comparison: usual care				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	№ of participants (studies)	Quality of the evidence (GRADE)	What it means
Function (ADL)	One study had an odds ratio of 3.78 [95% CI 1.37 to 10.44]	80 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether geriatric orthopedic rehabilitation improves function in patients with post-acute admission for hip fracture
Length of hospital stay	Three studies included in the meta-analysis with an MD of 1.63 days [95% CI -27.99 to 31.25].	708 (3 studies)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may improve Length of hospital stay in patients with post-acute admission for hip fracture
Returning home after discharge	Four studies included in the meta-analysis with an odds ratio of 1.36 [95% CI 0.86 to 2.13].	723 (4 studies)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may increase admission to nursing homes after discharge in patients with post-acute admission for hip fracture
Patient and/or family satisfaction	Four studies included in the meta-analysis with an odds ratio of 1.36 [95% CI 0.86 to 2.13].	723 (4 studies)	⊕○○○ very low ^{1,2}	Geriatric orthopedic rehabilitation probably increases patient and/or family satisfaction in patients with post-acute admission for hip fracture
Readmission to hospital	One study had an odds ratio of 0.59 [95% CI 0.36 to 0.95]	2029381 (1 study)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may increase readmission to hospital in patients with post-acute admission for hip fracture

Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Mortality	Four studies included in the meta-analysis with a risk ratio of 0.76 [95% CI 0.54 to 1.06	2927 (8 studies)	⊕⊕⊕○ moderate ¹	Multidisciplinary inpatient geriatric rehabilitation may reduce mortality in patients with post-acute admission for medical illness

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded for high risk of bias

² Downgraded for imprecision

³ Downgraded for indirectness. Patient satisfaction was assessed by residence status at discharge. Discharge to home improved satisfaction

The geriatric hip fracture program (GHFP) was more effective than usual care in improving function, reducing length of stay, increasing the rate of returning home after discharge. There was no significant difference in readmission to hospital and mortality. Patient satisfaction was not assessed [21]. See Table 7.

Table 7: Summary of findings table from one review Cameron 2000 [21]

Geriatric hip fracture program for patients with post-acute admission for hip fracture at discharge				
Patient or population: geriatric patients with post-acute admission for hip fracture Setting: geriatric rehabilitation unit Intervention: geriatric hip fracture program Comparison: usual care				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	N^o of participants (studies)	Quality of the evidence (GRADE)	What it means
Function	Two studies (not pooled) had beneficial effect on mobility and activities of daily living	323 (2 studies)	⊕⊕○○ low ^{1,2}	Geriatric hip fracture program probably improves function in patients with post-acute admission for hip fracture
Length of hospital stay	Two studies had a mean reduction in length of stay of 9 days	323 (2 studies)	⊕⊕○○ low ^{1,2}	Geriatric hip fracture program probably improves length of hospital stay in patients with post-acute admission for hip fracture
Returning home after discharge	Two studies included in the meta-analysis with an odds ratio of 2.06 [95% CI 1.08 to 3.93].	270 (2 studies)	⊕⊕⊕○ moderate ¹	Geriatric hip fracture program may increase admission to nursing homes after discharge in patients with post-acute admission for hip fracture
Patient and/or family satisfaction	Not assessed	-	-	We do not know whether geriatric hip fracture program has an effect on patient and/or family satisfaction in patients with post-acute admission for hip fracture

Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	No of participants (studies)	Quality of the evidence (GRADE)	What it means
Readmission to hospital	One study had an odds ratio of 1.49 [95% CI 0.66 to 3.36]	252 (1 study)	⊕⊕○○ low ^{1, 2}	Geriatric hip fracture program probably has an effect on readmission to hospital in patients with post-acute admission for hip fracture
Mortality	Two studies included in the meta-analysis with an odds ratio of 0.85 [95% CI 0.48 to 1.51].	323 (2 studies)	⊕⊕⊕○ moderate ¹	Geriatric hip fracture program may improve mortality in patients with post-acute admission for hip fracture

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded for high risk of bias

² Downgraded for imprecision (not pooled)

Multidisciplinary rehabilitation had similar or better effects than usual care in improving function, reducing the length of hospital stay, increasing the rate of returning home after discharge, and reducing readmission to hospital. There was no difference in mortality. Patient satisfaction was not assessed [23, 25, 28]. Findings from one review [28] are summarized in Table 8.

Table 8: Summary of findings table from one review Wang 2015 [28]

Multidisciplinary rehabilitation for patients with post-acute admission for hip fracture at discharge				
Patient or population: geriatric patients with post-acute admission for hip fracture Setting: geriatric rehabilitation unit Intervention: geriatric orthopedic rehabilitation Comparison: usual care				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Function	Three studies included in the meta-analysis with an odds ratio of 2.17 [95% CI 1.52 to 3.10].	585 (3 studies)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may improve function in patients with post-acute admission for hip fracture
Length of hospital stay	Seven studies included in the meta-analysis with an MD of 1.60 [95% CI - 2.81 to 6.01]	1412 (7 studies)	⊕⊕○○ low ^{1,2}	Geriatric orthopedic rehabilitation may improve Length of hospital stay in patients with post-acute admission for hip fracture
Returning home after discharge	Six studies included in the meta-analysis with an odds ratio of 1.67 [95% CI 1.26 to 2.21].	1853 (9 studies)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may increase admission to nursing homes after discharge in patients with post-acute admission for hip fracture
Patient and/or family satisfaction	Not assessed	-	-	We do not know whether geriatric orthopedic rehabilitation has an effect on patient and/or family satisfaction in patients with post-acute admission for hip fracture

Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Readmission to hospital	Not assessed	-	-	We do not know whether geriatric orthopedic rehabilitation has an effect on readmission to hospital in patients with post-acute admission for hip fracture
Mortality	Nine studies included in the meta-analysis with an odds ratio of 0.93 [95% CI 0.77 to 1.12].	4198 (9 studies)	⊕⊕⊕○ moderate ¹	Geriatric orthopedic rehabilitation may improve mortality in patients with post-acute admission for hip fracture

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded for high risk of bias

² Downgraded for inconsistency

Other models of care for post hip-fracture populations

Clinical pathways for hip fracture were more effective than usual care in reducing length of stay and increasing the rate of returning home after discharge. There was no difference in readmission to hospital. Function and patient satisfaction were not assessed [21].

For hip fracture, early support discharge (ESD) led to shorter hospital stay and increased frequency of residence in nursing homes than usual care. Function and patient satisfaction were not assessed. This model is suitable only for a subset of less disabled patients [21].

For mixed population

One review [22] with 12 studies compared inpatient multidisciplinary rehabilitation with home-based rehabilitation in a mixed population with hip fracture, hip or knee replacement or medical illness.

Multidisciplinary rehabilitation was less effective than home-based rehabilitation care in improving patient satisfaction. There was no difference in functional status improvement and readmission to hospital was not assessed. Although length of stay was shorter in the home-based rehabilitation group, the total duration of rehabilitation (in hospital and at home) was longer in the home-based rehabilitation group than in the inpatient rehabilitation group in two studies.

For patients with dementia following hip fracture

Specific rehabilitation strategies including enhanced rehabilitation and care pathways, with an emphasis on orientation to the environment, cues, reminiscence and structured, familiarized routines were considered in one review with 5 studies [30]. The control group received conventional rehabilitation which was not interdisciplinary and with no continuity of care between healthcare professionals.

Enhanced interdisciplinary inpatient rehabilitation compared to conventional rehabilitation had large effects on length of stay, function, discharge location and mortality, but none reached statistical significance due to small sample size, very low certainty. Patient satisfaction and readmission were not assessed. See Table 9.

Table 9: Summary of findings table from one review Smith Toby 2015 [30]

Enhanced interdisciplinary inpatient geriatric rehabilitation for patients with dementia following hip fracture				
Patient or population: geriatric patients with dementia following hip fracture				
Setting: geriatric rehabilitation unit				
Intervention: enhanced interdisciplinary inpatient rehabilitation				
Comparison: conventional rehabilitation				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Function (ADL)	One study had an odds ratio of 4.62 [95% CI 0.18 to 119.63].	47 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient rehabilitation has an effect on function in patients with dementia following hip fracture
Length of hospital stay	One study had an MD of -12.30 days [95% CI -24.66 to 0.06]	64 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient rehabilitation has an effect on length of stay in patients with dementia following hip fracture
Discharge to nursing home	One study had an odds ratio of 0.41 [95% CI 0.06 to 2.73].	47 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient rehabilitation has an effect on discharge location in patients with dementia following hip fracture
Patient and/or family satisfaction	Not assessed	-	-	We do not know whether enhanced interdisciplinary inpatient rehabilitation has an effect on patient and/or family satisfaction in patients with dementia following hip fracture

Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Readmission to hospital	Not assessed	-	-	We do not know whether enhanced interdisciplinary inpatient rehabilitation has an effect on readmission to hospital in patients with dementia following hip fracture
Mortality	One study had an odds ratio of 2.25 [95% CI 0.67 to 7.61]	47 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient rehabilitation has an effect on mortality in patients with dementia following hip fracture

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded for high risk of bias

² Downgraded for imprecision

Enhanced interdisciplinary inpatient and home-based rehabilitation compared to conventional rehabilitation led to better ADL performance at 3 and 12 months (very low certainty) and discharge to institutional care at 3 months (low uncertainty) but no difference in mortality. Patient satisfaction and readmission were not assessed. See Table 10.

Subgroup analyses showed shorter length of stay for patients with mild and moderately severe cognitive impairment but length of stay was similar for those with severe cognitive impairment in both groups at three months (very low certainty). See Table 10.

Table 10: Summary of findings table from one review Smith Toby 2015 [30]

Enhanced interdisciplinary geriatric inpatient and home-based rehabilitation for patients with dementia following hip fracture at 3 months post-hip fracture				
Patient or population: geriatric patients with dementia following hip fracture				
Setting: geriatric rehabilitation unit				
Intervention: enhanced interdisciplinary inpatient rehabilitation				
Comparison: conventional rehabilitation				
Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	Nº of participants (studies)	Quality of the evidence (GRADE)	What it means
Function (ADL)	One study had an MD of 18.81 [95% CI 9.40 to 28.22]	43 (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient and home-based rehabilitation has an effect on function in patients with dementia following hip fracture
Length of hospital stay	One study had a median length of stay of 29 vs 46 days in patients with mild dementia (P=0.002); 47 vs 147 days (P=0.04) in patients with moderate dementia; and 85 vs 67 days (P=0.902) in patients with severe dementia	77 with mild, 36 with moderate and 28 with severe dementia (1 study)	⊕○○○ very low ^{1,2}	We are uncertain whether enhanced interdisciplinary inpatient and home-based rehabilitation has an effect on length of stay in patients with dementia following hip fracture
Discharge to nursing home	Two studies included in the meta-analysis with an odds ratio of 0.46 [95% CI 0.22 to 0.95]	184 (2 studies)	⊕⊕○○ low ^{1,2}	Enhanced interdisciplinary inpatient and home-based rehabilitation may improve discharge location in patients with dementia following hip fracture

Outcomes	Effects of Multidisciplinary inpatient geriatric rehabilitation	№ of participants (studies)	Quality of the evidence (GRADE)	What it means
Patient and/or family satisfaction	Not assessed	-	-	We do not know whether enhanced interdisciplinary inpatient and home-based rehabilitation has an effect on patient and/or family satisfaction in patients with dementia following hip fracture
Readmission to hospital	Not assessed	-	-	We do not know whether enhanced interdisciplinary inpatient and home-based rehabilitation has an effect on readmission to hospital in patients with dementia following hip fracture
Mortality	Two studies included in the meta-analysis with an odds ratio of 1.20 [95% CI 0.36 to 3.93]	184 (2 studies)	⊕⊕○○ low ^{1,2}	Enhanced interdisciplinary inpatient and home-based rehabilitation may improve mortality in patients dementia following hip fracture
<p>GRADE Working Group grades of evidence</p> <p>High quality: We are very confident that the true effect lies close to that of the estimate of the effect</p> <p>Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different</p> <p>Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect</p> <p>Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect</p>				
<p>¹ Downgraded for high risk of bias</p> <p>² Downgraded for imprecision</p>				

There was no difference in length of stay for geriatrician-led inpatient rehabilitation and orthopedic-led inpatient rehabilitation. Patient satisfaction, function, discharge location and readmission were not assessed.

Findings from clinical practice guidelines

All seven guidelines (See Table 2) recommended:

- That a multidisciplinary team be used to facilitate the rehabilitation process for these older adults with post-acute medical illness or hip fracture.
- Comprehensive geriatric assessment (CGA) by an interdisciplinary rehabilitation team as the first step to determine:
 - If the patient is a candidate for inpatient rehabilitation, is medically stable and ready for rehabilitation.
 - The key reason and goals for rehabilitation (to restore function or enhance functional capacity)
 - The treatment plan or type of rehabilitation program – Geriatric assessment unit (GAU/MARU), Geriatric rehabilitation unit (GRU)

A comprehensive geriatric assessment (CGA) includes physical, cognitive (including delirium and dementia), affective, social, financial, environmental, and spiritual components that influence an older adult's health. It facilitates rehabilitation and discharge and improves health outcomes.

The NICE guidelines and the Australian NEW Zealand guidelines also recommended continued coordinated multidisciplinary team review [14, 16].

The integrated inter-professional team may vary according to the type of programs. They could include: geriatric and physiatry specialists, physiotherapists, occupational therapists, speech language pathologists, rehabilitation nurses, and therapy assistants, a range of medical, nursing, pharmacy, dietary and psychiatric professionals, and other team assistants. Unpaid care-givers should be involved in the

care process through discussions about goals, plans, and key treatment decisions.

A variety of multidisciplinary service models exist determined by local circumstances and expertise. The geriatric assessment unit (GAU) focuses on the assessment and treatment of both medical and functional problems while the geriatric rehabilitation unit (GRU) focuses mainly on restoring function. The geriatric mixed assessment and rehabilitation unit (MARU) attends to patients with stroke and other disabling conditions.

For hip fracture, there are three in-patient geriatric rehabilitation programs described in the UK: the geriatric mixed assessment and rehabilitation units (MARUs), the geriatric orthopedic rehabilitation unit (GORU), and the ortho-geriatric hip fracture program (GHFP). In addition, early supported discharge (ESD) or intermediate care model can be considered as part of the hip fracture program if the multidisciplinary team remains involved and the patient is medically stable and mentally alert and has not achieved full rehabilitation potential [15, 16]. The Australian and New Zealand guidelines were adapted from the NICE guidelines and have similar recommendations [14]. Care should be provided such that the patient's risk of delirium is minimized and independence is maximized and additional guidance for people with dementia should be sought [14, 16]. The GTA Rehab Network in Canada recommends the inpatient rehabilitation hip fracture clinical pathway [20]. The latter also recommends the assessment of cognitive status.

The elements of the models were not described. However, the Ontario MOHLTC Assist and Restore guidelines [17] described three types of facility-based interventions for frail seniors and other persons who have experienced a recent loss of functional ability after a medical event or decline in health or are at high risk for imminent institutionalization (in a hospital or LTC home) as a result of functional loss and have the potential to regain that functional loss

(‘restorative potential’).

- 1) Type 1: Sub-acute complex interventions for people with low level of physical or cognitive ability who may be in transition from acute medical treatment or surgery.
- 2) Type 2: Geriatric rehabilitative interventions for people with potential cognitive capacity and endurance to participate in daily, intensive, goal-directed rehabilitative therapy with medical oversight. They require less active medical management than patients receiving Type 1 interventions.
- 3) Type 3: Active recuperative interventions for people who may lack physical or cognitive capacity to participate in a rigorous rehabilitative care pro-

gram. They require less active medical management than patients admitted to Types 1 and 2 interventions.

The GTA inpatient rehabilitation referral guidelines [19] also mentioned two types of interventions: high tolerance short duration or low tolerance long duration interventions. The high tolerance short duration interventions are provided in MARU/GAU for 2-8 weeks and comprise an average of 120 minutes of therapy daily for 5-7 days as tolerated by the patient. Low tolerance long duration interventions in the GRU are provided for 3-6 months and comprise an average of 30 minutes of therapy, 2 sessions per day, 3 times per week as tolerated by the patient.

Case studies

We identified six exemplars of inpatient geriatric rehabilitation care models, based on suggestions from the clinical leads: Baycrest in-patient rehabilitation program, Bridgepoint Active Healthcare program, St Joseph’s Healthcare London, Parkwood Institute, Lakeland health, Credit Valley Hospital, Mississauga and The New South Wales (NSW) Rehabilitation Model of Care, Australia (See Appendix 4 for details). We did not find evidence of effectiveness or patient outcomes for these programs.

Discussion

Applicability of evidence/ implementation

Clinical practice guidelines recommend the involvement of a multidisciplinary or inter-professional team for optimal geriatric rehabilitation. Family care-givers were not involved in any of the rehabilitation teams in the systematic reviews though guidelines recommend their involvement. All but one included systematic review provided the professions of the multidisciplinary teams without describing the interventions they provided.

Multidisciplinary geriatric inpatient rehabilitation is more effective compared to usual care for short-term function, nursing home admission and mortality in patients with hip fracture and/or medical illnesses. The effects are smaller when assessed 3-12 months post-discharge.

Enhanced interdisciplinary inpatient and home-based rehabilitation compared to usual care improved ADL performance and discharge to institutional care in patients with cognitive impairment at 3 months post-hip fracture. Only the effect on ADL performance was maintained at 12 months. There was also a shorter length of stay in patients with mild or moderate dementia.

There is limited information about the components of the individual models of care assessed. Although specific strategies were considered for dementia patients with cognitive impairment, these were not described in detail.

There is a lack of data on patient and family satisfaction with care. Patient satisfaction was greater for post-hip fracture patients in geriatric orthopedic rehabilitation units and home-based rehabilitation.

Strengths and limitations

We found high-quality systematic reviews and guidelines and used a structured process to synthesize results, including assessment of quality.

There were differences in the patient populations and settings, and the outcome measurements across the studies included in the reviews.

A description of the components of the interventions was lacking but the models of care assessed in the systematic reviews were in agreement with those recommended in the guidelines. There was no mention or description of types of rehabilitation processes such as compensatory or restorative rehabilitation in any of the included reviews or guidelines.

No review had data on patient experience and geriatric rehabilitation.

Only one guideline described the frequency but not the components of geriatric rehabilitation care models.

Implications

Practice implications/ recommendations

- Optimal evidence-based geriatric rehabilitation care is provided by multidisciplinary or inter-professional care teams whose diverse members communicate with each other regularly and participate in the care of their patients.
- Multidisciplinary geriatric inpatient rehabilitation is more effective compared to usual care for short-term function, nursing home admission and mortality in patients with post-acute admission for medical illnesses, hip fracture and/or dementia following hip fracture.
- For dementia patients with cognitive impairment, strategies with an emphasis on orientation to the environment, cues, reminiscence and structured, familiarized routines should be included in the model of geriatric rehabilitation.

Research recommendations

- There is a need for research on family caregiver involvement in rehabilitation.
- Studies of geriatric rehabilitation need to include measures of patient experience including patient and family satisfaction.
- There is need for new studies that describe and assess the effectiveness of different components of geriatric rehabilitation (such as multidisciplinary team, comprehensive geriatric assessment, restorative or compensatory therapeutic strategies or interventions, etc.) to guide best practices in providing care (such as frequency, choice of restorative or compensatory approaches).

Possible next steps

- Determine key outcomes to be measured in the unit to assess and monitor standards of practice or quality of care.

There are no core set of outcomes for inpatient geriatric rehabilitation but guidelines recommend the following:

- ◇ Functional status
- ◇ Length of stay
- ◇ Quality of life
- ◇ Mortality
- ◇ Place of residence/discharge
- ◇ Hospital readmission

The choice of assessment tools should be guided by the patient population, the setting and feasibility of implementation. However, the following have been recommended by the COMET (Core Outcome Measures in Effectiveness Trials) Initiative for assessing functional status and quality of life in the rehabilitation of critical illness survivors after hospital discharge [31].

1. Physical function and mobility scales were ranked important (score: 3) in consensus:
 - a. the De Morton Mobility Index (DEMMI);
 - b. the Timed Up and Go test;
 - c. the Functional Independence Measure;
 - d. the Short Physical Performance Battery; and
 - e. the Short Form 36—physical function domain.
2. Tools to assess (instrumental) ADL function;
 - a. the Barthel Index,
 - b. the KATZ-ADL, and

-
- c. Lawton's iADL.
3. Quality of life – ranked as very important (score 2) in consensus:
- a. The Short Form 36, and
 - b. The Euro Qol Health questionnaire (EQ-5D); followed by
 - c. The Sickness Impact Profile (ranked as important, score 3)

References

1. Wells, J.L., et al., State of the art in geriatric rehabilitation. Part I: review of frailty and comprehensive geriatric assessment. *Archives of physical medicine and rehabilitation*, 2003. 84(6): p. 890-897.
2. Holstege, M., et al., Changes in geriatric rehabilitation: a national programme to improve quality of care. The Synergy and Innovation in Geriatric Rehabilitation study. *International journal of integrated care*, 2015. 15(4).
3. Momsen, A.-M., et al., Multidisciplinary team care in rehabilitation: an overview of reviews. *Journal of Rehabilitation Medicine*, 2012. 44(11): p. 901-912.
4. Cameron, I.D. and S.E. Kurrle, Rehabilitation and older people. *Medical Journal of Australia*, 2002. 177(7): p. 387-91.
5. St. John, P.D., Geriatric Assessment Units (GAUs): Optimizing evidence-based inpatient care in the modern hospital. *Canadian Geriatrics Society Journal of CME*, 2016. 6(1).
6. Bachmann, S., et al. Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials (Structured abstract). *Bmj*, 2010.
7. Brown, L., et al. Medical day hospital care for older people versus alternative forms of care. *Cochrane Database of Systematic Reviews*, 2015. DOI: 10.1002/14651858.CD001730.pub3.
8. Kortebein, P., Rehabilitation for hospital-associated deconditioning. *American Journal of Physical Medicine & Rehabilitation*, 2009. 88(1): p. 66-77.
9. Wells, J.L., et al., State of the art in geriatric rehabilitation. Part II: clinical challenges. *Archives of physical medicine and rehabilitation*, 2003. 84(6): p. 898-903.

-
10. Shea, B.J., et al., Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC medical research methodology*, 2007. 7(1): p. 1.
 11. Brouwers, M.C., et al., AGREE II: advancing guideline development, reporting and evaluation in health care. *Canadian Medical Association Journal*, 2010. 182(18): p. E839-E842.
 12. Higgins, J.P.T., S. Green, and (editors), *Cochrane handbook for systematic reviews of interventions*. Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org. Accessed November 17, 20162011.
 13. Balshem, H., et al., GRADE guidelines: 3. Rating the quality of evidence. *Journal of clinical epidemiology*, 2011. 64(4): p. 401-406.
 14. Group, A.S., *Australian and New Zealand Guideline for Hip Fracture Care: Improving Outcomes in Hip Fracture Management of Adults*. Sydney: Australian and New Zealand Hip Fracture Registry Steering Group, 2014.
 15. Network, S.I.G., *Management of hip fracture in older people. A national clinical guideline*, 2009, NHS Quality Improvement, Scotland.
 16. Centre, N.C.G., *The Management of Hip Fracture in Adults*, 2011, Available from: www.ncgc.ac.uk; London: National Clinical Guideline Centre.
 17. MOHLTC, *Assess and restore guidelines*. Ministry of Health and Long-Term Care, Ontario, 2014.
 18. Services, B.C.M.o.H., *Guidelines for elderly mental health care planning for best practices for health authorities*. Available from: http://www.health.gov.bc.ca/library/publications/year/2002/MHA_elderly_mentalhealth_guidelines.pdf, 2002.
 19. Network, G.R., *Inpatient Rehab/LTLD Referral Guidelines*. Available from: www.gtarehabnetwork.ca, 2009.
 20. Network, G.R., *Inpatient Rehab Hip Fracture Clinical Pathway*. Available from: www.gtarehabnetwork.ca, 2011.
 21. Cameron, I., et al. Geriatric rehabilitation following fractures in older people: a systematic review (Structured abstract). *Health Technology Assessment*, 2000. 1-111.
 22. Stolee, P., et al. Inpatient versus home-based rehabilitation for older adults with musculoskeletal disorders: a systematic review (Structured abstract). *Clinical Rehabilitation*, 2012. 387-402.
 23. Handoll Helen, H.G., et al. Multidisciplinary rehabilitation for older people with hip fractures. *Cochrane Database of Systematic Reviews*, 2009. DOI: 10.1002/14651858.CD007125.pub2.
 24. Timmer, A.J., C.A. Unsworth, and N.F. Taylor, Rehabilitation interventions with deconditioned older adults following an acute hospital admission: a systematic review. *Clinical Rehabilitation*, 2014. 28(11): p. 1078-1086.
 25. Halbert, J., et al., Multi-disciplinary rehabilitation after hip fracture is associated with improved outcome: a systematic review. *Journal of Rehabilitation Medicine*, 2007. 39(7): p. 507-512.
 26. Baztán, J.J., et al., Effectiveness of acute geriatric units on functional decline, living at home, and case fatality among older patients admitted to hospital for acute medical disorders: meta-analysis. *Bmj*, 2009. 338: p. b50.
 27. Parker, G., et al., Best place of care for older people after acute and during subacute illness: a systematic review. *Journal of health services research & policy*, 2000. 5(3): p. 176-189.

References

28. Wang, H., et al., The influence of inpatient comprehensive geriatric care on elderly patients with hip fractures: a meta-analysis of randomized controlled trials. *International journal of clinical and experimental medicine*, 2015. 8 (11): p. 19815.
29. Ellis, G., et al., Comprehensive geriatric assessment for older adults admitted to hospital. *The Cochrane Library*, 2011.
30. Smith Toby, O., et al. Enhanced rehabilitation and care models for adults with dementia following hip fracture surgery. *Cochrane Database of Systematic Reviews*, 2015. DOI: 10.1002/14651858.CD010569.pub2.
31. Major, M., et al., Surviving critical illness: what is next? An expert consensus statement on physical rehabilitation after hospital discharge. *Critical Care*, 2016. 20(1): p. 354.

Appendices

Appendix 1: search strategy

Cochrane Library

Date Run: 16/12/16 16:20:20.89

Search Hits

ID	Search	Hits
#1	MeSH descriptor: [Femoral Fractures] explode all trees	1474
#2	((hip* or ((femur* or femoral*) near/3 (neck or proximal))) near fracture*)	3631
#3	#1 or #2	3791
#4	MeSH descriptor: [Physical Therapy Modalities] explode all trees	19634
#5	MeSH descriptor: [Rehabilitation] explode all trees	19416
#6	MeSH descriptor: [Activities of Daily Living] explode all trees	4562
#7	MeSH descriptor: [Early Ambulation] explode all trees	337
#8	MeSH descriptor: [Occupational Therapy] explode all trees	660
#9	MeSH descriptor: [Critical Pathways] explode all trees	302

#10	MeSH descriptor: [Physical Therapy Specialty] explode all trees	124
#11	#4 or #5 or #6 or #7 or #8 or #9 or #10	29092
#12	MeSH descriptor: [Rehabilitation Nursing] explode all trees	56
#13	(rehab* or (early near/1 (mobil* or discharg* or ambulat*)) or occupational therap* or physiotherap* or physical therap* or multidisciplin*)	77820
#14	(geriatr* or geriatr*-orthop* or orthop?edic-geriatr* or ortho*-geriatr* or orthogeriatr*)	10751
#15	hospital at home	7728
#16	MeSH descriptor: [Hospitalization] explode all trees	14124
#17	#11 or #12 or #13 or #14 or #15 or #16	112812
#18	#3 and #17	1115
#19	"aged":ti,ab,kw (Word variations have been searched)	442970
#20	#18 and #19	817
#21	MeSH descriptor: [Cognition Disorders] explode all trees	3425
#22	#21 and #17	1164
#23	#22 and #19	950
#24	Patient experience	12862
#25	#24 and #17	4254
#26	#25 and #19	1713
#27	"patient experience"	340
#28	#27 and #17	95
#29	#28 and #19	38

Trip Database

P – Geriatric patients

I – Interprofessional patient-centred models of care for geriatric rehabilitation

C – usual care

O – any outcomes

438 articles:

Systematic reviews – 85

Evidence-based synopses – 60

Guidelines - 293

Appendix 2: Quality assessment of included reviews and guideline

We assessed quality using AMSTAR score for systematic reviews and AGREE score for guidelines. The AMSTAR instrument uses the following assessment criteria for systematic reviews:

1. Was an a priori design provided?
2. Was there duplicate study selection and data extraction?
3. Was a comprehensive literature search performed?
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?
5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies provided?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
9. Were the methods used to combine the findings of studies appropriate?
10. Was the likelihood of publication bias assessed?
11. Was the conflict of interest stated?

The quality assessments of the reviews are summarized in the table below.

AMSTAR criteria/ score	Bachmann 2010	Baztan 2009	Cameron 2000	Ellis 2011	Halbert 2007	Handoll 2009 (Cochrane review)	Parker 2000	Stolee 2011	Smith 2015	Timmer 2014	Wang 2015
Was an a priori design provided?	Can't answer	Can't answer	yes	yes	Can't answer	yes	Can't answer	Can't answer	yes	Can't answer	Can't answer
Was there duplicate study selection and data extraction?	yes	yes	yes	yes	yes	yes	Can't answer	no	yes	no	yes
Was a comprehensive literature search performed?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

AMSTAR criteria/ score	Bach- mann 2010	Bazt an 2009	Cam- eron 2000	Ellis 2011	Hal- bert 2007	Hand oll 2009 (Cochr ane re- view)	Par- ker 2000	Stolee 2011	Smith 2015	Tim- mer 2014	Wang 2015
Was the status of publication (i.e. grey literature) used as an inclusion criterion?	yes	no	yes	yes	yes	yes	no	yes	yes	yes	no
Was a list of studies (included and excluded) provided?	no	no	yes	yes	no	yes	no	no	yes	no	no
Were the characteristics of the included studies provided?	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Was the scientific quality of the included studies assessed and documented?	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Was the scientific quality of the included studies used appropriately in formulating conclusions?	yes	yes	yes	yes	Can't answer	yes	yes	yes	yes	yes	yes

AMSTAR criteria/ score	Bachmann 2010	Baztan 2009	Cameron 2000	Ellis 2011	Halbert 2007	Handoll 2009 (Cochrane review)	Parker 2000	Stolee 2011	Smith 2015	Timmer 2014	Wang 2015
Were the methods used to combine the findings of studies appropriate?	yes	yes	yes	yes	yes	yes	Not applicable	Not applicable	yes	Not applicable	yes
Was the likelihood of publication bias assessed?	no	yes	yes	Can't answer	no	yes	no	no	yes	no	yes
Was the conflict of interest stated?	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes
Score	8/11	8/11	11/11	10/11	9/11	11/11	4/11	4/11	11/11	6/11	8/11

The AGREE II for assessing guidelines consists of 23 key items organized within 6 domains followed by 2 global rating items (Overall Assessment). Each domain captures a unique dimension of guideline quality.

The quality assessments of the guidelines are summarized in the table below.

AGREE domain	SIGN guidelines 2009	NICE guidelines 2011	A&R guidelines 2014	EMHC guidelines 2002	GTA inpatient rehab clinical pathway 2011	GTA Rehab 2009	ANZ guidelines 2014
Domain 1 – scope and purpose is concerned with the overall aim of the guideline, the specific health questions, and the target population (items 1-3)	21	21	21	21	19	21	21

AGREE domain	SIGN guidelines 2009	NICE guidelines 2011	A&R guidelines 2014	EMHC guidelines 2002	GTA in-patient rehab clinical pathway 2011	GTA Rehab 2009	ANZ guidelines 2014
Domain 2 – stakeholder involvement focuses on the extent to which the guideline was developed by the appropriate stakeholders and represents the views of its intended users (items 4-6)	21	21	8	20	3	3	20
Domain 3 – Rigour of Development relates to the process used to gather and synthesize the evidence, the methods to formulate the recommendations, and to update them (items 7-14)	56	56	14	33	8	8	49
Domain 4 – Clarity of Presentation deals with the language, structure, and format of the guideline (items 15-17)	20	21	21	21	15	15	21
Domain 5 – Applicability pertains to the likely barriers and facilitators to implementation, strategies to improve uptake, and resource implications of applying the guideline (items 18-21)	28	22	23	22	12	9	24
Domain 6 – Editorial Independence is concerned with the formulation of recommendations not being unduly biased with competing interests (items 22-23)	7	14	2	2	2	2	8
Overall assessment includes the rating of the overall quality of the guideline and whether the guideline would be recommended for use in practice (items 24-25)	6/yes	6/yes	4/yes	4/yes	4/yes	4/yes	5/yes
Score	159/168	164/168	94/168	123/168	63/168	62/168	148/168
	SIGN= Scottish Intercollegiate Guidelines Network; NICE=National Institute for Health and Clinical Excellence; A & R=Assist and Restore; EMHC= Elderly Mental Health Care; GTA						

Appendix 3: Grading of the quality of the evidence

We used the GRADE approach to assess the quality of the evidence [12, 13]. There are four categories: high, moderate, low and very low.

Quality level	Definition
High	We are very confident that the true effect lies close to that of the estimate of the effect
Moderate	We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low	We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

Factors that may decrease the quality level of a body of evidence

1. Limitations in the design and implementation of available studies suggesting high likelihood of bias.
2. Indirectness of evidence (indirect population, intervention, control, outcomes).
3. Unexplained heterogeneity or inconsistency of results (including problems with subgroup analyses).
4. Imprecision of results (wide confidence intervals).
5. High probability of publication bias.

Appendix 4: Case studies

Baycrest in-patient rehabilitation program

<http://www.baycrest.org/care/care-programs/inpatient-care/in-patient-rehabilitation-program/>

Offers a comprehensive array of specialized interventions (low tolerance long duration, high tolerance short duration) focused on the unique needs of frail seniors with complex needs, including multiple health conditions, physical impairments, recent functional decline and cognitive change.

Program	Population	Intervention
<p>Sidney and Florence Cooper <u>High Tolerance Short Duration</u> Rehabilitation (In-Patient) Unit</p>	<p>Participants must be 55 years of age, or older, and meet defined admission criteria. Applicants must have restorative potential, be medically stable, and have the cognitive capacity, motivation, stamina and endurance required to actively participate in intensive daily therapies (2-3 hours daily), provided in both individual and group formats, so as to achieve realistic rehabilitation goals.</p>	<p>A patient-centered, goal-directed approach, care and therapy are provided by an inter-professional team whose expertise includes helping participants improve their strength, mobility, balance and walking; optimizing the activities of daily living; providing equipment recommendations and strategies for managing in the home environment; addressing memory and thinking problems; and managing chronic pain.</p> <p>The inter-professional team supports participants in enhancing and restoring their functional independence in preparation for discharge, assisting patients and caregivers in returning to their previous living environment to continue with supports, services and ongoing rehabilitation, as needed, on an outpatient basis.</p> <p>While length of stay will vary by individual needs, determined by the health care team, the High Tolerance Short Duration Rehabilitation program runs on average 25 days, ranging from approximately 14-28 days. Off-site treatments (laboratory, diagnostic, surgical) and appointments (fracture clinic, specialists) may not be available at Baycrest. When necessary, the care team will work with you to co-ordinate your treatment at another health care facility. Transportation costs may apply.</p>
<p>Charlotte and Lewis Steinberg Family <u>Low Tolerance Long Duration</u> Rehabilitation (In-Patient) Unit</p>	<p>Participants must be 55 years of age or older, and meet defined admission criteria.</p> <p>Applicants may require occasional active medical management, be medically stable, and have the necessary cognitive capacity, motivation, stamina and endurance required to actively participate in daily therapies (30 minutes daily) provided in both individual and group formats, so as to achieve realistic rehabilitation goals.</p>	<p>Provide slower-paced, low intensity restorative/ rehabilitative care and therapy to the medically complex frail elderly who have experienced a decline in function due to a recent complicated course in hospital, musculo-skeletal injury or multi-system illness.</p> <p>Using a patient-centered, goal-directed approach, care and therapy are provided by an interprofessional team whose expertise includes helping participants improve their strength, mobility, balance and walking, optimizing the activities of daily living, providing equipment recommendations and strategies for managing in the home environment addressing memory and thinking problems and managing chronic pain.</p> <p>The inter-professional team supports participants in enhancing and restoring their functional independence in preparation for discharge, assisting patients and caregivers in returning to their previous living environment to continue with supports, services and ongoing rehabilitation, as needed, on an outpatient basis.</p> <p>While length of stay will vary by individual needs, determined by the health care team, the Low Tolerance Long Duration program typically runs between 45-65 days.</p> <p>Offsite treatments (laboratory, diagnostic, surgical) and appointments (fracture clinic, specialists) may not be available at Baycrest. When necessary, the care team will work with you to co-ordinate your treatment at another health care facility. Transportation costs may apply.</p> <p>Patients who become acutely ill and require emergency care will be sent to the closest health care facility.</p>

Bridgepoint Active Healthcare program

<http://www.bridgepointhealth.ca/en/what-we-do/inpatient-care.asp>

The inpatient rehabilitation care includes: an orthopedic rehabilitation unit for people recovering from a traumatic injury such as a hip fracture or joint surgery; a stroke & neurological rehab unit for patients who have experienced moderate to severe impairment after a stroke, a brain injury (acquired or traumatic), or neuromuscular condition and have a good chance of recovery; and a medical rehab unit for patients with significant health impairment, disability or advanced stage disease. The length of stay varies from 4-8 weeks in the orthopedic rehabilitation unit and the stroke & neurological rehab unit.

Program	Population	Intervention
Bridgepoint Active Healthcare Toronto	Inpatient Care	<p>Orthopedic Rehab:</p> <p>This program helps people recover from a traumatic injury such as a hip fracture or joint surgery. It could be the result of serious injuries in a car accident, a long illness in hospital, or a broken hip from a fall. We help individuals regain their strength, physical abilities and independence. We also help patients with progressive bone and joint disorders (e.g., rheumatologic conditions).</p> <p>While length of stay will vary by individual needs, the general program runs 4 to 8 weeks.</p> <p>Stroke & Neurological Rehab</p> <p>This program is for patients who have experienced moderate to severe impairment after a stroke, a brain injury (acquired or traumatic), or neuromuscular condition and have a good chance of recovery.</p> <p>While length of stay will vary by individual needs, the general program is 4 to 8 weeks.</p> <p>Medical Rehab</p> <p>This program is for patients with significant health impairment, disability or advanced stage disease. Our programming focuses on quality of life, coping and adaptation to illness/disability.</p>

Program	Population	Intervention
<p>Bridgepoint Active Healthcare Toronto</p>	<p>Outpatient Care</p>	<p>Musculoskeletal rehabilitation program: They offer outpatient services for patients with complex musculoskeletal rehabilitation needs with a short-term intensive program. Appropriate patients include those who have had orthopaedic surgery for complex fracture, multiple trauma, rheumatic disease or complex soft tissue injuries. Program duration: Approximately 6 weeks.</p> <p>Neurological rehabilitation program: They offer outpatient services for patients with complex neurological rehabilitation needs with a short-term intensive program. Appropriate patients include those with a recent acquired brain injury, stroke or neurovascular impairment or a neuromuscular disorder. Patients in this program have access to vocational rehabilitation, neuropsychology services and a neurological peer support group for younger adults. Program duration: Approximately 8 weeks.</p> <p>Mindfulness based stress reduction program: This program combines eastern practices of meditation and exercise, with western understanding of stress and its effect on physical and mental health. Research has demonstrated its effectiveness in many chronic health conditions, including chronic pain. Patients meet weekly over the course of 9 weeks. They learn a variety of meditation practices focused on developing skills in moment-to-moment, non-judgmental awareness of their experiences in life. Patients who engage fully in the program are likely to experience reduced levels of pain and emotional distress, increased activity levels and enhanced self-esteem by the end of the program. There is a small fee associated with this program.</p> <p>Pain management program: This 10-week program uses a cognitive-behavioural approach and physical activity to provide coping strategies. It is available to people with a medically stable chronic pain condition, which has been present for longer than 6 months and has not been responsive to traditional medical intervention. There is a small fee associated with this program.</p>

St Joseph's Healthcare London, Parkwood Institute

<https://www.sjhc.london.on.ca/areas-care/specialized-geriatric-services/programs-and-services/inpatient>

Offers specialized inpatient geriatric services including a Geriatric Rehabilitation Unit, a Musculoskeletal Rehabilitation Unit and a Geriatric Psychiatry Program. The length of time patients stay depends on the type of treatment they need. Within the first few days of their stay we work with them to plan their discharge, ensuring any community services they may need are in place when they return home.

Program	Population	Intervention
<p>St Joseph's Healthcare Lon- don</p> <p>Parkwood</p>	<p>Geriatrics</p>	<p>Specialized Geriatric Services Inpatient Program:</p> <p>Geriatric rehabilitation unit</p> <p>This is a 30-bed inpatient unit for patients with multiple, complex health problems (e.g. physical, emotional, cognitive and social issues). The goals are to promote patient's health, functional independence and quality of life. Length of stay varies from 2 to 4 weeks.</p> <p>They specialize in treating inpatients that have complex, multi-factorial problems (e.g. impaired mobility, falls, incontinence, cognitive impairment, etc.). These may include physical, emotional and social issues. The program is tailored to the individual needs of each patient. The approach is interdisciplinary. Patients must have minimum 50% weight-bearing ability.</p> <p>Musculoskeletal Rehabilitation Unit:</p> <p>This is a 20-bed inpatient unit for adults 18 and over. Length of stay varies from 10 days to 4 weeks. The program is designed to meet the rehabilitation needs of those with complex musculoskeletal problems requiring an inpatient, interdisciplinary approach. Common admission problems include, but are not limited to: Hip Fracture, Total Joint Replacement, Generalized Deconditioned State, Neuromuscular Disorders, Trauma.</p> <p>Admission Criteria for Musculoskeletal Rehabilitation:</p> <ul style="list-style-type: none"> Minimum of 50% weight bearing ability Clear rehabilitation goals typically defined as improving mobility and functional independence Medical and cognitive/emotional ability to take part in rehabilitation therapies <p>Outpatient Geriatric Rehabilitation Day Hospital</p> <p>The Geriatric Rehabilitation Day Hospital's specialized rehabilitation service helps frail patients 60 years of age and older to be healthy, independent and maintain their quality of life. This rehabilitation helps patients who are struggling to maintain their independence: after being discharged from hospital, following a surgery, after an illness, because of declining health.</p> <p>Admission Criteria for the Geriatric Rehabilitation Day Hospital:</p> <ul style="list-style-type: none"> The rehabilitation team involves nursing, physiotherapy, occupational therapy, social work, speech and language pathology, therapeutic recreation, registered dietitian, and psychologist. Medical care is provided by a Geriatrician. To be eligible for the Day Hospital program the individual must require 2 or more services.

Lakeridge health

<https://www.lakeridgehealth.on.ca/en/ourservices/rehabilitation.asp>

Offers three types of in-hospital rehabilitation programs: Inpatient rehabilitation unit for intensive, short-term rehabilitation in-hospital; Geriatric assessment and rehabilitation for individualized rehabilitation for frail seniors who also have another condition, such as depression, delirium or risk of falls; and a Stroke rehabilitation unit for rehabilitation with the goal of helping stroke survivors regain their independence.

Program	Population	Intervention
<p>Lakeridge Health</p> <p>Geriatric Assessment & Rehab Unit</p>	<p>Geriatric inpatient and outpatient</p>	<p>The rehabilitation programs help people regain or improve abilities they may have lost following an illness or injury.</p> <p>They offer in-hospital rehabilitation for patients who are staying, and outpatient rehabilitation for people who can travel to the hospital for their rehabilitation session. The types of rehabilitation:</p> <p><u>Musculoskeletal Physiotherapy</u> can help you regain movement and balance following hip or knee surgery, an upper extremity fracture, a soft tissue injury or another musculoskeletal condition. They offer individual treatment programs and group-based rehabilitation. Your program will be tailored to meet your needs and may include an exercise program, manual therapy, mobility training, and education. Musculoskeletal Physiotherapy is offered through our Ambulatory Rehabilitation Centres.</p> <p><u>Neurological Rehabilitation</u> team supports people who have suffered a stroke, brain injury or other new neurological event to regain as much independence as possible.</p> <ul style="list-style-type: none"> Helping re-learn daily activities such as eating, dressing Help with memory and thinking skills Teach how to improve walking and balancing Help communicate better by working on speaking, listening reading or writing Teach about health Link them with other services in the community and help cope with day to day life after a neurological injury. Each clinical service offers individualized assessments, therapy and health teaching during a maximum 12 week treatment period. <p><u>Neurological Rehabilitation</u> team support and helps people learn to control their breathing, manage their lung disease and exercise safely. The program consists of education and supervised exercise, and is offered three times per week over ten weeks.</p> <p>After ten weeks, most of our clients are ready to exercise safely in the community.</p> <p>The program is intended for people with chronic lung disease who have the potential to improve their health and independence through respiratory rehabilitation. Participants must be non-smokers or in the process of smoking cessation.</p>

Credit Valley Hospital, Mississauga

<https://trilliumhealthpartners.ca/patientservices/seniors/Pages/rehabilitation.aspx>

The Seniors and Rehabilitation Day Hospital is an outpatient rehabilitation program for adults 18 years or older to assist in transitioning from the medical environment to the community. They provide:

- Assessment of functioning at home and in the community
- Enhancement of physical, cognitive, functional and psychosocial skills
- Education for patients and their families to help improve their coping skills, maximize potential and optimize function
- Development of skills leading to successful community integration
- Support in maximizing independence in the community and liaison with community support systems, especially the Next Step to Active Living Program, which is offered at the South Common Community Centre and the Huron Park Community Centre.

A Falls Clinic and Falls Program are provided as well.

Program	Population	Intervention
<p>Credit Valley Hospital</p> <p>The Seniors and Rehabilitation Day Hospital. Mississauga</p>	<p>Seniors 65 year +</p>	<p>The program is a bridge, assisting patients in transitioning from the medical environment to the community.</p> <ul style="list-style-type: none"> Assessment of functioning at home and in the community Enhancement of physical, cognitive, functional and psychosocial skills Education for patients and their families to help improve their coping skills, maximize potential and optimize function Development of skills leading to successful community integration Support in maximizing independence in the community and liaison with community support systems, especially the Next Step to Active Living Program, which is offered at the South Common Community Centre and the Huron Park Community Centre. <p>A Falls Clinic and Falls Program is also offered at the Seniors and Rehabilitation Day Hospital.</p> <p>A separate referral is required for the Falls Clinic which involves an assessment by a Geriatrician, Physiotherapist and Nurse. The Falls Program is a six week group exercise program, which includes home safety and community program education.</p> <p>Length of stay may vary 2-6 weeks with average length of stay of approximately 4 weeks.</p>

The New South Wales (NSW) Rehabilitation Model of Care, Australia

<https://www.aci.health.nsw.gov.au/resources/rehabilitation/rehabilitation-model-of-care/rehabilitation-moc/NSW-Rehabilitation-MOC.pdf>

Offers rehabilitation services that enhance functional independence and impact patient flow from the acute care setting to the sub-acute care setting and patient flow from the sub-acute care setting into an ambulatory care setting and ultimately the client's return to the community and home (where possible).

Depending on the capacity and capability of the unit the following may be characteristics of the sub-acute care setting for rehabilitation:

- Streaming of care, where patients are grouped according to impairment type
- Intensive multidisciplinary inpatient program for patients that require and can tolerate it
- Integrated care types for example: acute care and rehabilitation care (i.e. in-reach teams and SMART beds); rehabilitation care and aged care (i.e. parallel care for ortho-geriatrics).

A Day Hospital may offer a comprehensive rehabilitation program conducted by a multidisciplinary team in an out-patient setting.

Program	Population	Intervention
Orthogeriatrics and rehabilitation	Adult patients	There is evidence that inpatient rehabilitation specifically designed for geriatric patients compared with usual care results in improved functional status, decreased admission to nursing homes and decreased mortality. Orthogeriatric services have provided the model on which the ACE, ART and SMART are based. Orthogeriatric services operate on the principle of comprehensive geriatric assessment and an interdisciplinary approach that encompasses the totality of the patient's medical, psychosocial and functional needs. For example, the orthogeriatric model is appropriate whilst patients are requiring the operative management of orthopaedic conditions. In this example a patient's medical and rehabilitation requirements are attended to by geriatric medicine. Such programs are common in larger teaching hospitals and rollout to district hospitals strongly supported by the ACI and NSW Health.

Program	Population	Intervention
Case Managers for rehabilitation	Adult patients	<p>Case Managers for rehabilitation have been implemented in a number of sub-acute facilities in NSW one example being Orange Hospital. The goals of case management at Orange Hospital include:</p> <ul style="list-style-type: none"> • To enhance and foster client-centred therapy where the patient and their family are included and central in the goal setting and discharge planning processes • To improve the transition from acute care to rehabilitation to discharge destination. (Successful discharge should be well planned, timely, and coordinated). • To increase and improve communication and information sharing between the treating team and the client and their family. <p>Orange Hospital seeks to allocate a case manager to patients within 48 hours of admission. The case manager is a member of the nursing staff and meets with the client at least once a week and the family is provided with the case manager's contact details. The case manager is the first point of contact for clients, families and other health professionals or service providers. The case manager is responsible for providing information, dealing with issues and assisting with transfer of care processes. The case manager also completes the goal planning sheet and discharge checklist.</p>

Program	Population	Intervention
Comprehensive Geriatric Medicine Service	Adult patients	<p>Through the provision of a Comprehensive Geriatric Medicine Service at Westmead Hospital the above inreach programs are obviated by having such capacity inbuilt into the operational structure of the geriatric medicine services. The duality of inputs is replaced by having the attending physician skilled in both acute care and rehabilitation. The patient is admitted under the care of a geriatrician and associated interdisciplinary team. The patient undergoes a comprehensive assessment of their physical, psychosocial and functional needs. Care is focused on accurate diagnosis, optimising physiological and physical function and development of comprehensive care plan under the auspices of the service. There is a continuum of care provision through the acute, subacute and non-inpatient settings as required.</p>

Program	Population	Intervention
Day Hospital	Adult patients	<p>Referral & Services:</p> <ul style="list-style-type: none"> ● Referrals come from private and public hospitals, private and public sub-acute facilities, specialist private clinics, community GPs. ● Services run 5 hours/day 5 days/wk for group of approximately 12 patients per day ● Clients attend 1+ days/week for 6 week duration <p>Baseline assessment on admission:</p> <ul style="list-style-type: none"> ● Geriatrician/ Rehabilitation physician ● Allied Health team <p>Activities include:</p> <ul style="list-style-type: none"> ● Gym session with Physiotherapist and/or Therapy Aids and/or one-on-one ● Occupational Therapy group/one-on-one ● Speech Pathology sessions ● Hydrotherapy groups ● Communal dining with Dietician supervision and session ● Diversional therapy activities including Wii games and Tai Chi <p>Goal setting and review:</p> <ul style="list-style-type: none"> ● Goal setting is reviewed weekly with Case Manager ● Client is discussed at least monthly at a Multidisciplinary Team Case conference (including physician) <p>Referral & follow-up</p> <ul style="list-style-type: none"> ● Comprehensive GP discharge summary, support service contact, carer/family information handouts, Patient Information handouts ● Phone follow-up 2 weeks post-discharge

Glossary

Comorbidity: Co-existence of more than one disease or an additional disease (other than that being studied or treated) in an individual.

Early Supported Discharge (ESD): Patients are discharged home from the acute trauma ward, or in some cases a subsequent rehabilitation ward within the hospital, with a supported 4-6 week rehabilitation package.

Geriatric Orthopaedic Rehabilitation Unit (GORU): A separate geriatrician-led trauma ward. The extent of surgical input to the GORU varies, depending on how early patients are moved from the acute trauma wards.

Geriatric Hip fracture programme (GHFP): Formal 'orthogeriatric' care - with the geriatric medical team contributing to joint preoperative patient assessment, and increasingly taking the lead in postoperative medical care, multi-disciplinary rehabilitation and discharge planning.

Mixed Assessment and Rehabilitation Unit (MARU): A rehabilitation unit able to accept patients with a variety of medical, surgical and orthopaedic conditions.

Orthogeriatric: A care of the elderly by a physician with an interest in fracture care.

Psychogeriatric: Refers to psychiatric disorders or conditions that are primarily experienced by elderly people and are considered to represent age-related disorders.

Copyright Bruyère Research Institute 2016. This work is licensed under the Creative Commons Attribution-NonCommercial 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc/4.0/>.

Suggested citation: Ghogomu E, Ghaedi B, Yoganathan M, Welch V, Harley A, French V, McCumber C, Inter-professional patient-centred models of care for geriatric rehabilitation. A Bruyère Rapid Review. Bruyère Reports. March 2017.