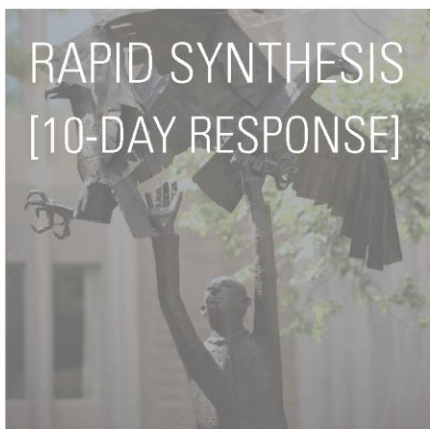
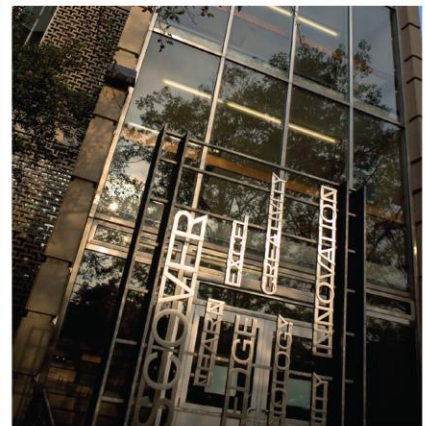




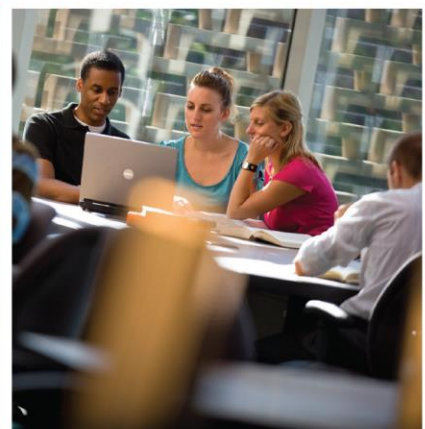
EXAMINING THE EFFECTIVENESS  
AND COST-EFFECTIVENESS  
OF REHABILITATION-CARE MODELS  
FOR FRAIL SENIORS



RAPID SYNTHESIS  
[10-DAY RESPONSE]



30 SEPTEMBER 2013



EVIDENCE >> INSIGHT >> ACTION

**Rapid Synthesis:  
Examining the Effectiveness and Cost-effectiveness  
of Rehabilitation-care Models for Frail Seniors**

30 September 2013

## McMaster Health Forum

### McMaster Health Forum

For concerned citizens and influential thinkers and doers, the McMaster Health Forum strives to be a leading hub for improving health outcomes through collective problem solving. Operating at the regional/provincial level and at national levels, the Forum harnesses information, convenes stakeholders, and prepares action-oriented leaders to meet pressing health issues creatively. The Forum acts as an agent of change by empowering stakeholders to set agendas, take well-considered actions, and communicate the rationale for actions effectively.

### Authors

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### Timeline

Rapid syntheses can be requested in a three-, 10- or 30-business day timeframe. This synthesis was prepared over a 10-business day timeframe. An overview of what can be provided and what cannot be provided in each of the different timelines is provided on McMaster Health Forum's Rapid Response program webpage (<http://www.mcmasterhealthforum.org/index.php/stakeholders/rapid-response>).

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### Conflict of interest

The authors declare that they have no professional or commercial interests relevant to the rapid synthesis. The funder played no role in the identification, selection, assessment, synthesis or presentation of the research evidence profiled in the rapid synthesis.

### Merit review

The rapid synthesis was reviewed by a small number of researchers in order to ensure its scientific rigour and system relevance.

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## KEY MESSAGES

### Question

- How effective and cost-effective are different models of physical and occupational rehabilitation for frail seniors?

### Why the issue is important

- Functional difficulties significantly compromise quality of life and are associated with depression, increased frailty, long-term care home (LTCH) placement, and mortality.
- Rehabilitation services to improve functional abilities are generally understood to be essential components of the bundle of services that should be made available to seniors to help them live in their own homes for as long as possible.
- It has been recommended that Ontario adopt an ‘assess and restore’ approach to the care of all seniors that emphasizes timely access to rehabilitation and other ‘restorative care’ services as a means of avoiding or delaying LTCH placement, emergency department visits, and admissions to hospital.

### What we found

- *Effectiveness* - We identified 15 systematic reviews that provide findings related to different types of rehabilitation care, the types of settings in which rehabilitation can be safely and effectively provided, and the specific health issues for which rehabilitative care can be effectively provided.
  - *Types of rehabilitation care*
    - Four reviews found a range of benefits for exercise interventions for frail seniors, high-intensity, progressive-resistance strength training, long-lasting multicomponent exercise programs for older adults with moderate levels of frailty, and comprehensive occupational therapy for community dwelling older adults.
  - *Settings in which rehabilitation care can be safely and effectively provided*
    - Two systematic reviews found home-based rehabilitation to be effective, with one indicating that hospital-discharge services that include home-based rehabilitation support helped patients return home earlier, remain at home and regain independence as compared to those receiving conventional care, and another finding that home-based rehabilitation was similar or superior to hospital care for improving function, cognition and quality of life.
    - Centre-based physical activity programs were found in one review to be more effective than home-based programs, but adherence was significantly higher in home-based programs.
    - Inpatient rehabilitation specifically designed for geriatric patients was found to be effective at improving functional status and reducing nursing home admission and mortality rates, as compared to usual care.
    - Physical rehabilitation provided in long-term care settings was found to result in small improvements in independence of activities in daily living, as compared to those who did not receive physical rehabilitation.
  - *Health issues for which rehabilitation care can be provided*
    - Two reviews focused on hip fracture found that multidisciplinary rehabilitation was beneficial for improving outcomes following hip fracture, and another review found several interventions in acute, inpatient and outpatient settings to be effective at improving ambulatory outcomes, functional recovery, strength and balance recovery, falls and lower-extremity strength, and at reducing hospital length of stay following hip fracture.
- *Costs and cost-effectiveness* – We identified four systematic reviews that included cost considerations within the scope of the findings (but only one that provided detailed findings), and six economic evaluations.
  - One systematic review found that rehabilitation in the home or community is less costly than inpatient rehabilitation, and that inpatient rehabilitation is less costly than general acute care following stroke.
  - Of the six economic evaluations identified, only two found significant differences between the intervention and comparator, with one indicating that early supported-discharge models are cost-effective compared to usual care, and the other finding that preventive occupational therapy is cost-effective compared to a general social activity program or to no therapy.

## **QUESTION**

How effective and cost-effective are different models of physical and occupational rehabilitation for frail seniors?

Note that physical therapy/rehabilitation has the broad aim to enhance or restore function in multiple body systems.(1) In contrast, occupational therapy/rehabilitation is defined more broadly and is focused on enabling engagement in everyday living through occupation, and enabling people to perform the occupations that foster health and well-being where occupation refers to everything that people do during the course of everyday life.(2;3)

## **WHY THE ISSUE IS IMPORTANT**

The health of the aging population has been identified as a high priority for the province of Ontario and has become one of the province's most pressing health and social policy issues.(4) Within this priority area, there is significant focus on the delivery of high-value services to seniors to maximize their ability to live in their own homes for as long as possible. Historically, the province has focused on enabling people to continue leading healthy and independent lives in their own homes by helping them transition to the community more quickly (from hospitals or other care facilities) to take pressure off hospitals, and help to lower wait times.(5;6) More recently, the province has given greater attention to helping people avoid admission to hospitals and other institutions in the first place.(7)

Functional difficulties significantly compromise quality of life and are associated with depression, increased frailty, long-term care home (LTCH) placement, and mortality.(8-10) Given this, rehabilitation services to improve functional abilities are generally understood to be essential components of the bundle of services that should be made available to seniors to help them live in their own homes for as long as possible. For example, in 2011, Dr. David Walker made a number of recommendations to the Ministry on improving the care of seniors in his report *Caring for Our Aging Population and Addressing Alternate Levels of Care*.(11) Among these recommendations, he called for Ontario to adopt an 'assess and restore' approach to the care of all seniors that emphasizes timely access to rehabilitation and other 'restorative care' services as a means of avoiding or delaying LTCH placement, emergency department visits, and admissions to hospital.

This rapid synthesis was requested by the Ontario Ministry of Health and Long-Term Care (MOHLTC) to provide evidence about the effectiveness and cost-effectiveness of different models of rehabilitation for frail seniors, to support the ministry's efforts and the efforts of other stakeholders in the province (e.g. Local Health Integration Networks and providers) to improve the value and quality of rehabilitation care for frail seniors in Ontario.

### **Box 1: Background to the rapid synthesis**

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the McMaster Health Forum's Rapid Response program. Whenever possible, the rapid synthesis summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

Rapid syntheses can be requested in a three-, 10- or 30-business day timeframe. An overview of what can be provided and what cannot be provided in each of these timelines is provided on McMaster Health Forum's Rapid Response program webpage (<http://www.mcmasterhealthforum.org/index.php/stakeholders/rapid-response>)

This rapid synthesis was prepared over a 10-business day timeframe and involved five steps:

- 1) submission of a question from a health system policymaker or stakeholder (in this case, the Ontario Ministry of Health and Long-Term Care);
- 2) identifying, selecting, appraising and synthesizing relevant research evidence about the question;
- 3) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence; and
- 4) finalizing the rapid synthesis based on the input of at least two merit reviewers.

## **WHAT WE FOUND**

We identified 15 systematic reviews that provide findings related to different types of rehabilitation care for seniors, the types of settings in which rehabilitation can be safely and effectively provided, and the specific health issues for which rehabilitative care can be effectively provided. Of these, only two (12;13) focused specifically on frail seniors, although several of the other reviews are focused on settings (e.g., long-term care facilities or inpatient settings) or health issues (e.g., hip fractures) that are relevant to rehabilitation-care models to frail seniors. In addition, we identified four systematic reviews that included cost considerations within the scope of the findings (but only one that provided detailed findings), and six economic evaluations that evaluated the costs and cost-effectiveness of rehabilitation-care models. We present the findings from systematic reviews along with an appraisal of whether their methodological quality (using the AMSTAR tool) is high (scores of 8 or higher out of a possible 11), medium (scores of 4-7) or low (scores less than 4) (see the appendix for more details about the quality appraisal process). We also highlight whether they were conducted recently, which we define as the search being conducted within the last five years.

### **Effects of rehabilitation-care models**

The systematic reviews we identified provide findings related to different types of rehabilitative care (e.g., exercise, occupational therapy (OT) and high-intensity progressive resistance exercise), the types of settings in which rehabilitation can be provided (e.g., home, hospital/inpatient, long-term care and rehabilitation centres) and the specific health issues for which rehabilitative care can be provided (e.g., hip fracture).

#### *Types of rehabilitative care*

Of the four reviews addressing different types of rehabilitative care, a recent high-quality review found that providing exercise interventions to frail seniors improved gait speed, balance and performance in activities of daily living, but had no significant effects on a test of physical function (the ‘Timed Up and Go’ test) or quality of life.(13) The exercise programs evaluated in the review included flexibility, low- or intensive-resistance, aerobic, coordination, balance and Tai-Chi exercises, repetitive performance of activities of daily living, and task-oriented or gait training. Each exercise program generally involved 60- to 90-minute sessions, repeated daily or weekly for three to 12 months.

A recent medium-quality review found that high-intensity, progressive-resistance strength training significantly improves strength in lower limbs, but that training intensity did not have significant effects on

### **Box 2: Identification, selection and synthesis of research evidence**

We identified research evidence by searching Health Systems Evidence ([www.healthsystemsevidence.org](http://www.healthsystemsevidence.org)) using rehab\* as a search term in the open search (in the title, abstract and keywords fields), and limited the results to those categorized under the ‘optimal aging’ theme. We supplemented this with a search for rehab\* AND (senior\* OR elder\* OR older adult\* OR frail\*) in EvidenceUpdates (<http://plus.mcmaster.ca/evidenceupdates>) for systematic reviews addressing programs and services (not health system arrangements), and in the Economic Evaluations Database (<http://www.thecochranelibrary.com/view/0/economicEvaluations.html>) for economic evaluations addressing programs and services (not health system arrangements).

The results from the searches were assessed by one reviewer for inclusion. A document was included if it fit within the scope of the question posed for the rapid synthesis.

For each review we included in the synthesis, we documented the focus of the review, key findings, last year the literature was searched (as an indicator of how recently it was conducted), the methodological quality using the AMSTAR quality appraisal tool (see the Appendix for more detail), and the proportion of the included studies that were conducted in Canada. For primary research (if included), we documented the focus of the study, methods used, a description of the sample, the jurisdiction(s) studied, key features of the intervention, and key findings. We then used this extracted information to develop a synthesis of the key findings from the included reviews and primary studies.

functional performance, disability and quality of life.(14) The review also found that groups receiving similar training volumes (i.e., increasing the amount of exercises or repetition of specific exercises) had comparable increases in lower-limb strength regardless of the intensity of the training. Similarly, another medium-quality but older review found some indication that long-lasting and high-intensity multicomponent exercise programs improve activities of daily living and instrumental activities of daily living for older adults with moderate levels of physical frailty.(12) However, the review noted that interpretation of the elements contributing to successful outcomes is difficult given the differences between the intervention characteristics (e.g., intervention individualization, duration, intensity and setting that were assessed). Lastly, the review outlined that single lower extremity training had no effects on levels of disability.(12)

The fourth review, which is older but of high-quality, found that occupational therapy for community-dwelling older adults is generally beneficial.(15) The review also found strong evidence that functional abilities are increased after the provision of advice about assistive devices as part of a home-hazards assessment. In addition, the review found some evidence to indicate that combining skills training with a home-hazard assessment reduces the incidence of falls among those at a high risk of falls, and that comprehensive occupational therapy improves functional ability, social participation and quality of life.

### *Settings for rehabilitative care*

The majority of the reviews we identified (nine of 13) evaluated the provision of rehabilitation care for seniors in different settings, with most focused on home-based rehabilitation. The two most recent reviews evaluating the effects of home rehabilitation found it to have positive effects. Specifically, a recent high-quality review evaluating discharge services with home-based support for stroke patients found that patients returned home earlier and were more likely to remain at home and to regain independence in daily activities, as compared to those receiving conventional care.(16) The recent medium-quality review found that home-based rehabilitation was similar or superior to hospital care for improving function, cognition and quality of life.(17) When compared to centre-based physical activity programs for older adults, an older high-quality review found that home-based exercise programs were not as effective in the short-term, but that adherence to the program was significantly higher in home-based rehabilitation.(18) The other (older) reviews that focused on home-based rehabilitation either found insufficient evidence (19) or no differences between home rehabilitation and conventional care.(20;21) However one of these reviews, which was of low quality, found higher levels of patient and family satisfaction with palliative-care services delivered at home.(20)

In addition to comparisons involving home-based settings, we also found reviews evaluating rehabilitation in inpatient and long-term care settings. A recent high-quality review found that inpatient rehabilitation specifically designed for geriatric patients was effective at improving functional status and reducing nursing home admissions and mortality rates, as compared to usual care.(22) The review also found:

- a greater functional improvement in orthopedic programs as compared to general geriatric rehabilitation programs in both the short- and long-term;
- a larger reduction in nursing home admissions among those 80 years and younger as compared to those over 80 years of age;
- similar long-term effects across the intervention characteristics that were hypothesized to potentially have an impact on the overall effects of the intervention (the list of intervention characteristics included in the analysis is provided in the appendix as part of the key findings related to this review);
- reduced mean length of hospital stay in orthopedic rehabilitation as compared to general geriatric rehabilitation; and
- lower hospital readmissions among those receiving the inpatient-rehabilitation intervention specifically designed for geriatric patients.



The other review we identified, which is recent and of medium quality, found that providing physical rehabilitation to elderly residents in long-term care facilities resulted in small improvements in independence in activities of daily living, as compared to no intervention.(10)

*Specific health issues for which rehabilitative care can be provided*

The three reviews that we identified that address rehabilitation for specific health issues all focused on hip fracture. Two of the reviews evaluated multidisciplinary rehabilitation for hip fracture. The recent and high-quality review found some evidence to suggest that multidisciplinary rehabilitation helps older adults recover from hip fracture (but the authors note that the results cannot be considered conclusive).(23) The evidence included in the review also indicated that there are no harms associated with multidisciplinary rehabilitation, and that there was inconclusive evidence regarding whether it adds to the burden of caregivers. The other review, which was older and of medium-quality, similarly found that multidisciplinary rehabilitation following hip fracture lowered the risk of poor outcome (defined as either death or nursing home admission), and that the number needed to treat to avoid a poor outcome was 24 people.(24) Lastly, an older medium-quality review analyzed hip fracture rehabilitation practices in the elderly and found 55 studies that were distributed across six types of rehabilitation intervention categories (care pathways, early rehabilitation, interdisciplinary care, occupational and physical therapy, exercise and unspecified interventions) and three settings (acute care in hospital, post-acute care/rehabilitation and post-rehabilitation).(25) We summarize in Table 1, the settings and interventions for which improvements in outcomes were found.

**Table 1: Summary of findings from a systematic review (25) of hip fracture rehabilitation practices in the elderly**

Area of improvement	Settings and interventions associated with improvements
Improved ambulatory outcomes	<p><i>Acute care</i></p> <ul style="list-style-type: none"> <li>• Postoperative management monitored by a physician; high-frequency PT/OT; and additional OT combined with PT.</li> </ul> <p><i>Inpatient (post-acute care/rehabilitation)</i></p> <ul style="list-style-type: none"> <li>• PT and OT on a rehabilitation ward; treadmill gait training; PT plus quadriceps training; weight-bearing exercise; and PT plus neuromuscular stimulation of the quadriceps muscle</li> </ul> <p><i>Outpatient (post-rehabilitation)</i></p> <ul style="list-style-type: none"> <li>• Combined aerobic and progressive-resistance training; combined strength and functional training; and home care rehabilitation setting</li> </ul>
Functional recovery	<p><i>Acute care</i></p> <ul style="list-style-type: none"> <li>• Clinical pathways involving intensive OT and/or PT exercises and early mobilization; early supported discharge; high-frequency OT/PT; and additional OT combined with PT</li> </ul> <p><i>Outpatient (post-rehabilitation)</i></p> <ul style="list-style-type: none"> <li>• OT and PT on a rehabilitation ward; and combined aerobic and progressive resistance training</li> </ul>
Strength and balance recovery	<p><i>Inpatient (post-acute care/rehabilitation)</i></p> <ul style="list-style-type: none"> <li>• OT and PT on a rehabilitation ward; inpatient PT plus quadriceps training; and inpatient PT plus neuromuscular stimulation of the quadriceps</li> </ul> <p><i>Outpatient (post-rehabilitation)</i></p> <ul style="list-style-type: none"> <li>• Progressive home-based PT component; and combined aerobic and progressive resistance training</li> </ul>
Decreased length of stay	<p><i>Acute care</i></p> <ul style="list-style-type: none"> <li>• Intensive OT and/or PT exercises and postoperative care from a geriatrician</li> </ul>

Increased falls self-efficacy	<i>Inpatient (post-acute care/rehabilitation)</i> <ul style="list-style-type: none"> <li>• Early supported discharge and OT and PT on a rehabilitation ward</li> </ul>
Improved lower-extremity power generation	<i>Inpatient (post-acute care/rehabilitation)</i> <ul style="list-style-type: none"> <li>• Post-operative interdisciplinary care monitored by a geriatrician and OT/PT</li> </ul> <i>Outpatient (post-rehabilitation)</i> <ul style="list-style-type: none"> <li>• Aerobic exercise with progressive resistance training or weight-bearing exercise and combined strength and functional training</li> </ul>

### Costs and cost-effectiveness of rehabilitation-care models

Of the 13 reviews we identified, four included cost considerations within the scope of the review findings. A recent and high-quality review, which was focused on adult rehabilitation (and therefore not specifically on older adults), found “high-level evidence” indicating that rehabilitation in the home or community is overall less costly compared to inpatient rehabilitation.(26) The review also outlined that there was “moderate-level” evidence that inpatient rehabilitation in stroke units is less costly than general acute care following stroke. In addition, it was found that function, quality of life, discharge destination and mortality were not compromised as a result of the less costly interventions. The other three reviews included: 1) a recent high-quality review about inpatient rehabilitation for geriatric patients, which found insufficient evidence to assess cost-effectiveness;(22) 2) an older medium-quality review, which found limited evidence suggesting that home rehabilitation after stroke is less costly compared to facility-base day care, but more costly when compared to conventional care (identified as various combinations of hospital stay, day care and outpatient rehabilitation);(21) and 3) an older low-quality review, which found comparable costs between home healthcare and hospital-based alternatives.(20)

The economic evaluations we identified evaluated: 1) post-acute care delivered in the community as compared to general or multidisciplinary hospital care;(27;28) 2) inpatient rehabilitation as compared to standard care;(29) 3) residential rehabilitation units for older adults following hospital discharge;(30) 4) early supported discharge as compared to usual care (e.g., routine social services or outpatient rehabilitation);(31) and 5) preventive occupational therapy as compared to social activity and non-treatment.(32) Only two of the economic evaluations found a difference between the cost-effectiveness of the intervention and the comparator, with one indicating that early supported discharge rehabilitation models are likely to be more cost-effective than usual care,(31) and another finding that preventive occupational therapy is more cost-effective than general social activity programs or no therapy.(32)

## REFERENCES

1. Canadian Physiotherapy Association. Description of Physiotherapy in Canada. Ottawa, Canada: Canadian Physiotherapy Association; 2012.
2. Canadian Association of Occupational Therapists. Occupational therapy: Definition. Canadian Association of Occupational Therapists 2013 December 3; Available from: URL: <http://www.caot.ca/default.asp?pageid=1344>
3. Townsend EA, Polatajko HJ. Enabling occupation II: Advancing an Occupational Therapy Vision for Health, Well-Being & Justice Through Occupation. Ottawa, Canada: Canadian Association of Occupational Therapists; 2013.
4. Seniors Advocacy Consortium. Priorities for the Aging Population in Ontario: The Collective Views of Nine Organizations Representing More Than 1 Million Seniors. Toronto, Canada: Seniors Advocacy Consortium; 2011.
5. Ontario Ministry of Health and Long-Term Care. Aging at Home Strategy - Background. Toronto, Canada: Ontario Ministry of Health and Long-Term Care; 2007.
6. Ontario Ministry of Health and Long-Term Care. Aging at Home Strategy Expands - McGuinty Government Helping More Seniors Get Healthcare at Home. Toronto, Canada: Ontario Ministry of Health and Long-Term Care; 2010.
7. Ontario Ministry of Health and Long-Term Care. Excellent Care for All: Ontario's Excellent Care for All Strategy. Ontario Ministry of Health and Long-Term Care 2012 August 12; Available from: URL: <http://www.health.gov.on.ca/en/ms/ecfa/public/>
8. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J et al. Frailty in Older Adults. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences 2001;56(3):M146-M157.
9. Kwag KH, artin P, ussell D, ranke W, ohut M. The Impact of Perceived Stress, Social Support, and Home-Based Physical Activity on Mental Health among Older Adults. International Journal of Aging and Human Development 2011;72(2):137-54.
10. Crocker T, Young J, Forster A, Brown L, Ozer S, Greenwood DC. The effect of physical rehabilitation on activities of daily living in older residents of long-term care facilities: Systematic review with meta-analysis. Age and Ageing 2013; Epub ahead of print: doi: 10.1093/ageing/aft133.
11. Walker D. Caring For Our Aging Population and Addressing Alternate Level of Care. Toronto, Canada: Ontario Ministry of Health and Long-Term Care; 2011.
12. Daniels R, van Rossum E, de Witte L, Kempen G, van den Heuvel W. Interventions to prevent disability in frail community-dwelling elderly: A systematic review. BMC Health Services Research 2008;8(1):278.
13. Chou CH, Hwang CL, Wu YT. Effect of exercise on physical function, daily living activities, and quality of life in the frail older adults: A meta-analysis. Archives of Physical Medicine and Rehabilitation 2012;93(2):237-44.
14. Raymond MJ, Bramley-Tzerfos RE, Jeffs KJ, Winter A, Holland AE. Systematic Review of High-Intensity Progressive Resistance Strength Training of the Lower Limb Compared With Other

- Intensities of Strength Training in Older Adults. *Archives of Physical Medicine and Rehabilitation* 2013;94(8):1458-72.
15. Steultjens EMJ, Dekker J, Bouter LM, Jellema S, Bakker EB, van den Ende CHM. Occupational therapy for community dwelling elderly people: a systematic review. *Age and Ageing* 2004;33(5):453-60.
  16. Fearon P, Langhorne P, Early Supported DT. Services for reducing duration of hospital care for acute stroke patients. *Cochrane Database of Systematic Reviews* 2012;(9):1-100.
  17. Stolee P, Lim SN, Wilson L, Glenn C. Inpatient versus home-based rehabilitation for older adults with musculoskeletal disorders: A systematic review. *Clinical Rehabilitation* 2012;26(5):387-402.
  18. Ashworth NL, Chad KE, Harrison EL, Reeder BA, Marshall SC. Home versus center based physical activity programs in older adults. *Cochrane Database of Systematic Reviews* 2005;(1):1-45.
  19. Ward D, Drahota A, Gal G, Severs M, Dean TP. Care home versus hospital and own home environments for rehabilitation of older people. *Cochrane Database of Systematic Reviews* 2008;(4):1-23.
  20. Andersson A, Beck-Friis B, Britton M, Carlsson P, Fridgren I, Furst CJ et al. Advanced home health care and home rehabilitation: Reviewing the scientific evidence on costs and effects. 1999.
  21. Britton M, Andersson A. Home rehabilitation after stroke. Reviewing the scientific evidence on effects and costs. *International Journal of Technology Assessment in Health Care* 2000;16(3):842-8.
  22. Bachmann S, Finger C, Huss A, Egger M, Stuck AE, Clough-Gorr KM. Inpatient rehabilitation specifically designed for geriatric patients: Systematic review and meta-analysis of randomised controlled trials. *BMJ* 2010;340:c1718.
  23. Handoll HHG, Cameron ID, Mak JCS, Finnegan TP. Multidisciplinary rehabilitation for older people with hip fractures. *Cochrane Database of Systematic Reviews* 2009;(4):1-80.
  24. Halbert J, Crotty M, Whitehead C, Cameron I, Kurrle S, Graham S et al. Multi-disciplinary rehabilitation after hip fracture is associated with improved outcome: A systematic review. *Journal of Rehabilitation Medicine* 2007;39(7):507-12.
  25. Chudyk AM, Jutai JW, Petrella RJ, Speechley M. Systematic review of hip fracture rehabilitation practices in the elderly. *Archives of Physical Medicine and Rehabilitation* 2009;90(2):246-62.
  26. Brusco NK, Taylor NF, Watts JJ, Shields N. Economic evaluation of adult rehabilitation: A systematic review and meta-analysis of randomized controlled trials in a variety of settings. *Archives of Physical Medicine and Rehabilitation* 2013;(in press).
  27. O'Reilly J, Lawson K, Young J, Forster A, Green J, Small N. A cost effectiveness analysis within a randomised controlled trial of post-acute care of older people in a community hospital. *BMJ* 2006;333.
  28. O'Reilly J, Lawson K, Green J, Young JB, Forster A. Post-acute care for older people in community hospitals: A cost-effectiveness analysis within a multi-centre randomised controlled trial. *Age and Ageing* 2008;37(5):513-20.

29. Kehusmaa S, Autti-Rämö I, Valaste M, Hinkka K, Rissanen P. Economic evaluation of a geriatric rehabilitation programme: A randomized controlled trial. *Journal of Rehabilitation Medicine* 2013;42(10):949-55.
30. Ellis A, Trappes-Lomax T, Fox M, Taylor R, Power M, Stead J et al. Buying Time II: an economic evaluation of a joint NHS/Social Services residential rehabilitation unit for older people on discharge from hospital. *Health & Social Care in the Community* 2006;14(2):95-106.
31. Miller P, Gladman JRF, Cunliffe AL, Husbands SL, Dewey ME, Harwood RH. Economic analysis of an early discharge rehabilitation service for older people. *Age and Ageing* 2005;34(3):274-80.
32. Hay J, LaBree L, Luo R, Clark F, Carlson M, Mandel D et al. Cost-Effectiveness of Preventive Occupational Therapy for Independent-Living Older Adults. *Journal of the American Geriatrics Society* 2002;50(8):1381-8.

## APPENDICES

The following tables provide detailed information about the systematic reviews and primary studies identified in the rapid synthesis. The ensuing information was extracted from the following sources:

- systematic reviews - the focus of the review, key findings, last year the literature was searched, the proportion of studies conducted in Canada and the proportion of studies focused on treating elderly people; and
- primary studies (in this case, economic evaluations and costing studies) - the focus of the study, methods used, study sample, jurisdiction studied, key features of the intervention and the study findings (based on the outcomes reported in the study).

For the appendix table providing details about the systematic reviews, the fourth column presents a rating of the overall quality of each review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial, or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered “high scores.” A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1):S8).

All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

**Appendix 1: Summary of findings from systematic reviews about effectiveness and cost-effectiveness of rehabilitation-care models for frail seniors**

Type of review	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Systematic review of effects	Effects of physical rehabilitation on activities of daily living in older residents of long-term care facilities.(10)	Physical rehabilitation may improve independence for elderly residents of long-term care facilities, although the size of improvement may be small.	2013	7/11 (AMSTAR rating from Program in Policy Decision-making)	Not reported
Systematic review of effects	Services for reducing duration of hospital care for acute stroke patients.(16)	Those patients who received early supported discharge services – which allow patients to receive rehabilitation at home – returned home earlier, were more likely to remain at home in the long term, and to regain independence in daily activities, as compared to those who received conventional care.  The greatest benefits were seen with well-organized discharge teams and in stroke patients with less severe strokes.  Early supported-discharge services can reduce long-term dependency, admission to institutional care, and the length of hospital stay for some stroke patients.  No adverse effects were observed on the mood or subjective health status of patients or carers.	2012	10/11 (AMSTAR rating from Program in Policy Decision-making)	1/14
Systematic review of effects	High-intensity progressive resistance strength training of the lower limb compared with other intensities of strength training in older adults.(14)	High-intensity progressive resistance strength training may improve strength more than lower intensity strength training  Training intensity did not appear to impact significantly on other outcomes, including function, mood and quality of life.  Training volume is an important factor when considering strength gains achieved.	2012	5/11 (AMSTAR rating from Program in Policy Decision-making)	Not reported
Systematic review of effects	Assessment of the costs of rehabilitation interventions in inpatient versus alternative settings, and whether any cost savings associated with different inpatient care models have an impact on the outcomes achieved.(26)	The review found high-level evidence that rehabilitation in the home or community is less costly than inpatient rehabilitation.  There is moderate-level evidence that inpatient rehabilitation in stroke units is less costly than general acute post-stroke care.  Function, quality of life, discharge destination, and mortality were not compromised as a result of a less costly intervention.	2011	10/11 (AMSTAR rating from Program in Policy Decision-making)	2/29

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Systematic review of effects	Inpatient rehabilitation versus home-based rehabilitation for older adults with musculoskeletal disorders.(17)	<p>Home-based rehabilitation was equal or superior to hospital-based rehabilitation in almost all patient outcomes assessed, including function, cognition and quality of life.</p> <p>Higher levels of satisfaction were reported with home-based rehabilitation.</p> <p>Rehabilitation at home should be considered as an alternative to hospital rehabilitation.</p>	2011	5/10 (AMSTAR rating from Program in Policy Decision-making)	2/12
Systematic review of effects	Effect of exercise on physical function, daily living activities, and quality of life in frail older adults.(13)	<p>Providing exercise interventions to frail older adults improved gait speed, balance and performance in activities of daily living.</p> <p>Exercise interventions had no significant effects on a test of physical function (Timed Up and Go test) or quality of life.</p> <p>The exercise programs evaluated in the review included flexibility, low or intensive resistance, aerobic, coordination, balance and Tai-Chi exercises; repetitive performance of ADLs; and task-oriented or gait training.</p> <p>The programs provided 60-90 minute sessions that were delivered daily or weekly over periods lasting from three to 12 months.</p> <p>Each exercise program generally involved 60- to 90-minute sessions, repeated daily or weekly for three to 12 months.</p>	2010	8/11 (AMSTAR rating from Program in Policy Decision-making)	Not reported
Systematic review of effects	Multidisciplinary rehabilitation for older people with hip fractures.(23)	<p>There is some evidence that suggests multidisciplinary rehabilitation may help older people recover after a hip fracture, although this result cannot be considered conclusive.</p> <p>The evidence indicates that multidisciplinary rehabilitation is not harmful.</p> <p>The evidence is inconclusive as to whether multidisciplinary rehabilitation did not add to the burden of carers.</p>	2009	10/11 (AMSTAR rating from Program in Policy Decision-making)	1/13



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<p>Systematic review of effects</p>	<p>Inpatient rehabilitation specifically designed for geriatric patients.(22)</p>	<p>Inpatient rehabilitation specifically designed for geriatric patients shows beneficial effects over usual care for improving functional status, and reducing admissions to nursing homes and mortality.</p> <p>Inpatient rehabilitation showed a short-term effect after discharge in addition to a less pronounced long-term effect at the end of follow-up.</p> <p>There is insufficient evidence to assess cost-effectiveness of successful programs.</p> <p>Intervention characteristics that were hypothesized to potentially have an impact on the overall effects of the intervention:</p> <ul style="list-style-type: none"> <li>• type of intervention program (general geriatric/orthopedic);</li> <li>• mean (or median) age of total study population (<math>\leq 80</math> v <math>&gt; 80</math>);</li> <li>• length of hospital stay after randomization in the intervention group (<math>\leq 21</math> v <math>&gt; 21</math> days);</li> <li>• outpatient follow-up therapy after the trial for patients in the intervention group (yes/no);</li> <li>• length of follow-up for outcome evaluation (<math>\leq 6</math> v <math>&gt; 6</math> months)</li> <li>• quality of the intervention program (use of multidimensional geriatric assessment and assignment of patients); and</li> <li>• methodological trial quality (concealment of allocation, blinding of outcome assessor, and analysis by intention to treat).</li> </ul>	<p>2008</p>	<p>10/11 (AMSTAR rating from Program in Policy Decision-making)</p>	<p>1/17</p>
<p>Systematic review of effects</p>	<p>Multidisciplinary rehabilitation for hip fracture.(24)</p>	<p>Multidisciplinary rehabilitation following hip fracture results in a lower risk of a poor outcome, defined as either death or nursing home admission after discharge from hospital.</p> <p>To avoid a poor outcome, 24 people need to be treated (NNT=24).</p> <p>Organized multi-disciplinary rehabilitation should be provided for patients with hip fracture.</p>	<p>2007</p>	<p>7/10 (AMSTAR rating from Program in Policy Decision-making)</p>	<p>1/11</p>

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Systematic review of effects	Interventions to prevent disability in frail community-dwelling older adults.(12)	<p>No evidence was found for the effect of nutritional interventions on disability measures.</p> <p>The physical exercise interventions involved two single-component programs focusing on lower extremity strength, and six multi-component programs addressing a variety of physical parameters.</p> <p>Out of eight physical exercise interventions, three reported positive outcomes for disability.</p> <p>There was no evidence for the effect of single lower extremity strength training on disability.</p> <p>Differences between the multi-component interventions in individualization, duration, intensity and setting hamper the interpretation of the elements that consistently produced successful outcomes.</p> <p>There is an indication that relatively long-lasting and high-intensive multicomponent exercise programs have a positive effect on activities of daily living and instrumental activities of daily living for community-living, moderately physically frail older persons.</p>	2007	7/10 (AMSTAR rating from Program in Policy Decision-making)	1/10
Systematic review of effects	Care home versus hospital and home environments for rehabilitation of older people.(19)	Evidence was deemed insufficient to compare the effects of care-home environments, hospital environments and own-home environments on older persons' rehabilitation outcomes.	2007	6/6 (AMSTAR rating from Program in Policy Decision-making)	No studies met the inclusion criteria for this review
Systematic review of effects	Hip fracture rehabilitation practices in the elderly.(25)	An older medium-quality review analyzed hip fracture rehabilitation practices in the elderly and found 55 studies that were distributed across six types of rehabilitation intervention categories (care pathways, early rehabilitation, interdisciplinary care, occupational and physical therapy (PT), exercise and unspecified interventions) and three settings (acute care in hospital, post-acute care/rehabilitation and post-rehabilitation).	2007	5/9 (AMSTAR rating from Program in Policy Decision-making)	Not reported
Systematic review of effects	Home versus centre-based physical activity programs in older adults.(18)	<p>In the short term (three months), there is limited evidence that centre-based programs are superior to home-based programs for patients with peripheral vascular disease.</p> <p>There was mixed evidence as to whether home or centre-based activity programs were more beneficial for older adults with chronic obstructive pulmonary disease.</p> <p>A significantly higher adherence rate was found with home-based programs, as compared to centre-based programs (especially in the long term).</p>	2005	10/10 (AMSTAR rating from Program in Policy Decision-making)	Not reported

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<p>Systematic review of effects</p>	<p>Occupational therapy for community dwelling elderly people.(15)</p>	<p>There is strong evidence that advising on assistive devices as part of a home hazards assessment increases functional ability.</p> <p>There is limited evidence that training of skills combined with instruction in the use of assistive devices reduces the incidence of falls in elderly people at high risk of falling.</p> <p>There is limited evidence for the efficacy of comprehensive occupational therapy on functional ability, social participation and quality of life.</p> <p>Evidence was deemed insufficient for assessing the efficacy of counselling the primary caregiver of dementia patients in maintaining the patient's functional abilities.</p> <p>Occupational therapy for community dwelling elderly people has beneficial outcomes.</p>	<p>2002</p>	<p>8/10 (AMSTAR rating from Program in Policy Decision-making)</p>	<p>Not reported</p>
<p>Systematic review of effects</p>	<p>Home rehabilitation after stroke.(21)</p>	<p>There were no differences in outcome between home rehabilitation and conventional care for ADL functions, depression, quality of life, or social activities for patients, or for stress, social activities, satisfaction, depression, and quality of life for family members.</p> <p>Limited evidence suggests that home rehabilitation may be less costly than regular day care, but more costly than conventional care.</p> <p>The outcomes and costs of home rehabilitation after stroke appear to be comparable to alternative strategies.</p>	<p>1999</p>	<p>5/9 (AMSTAR rating from Program in Policy Decision-making)</p>	<p>0/13</p>
<p>Systematic review addressing other questions</p>	<p>Costs and effects of advanced home healthcare and home rehabilitation.(20)</p>	<p>For palliative care and the care of children, patients and family members reported higher levels of satisfaction with home health services compared to hospital care. For symptom control, functional ability, and perceived quality of life, the results were comparable.</p> <p>As there is no evidence that indicates home healthcare results in different costs than other alternatives, free choice and quality should serve as guiding principles when planning advanced home health services.</p> <p>Home rehabilitation provides comparable results to alternative forms of rehabilitation with respect to patients' quality of life and ability to care for themselves. Costs were also comparable.</p> <p>Freedom of choice and local conditions should be key considerations when deciding on how to organize home rehabilitation.</p>	<p>1995</p>	<p>1/9 (AMSTAR rating from Program in Policy Decision-making)</p>	<p>Not reported</p>

**Appendix 2: Summary of findings from primary studies about effectiveness and cost-effectiveness of rehabilitation-care models for frail seniors**

Focus of study	Methods	Publication date	Sample description	Jurisdiction(s) studied	Key features of the intervention(s)	Key findings
Economic evaluation of a geriatric rehabilitation program.(29)	Cost-effectiveness analysis	2010	Older adults with progressively decreasing functional ability and unspecific morbidity	Finland	Inpatient rehabilitation program as compared to standard care	The designed rehabilitation program was not more cost-effective than standard care.
Cost-effectiveness of post-acute care for older adults in a community hospital.(27)	Cost-effectiveness analysis	2006	Older adults receiving post-acute care	United Kingdom (England)	Post-acute care delivered in community hospitals as compared to general, multidisciplinary hospital care	The cost effectiveness of post-acute rehabilitation for older people was similar in both the community and general hospital setting.
Cost-effectiveness of post-acute care for older adults in community hospitals.(28)	Cost-effectiveness analysis	2008	Older adults receiving post-acute care	United Kingdom (England)	Post-acute care delivered in community hospitals as compared to general hospital care	The cost effectiveness of post-acute rehabilitation for older people was similar in both community hospitals and general hospitals.
Economic evaluation of a residential rehabilitation unit for older people on discharge from hospital.(30)	Cost-effectiveness analysis	2006	Older adults likely to benefit from a short-term rehabilitation program	United Kingdom (England)	Residence in a short-term rehabilitation unit for older adults on discharge from community hospitals, as compared to 'usual' community services accessed from home	The two interventions were equally effective.  Since the two models of care are equally effective and efficient, the choice of the strategy may depend on other factors.
Economic analysis of an early discharge rehabilitation service for older people.(31)	Cost-effectiveness analysis	2005	Older adults who were medically fit for discharge and had social and rehabilitation needs that could be met at home	United Kingdom (England)	Early discharge and rehabilitation service, as compared to usual care (i.e. routine social services, outpatient rehabilitation)	An adequately equipped early supported-discharge service is likely to be more cost effective than usual care.
Cost-effectiveness of preventive occupational therapy for independent-living older adults.(32)	Cost-effectiveness analysis	2002	Independent-living older adults	United States	Preventive occupational therapy, as compared to social activity (active control) and non-treatment (passive control)	Preventive occupational therapy showed a trend toward reduced medical expenditures.  Preventive occupational therapy was more cost-effective than the general social activity program or no therapy at all.