The road to successful geriatric rehabilitation

Holstege, M.S.

CHAPTER 7

General discussion

The overall aim of this thesis is to investigate aspects of both structure and processes in geriatric rehabilitation related to the outcome of successful rehabilitation.

PART 1. ASPECTS OF SUCCESSFUL GERIATRIC REHABILITATION

The first part of this thesis presents two observational studies investigating structure and process aspects on the outcome of successful rehabilitation. First, we investigated the effects of organization structure (patient volume and service concentration) as a proxy for specialization on geriatric rehabilitation outcomes. We performed a post-hoc analysis in a national multicenter retrospective cohort study in skilled nursing facilities that provide geriatric rehabilitation in the Netherlands. This study showed that high service concentration, but not volume, may favor a shorter length of stay and discharge home for patients with total joint replacement. In addition, trauma patients in a concentrated ward had a greater chance to be discharged to home compared with trauma patients in a non-concentrated ward (**Chapter 2**). Second, in patients undergoing unilateral total hip replacement, we investigated whether preoperative strength of the muscle groups of the lower extremity is associated with postoperative functional recovery. The conclusions drawn from this prospective observational cohort are that preoperative greater musculus quadriceps femoris strength of the operated side is associated with better physical functioning, measured with the self-reported Western Ontario and McMaster Universities Osteoarthritis (WOMAC) physical functioning scale, 12 weeks postoperatively (**Chapter 3**).

In summary, the first part of this thesis shows that some aspects of structure and process are associated with successful geriatric rehabilitation. Development and improvement of the organizational structure and processes of care are needed to improve positive outcomes in geriatric rehabilitation. However, there is a lack of studies focusing on quality improvement in geriatric rehabilitation. Also, it remains unclear whether development of organizational structure and processes has an effect on the perspectives of professionals, patients and informal caregivers on the quality of care and on patient outcomes.

PART 2. INITIATIVES TO IMPROVE GERIATRIC REHABILITATION OUTCOMES

The second part of this thesis focuses on initiatives of skilled nursing facilities aiming to improve successful geriatric rehabilitation outcomes. The Synergy and Innovation in Geriatric Rehabilitation (SINGER) study was designed together with a government initiated program ('Proeftuinen geriatrische revalidatie') to improve the quality of care

through development of geriatric rehabilitation services. The SINGER study is a prospective longitudinal study with the participation of 16 skilled nursing facilities. The first SINGER study (**Chapter 4**) is a prospective cohort study describing changes in the geriatric rehabilitation service delivery process as experienced by professionals (elderly-care physicians, physiotherapists and nursing staff), patients, and their informal caregivers. The main goals of the development of integrated care fall into four domains of geriatric rehabilitation service delivery i.e. alignment with patients' care needs, care coordination, team cooperation and quality of care. During the national program small improvements were made in team cooperation (including assessment for intensive treatment and information transfer among professionals), but fewer improvements were found in alignment with patients' needs, care coordination, and care quality. No effects were found for patients' and informal caregivers' perceptions of geriatric rehabilitation service delivery. The perceptions of the geriatric rehabilitation service delivery were high at the start of the national program, which left little room for improvement due to this ceiling effect. The second SINGER study (**Chapter 5**) describes patient outcomes of successful rehabilitation after comparing two consecutive cohorts; i.e. at the start of implementation and at 1-year post-implementation of this national program. The program resulted in 12% more independency in activities of daily living (ADL) at discharge in the total geriatric rehabilitation population. Successful geriatric rehabilitation (independency in ADL, discharge home, and short length of stay) was not higher 1-year post-implementation of the national program. However, in patients with traumatic injuries, at 1-year post-implementation there was more successful rehabilitation compared with the start of implementation [OR 1.61; 95% CI 1.01-2.54]. In the subgroup of patients with stroke, independency in ADL increased at 1-year post-implementation of the program compared with the start of the program [OR 1.99; 95% CI 1.09-3.63].

In other words, the SINGER study showed small positive effects on geriatric rehabilitation service delivery process in the perception of professionals. Patients' and informal caregivers' perceptions of the process of care were similar after 1-year of implementation (**Chapter 4**). One year after implementation of the Dutch national program there was more independency in ADL at discharge, whereas the combined outcome of successful geriatric rehabilitation (independency in ADL, discharge home, short length of stay) showed significant improvement only in patients with traumatic injuries (**Chapter 5**).

The BACK-HOME study (**Chapter 6**), describes a local initiative (within the University Network of the Care sector South-Holland, UNC-ZH) for structured discharge planning with weekly scoring of a nursing support scorecard, and discussion of the results in the multidisciplinary geriatric rehabilitation team. The BACK-HOME study shows that structured scoring of supporting nursing tasks in geriatric rehabilitation may lead to earlier discharge from a skilled nursing facility to home, if no home adjustments of the home environment are required. The use of a nursing support scorecard may help as a

tool to target which patients have the potential to be discharged home, and to discuss the results in a multidisciplinary team meeting to establish if discharge home planning is really feasible.

This general discussion places successful geriatric rehabilitation in a broader perspective and addresses the methodological challenges involved when studying outcomes in geriatric rehabilitation. The discussion ends by considering which aspects of structure and processes need attention to improve successful outcomes, the implications for clinical practice, and some recommendations are made for future research.

PERSPECTIVES ON SUCCESSFUL GERIATRIC REHABILITATION

This thesis describes the evolvement in the outcome of successful geriatric rehabilitation aimed at a combined outcome measure consisting of the following factors i) being independent in ADL at discharge, ii) being discharged to home, and iii) having a short length of stay (≤25% of length of stay in the skilled nursing facility for each diagnostic group). This combined outcome measure was based on the overall aim of geriatric rehabilitation to restore physical functioning, or enhance residual functional capability and participation in older patients aiming at discharge to home. We added the component 'short length of stay' as we believe that healthcare resources should be used as efficiently as possible. In addition, a short length of stay with discharge to home (possibly with outpatient or home rehabilitation) has potential positive effects on regaining independency in ADL after discharge.[1-5] Many studies have focused on single outcomes of successful rehabilitation, such as length of stay, or discharge destination.[6, 7] In our opinion, the combination of components targets success better than the use of separate components. An even more desirable outcome would also include the 'patient's perspective' on the outcome of successful rehabilitation on the functional and participation level.

This combined outcome measure is an overall measure for the total population receiving geriatric rehabilitation. This also enables to compare performances within geriatric rehabilitation diagnostic groups and between facilities, when adjusted for case-mix characteristics. The combined measure consists of three perspectives, i.e. the patient's, the professional's, and the management perspective. However, because the term 'successful geriatric rehabilitation' is potentially ambiguous, these three perspectives are described in detail below to provide a broader view.

Patient perspective

In a prospective multicenter cohort study among geriatric rehabilitation patients receiving post-acute care in a hospital ward, the patients reported regaining ADL, return to

home, reduction of pain, regaining autonomy and improving general health condition as the most important goals.[8] The conclusions of a report from the Dutch Federation of Patients and Consumers Organizations (NPCF) on patients' perspectives in geriatric rehabilitation were that patients found it most important to be discharged to home and to be actively involved in the rehabilitation process.[9] The patient perspective on geriatric rehabilitation is not focused on one part of the care pathway, but based on the total care pathway from (pre-) acute care in hospital to post-acute care in the skilled nursing facility, followed by outpatient or home rehabilitation with home health care if needed.[9] In this thesis we did not study the patient perspective on the outcome of successful geriatric rehabilitation; however, this is an interesting topic for future research. In **Chapter 4** we described the patient's and informal caregiver's perspectives on geriatric rehabilitation service delivery processes during the implementation of a national program to improve the quality of geriatric rehabilitation. The results show overall positive patient and informal caregiver perceptions of health service delivery. Patients and informal caregivers rated the care pathway with a 7.3 (SD 1.3) (on a 0-10 scale). In **Chapter 4**, 61% of the patients and 48% of the informal caregivers rated the professionals dealing with their individual needs during geriatric rehabilitation as good or excellent. This implies that there is room for improvement.

When does the patient consider the outcome of geriatric rehabilitation to be successful? This should be an important question when setting rehabilitation goals. Active involvement of the patient and informal caregiver in goal setting, reporting on outcomes and decision-making, can improve positive experience with quality of care, regaining autonomy, and may increase intervention adherence.[10-14] There are initiatives for the development and implementation of goal attainment scaling in geriatric rehabilitation, e.g. the Canadian Occupational Performance Measure (COPM)[15] and the Goal Attainment Scale (GAS).[16, 17]

Both scales are individualized measures to identify and prioritize rehabilitation goals and rate the performance of the goals set by the patient in cooperation with a professional.

Development of patient-reported outcome measures (PROMs) is important when aiming to improve patient-centered care. PROMs can give insight into the patient's own opinion about the impact of their functioning on their daily life.[18, 19] **In Chapter 3**, the primary outcome 'functional recovery' was measured with the WOMAC physical function scale.[20] The WOMAC is a disease-specific PROM for patients with osteoarthritis of the hip and knee. No such PROM is available for measuring functioning in the total population of geriatric rehabilitation. Besides functional assessment, regaining participation in daily living is an important goal of geriatric rehabilitation; also, on a participation level, PROMs are needed to evaluate geriatric rehabilitation. More studies are required to develop and validate PROMs for geriatric rehabilitation.

Professional perspective

One of the main characteristics of geriatric rehabilitation is a multidisciplinary patient-centered approach. Structured and coordinated multidisciplinary team work with balanced and tailored interventions has a positive effect on functional improvement.[21] Goal setting can be challenging because the desired outcome of geriatric rehabilitation is dependent upon different context variables, such as patient-related factors (e.g. functioning, capacity, activities of daily living, participation in social life) and environmental factors (e.g. housing situation).[22] The patient's goals should be aligned with what professionals think is feasible within the rehabilitation period, and frequently evaluated when considering these context variables.[23] For this purpose, professionals need specific expertise and experience in geriatric rehabilitation.[21] Early assessment of rehabilitation goals, and discharge possibilities and barriers, may enhance discharge planning (**Chapter 6**). The BACK-HOME study showed that nursing staff can play an important role in targeting patients for possible discharge. The nursing support scorecard has the potential to assist staff to identify patients that are eligible for early discharge. After a patient is identified for discharge, the outcome on the scorecard is discussed in the multidisciplinary team to evaluate whether discharge home is in fact feasible (**Chapter 6**).

Management perspective

An increasing number of older patients with comorbidities have a need for rehabilitation resources. Reducing the length of stay is considered an indicator for efficient use of healthcare resources.[24] By reducing the length of stay, healthcare services can treat more patients and have shorter waiting lists. However, reducing the length of stay should not be achieved at the expense of quality of care and patient outcomes.[24] The costs and benefits of the geriatric rehabilitation pathway should be carefully weighed, taking into account patient, professional and management perspectives.[25]

No set of outcome measurements is currently available for geriatric rehabilitation across all settings to facilitate quality improvement and provide insight into the efficiency of the healthcare resources.[26] When aiming to further develop the quality of post-acute geriatric rehabilitation, improvements on different aspects of structure and process level are needed.[26]

METHODOLOGICAL CHALLENGES WHEN STUDYING OUTCOMES IN GERIATRIC REHABILITATION

Various challenges exist when investigating successful outcomes in geriatric rehabilitation. Because geriatric rehabilitation is a relatively young field of research, few evidence-based intervention strategies are available. Also, little is known about the dose-response

relations of therapy in geriatric rehabilitation, or which types of patients need which type of intervention frequency, intensity and setting, and which patients benefit most from geriatric rehabilitation.[27, 28]

Geriatric rehabilitation is multidisciplinary integrated care involving different health-care providers for patients with complex care problems. It is a worldwide challenge how to initiate, develop and evaluate integrated care for patients with complex care needs.

In this thesis, observational study designs were used to address the research questions. This type of study design has the advantage of providing information on the outcomes of geriatric rehabilitation in a 'real-world' setting and allows the inclusion of patients with co-morbidities and complications; this is not possible in clinical trials because of the strict eligibility criteria.[29] This thesis provides insight into the outcomes of successful geriatric rehabilitation on a national level **(Chapter 2),** regional level **(Chapters 4 and 5),** and local level **(Chapters 3 and 6).** A disadvantage is that the outcome of observational studies can be affected by selection bias and confounding variables, which can reduce the internal/external validity of the outcomes. Another methodological challenge is that, in geriatric rehabilitation practice, no validated set of outcome measurements is available, which makes it difficult to compare research outcomes. A good infrastructure for research and development in skilled nursing facilities (such as an academic nursing home network) is needed to enable coordinated research in geriatric rehabilitation and to implement research outcomes into daily practice.[30]

THE ROAD TO SUCCESSFUL GERIATRIC REHABILITATION

Improving the quality of geriatric rehabilitation consists of multiple factors on the structure and process level. However, because geriatric rehabilitation is a relatively young field of research we are still in the early stages of exploring which aspects of structure and process may help to improve geriatric rehabilitation.[26] Nevertheless, the following brief summary of clinical implications and recommendations can be drawn from the work in this thesis:

Structure:

1. Organizational structure: service concentration and patient volume
2. Research and innovation in skilled nursing facilities

Process:

3. Coordinated multidisciplinary care
4. Early discharge planning
5. Early assessment of barriers for discharge

6. Systematic evaluation with standardized measures

1. Organizational structure: service concentration and patient volume

In this thesis, we studied the effects of the organizational structure characteristics 'service concentration' and 'patient volume' on successful outcomes in geriatric rehabilitation **(Chapter 2).** Service concentration was defined as ≥ 80% of the population in a geriatric rehabilitation ward of a skilled nursing facility consisting of 1 or 2 diagnostic groups. Additionally, the facility should have a minimum of 10 rehabilitation beds. In a Dutch guideline for geriatric rehabilitation, a minimum of 10 beds is recommended in order to compose a multidisciplinary specialized team.[31] Patient volume was based on the total population receiving geriatric rehabilitation and categorized into tertile groups, categorized into low, medium and high volume.[32]

Internationally, discussion on the concentration of services and patient volume is an important topic among researchers and policymakers. High volume and concentration of services is thought to be a facilitator for good quality by health insurance companies and policymakers. In high-risk surgical procedures, there is evidence that high patient volume is related to lower complication and mortality rates.[33, 34] One study developed an extended methodology to examine the volume-effectiveness relationship in hip fracture patients. That study found a positive association with higher volume in rehabilitation units on the 4-month mortality rate, but not with hospital volume. These earlier studies focused on the effect of volume on mortality and readmission rates, whereas the effect of volume on patient functional recovery and cost-effectiveness remains unknown.[35]

In **Chapter 2** we reported that a high concentration of services in patients with joint arthroplasty has a positive effect on shorter length of stay in combination with discharge to home. Patient volume was not associated with the outcome of faster discharge to home. In order to improve the organization of geriatric rehabilitation, reasons for the benefit of concentration with discharge to home with a short length of stay for patients recovering from joint replacement also need further research. In our study, we used a narrow definition of successful rehabilitation because we lacked data on patients' functional and participation outcome. There is considerable evidence that stroke units (concentration of services) are efficient; however, evidence is lacking for geriatric rehabilitation post-acute services.[6]

In conclusion, more research is required to explore whether concentration of services and patient volume are a good proxy for specialization, and to establish which components of organizational structure are beneficial to successful geriatric rehabilitation in terms of cost-effectiveness and successful patient outcomes.

2. Research and innovation in skilled nursing facilities

Because geriatric rehabilitation is a relatively young field of research, more evidence-based practice, expertise and knowledge exchange is required. Introducing a research and innovation culture within skilled nursing facilities could facilitate this development. When developing geriatric rehabilitation, it is a challenge to examine possibilities of new innovative methods, such as e-health solutions, in order to optimize the outcome of successful geriatric rehabilitation.[36, 37] An innovative culture provides patients with access to innovative treatments, and professionals with the opportunity to improve clinical practice and develop expertise. An innovative culture also attracts outstanding clinicians which, in turn, facilitates the research culture.[30 38, 39] Professionals working in geriatric rehabilitation should have the opportunity to develop research expertise in the field and have the time, capacity and education to develop these skills and share best practices. Until know, funds for research in geriatric rehabilitation are limited, whereas specific funding might enhance research possibilities in the skilled nursing facilities. A research agenda is required to define and align research topics and questions between academia and practice.

The Netherlands has five university nursing home networks. These networks combine the expertise of elderly-care medicine departments with practical and organizational expertise of skilled nursing facilities. Care professionals collaborate with university researchers to improve the quality of care by developing, implementing and testing new initiatives.[30] Evidence-based practice combines the best available evidence with clinical expertise and patient's preferences and values. The BACK-HOME study **(Chapter 6)** is a good example of professionally-initiated research, supported by a university nursing home network which resulted in the implementation and evaluation of structured scoring of supporting nursing tasks to identify early discharge potential. Combining a research and innovation culture within skilled nursing facilities with the expertise of universities is needed to develop research in geriatric rehabilitation and to implement the results into practice.[30, 40]

3. Coordinated multidisciplinary care

The structure and processes of care for patients with complex care needs are often fragmented, causing inefficiency and poor quality outcomes.[41, 42] One of the main goals of geriatric rehabilitation is to provide coordinated multidisciplinary care to improve patient outcomes.[43] However, because of the different healthcare providers and professionals involved, optimal coordination, communication and continuity of care between settings is also required.[44]

The SINGER study **(Chapters 4 and 5)** monitored the process and effect outcomes of a national program aimed at stimulating integrated care ('Proeftuinen geriatrische revalidatie'). This thesis provides insight into the main goals of development in optimizing

integrated care formulated by the participating organizations (Chapter 4). The national program resulted in small improvements in team cooperation. The goals of development in team cooperation consisted of improving the inter-professional communication and alignment of professional performance. Team cooperation is a crucial aspect of integrated care because of the complementary role of the professionals and the interdependency between professionals.[21, 26, 45] Fewer process improvements were reported in the other three domains (alignment with patients' needs, care coordination, and care quality). This suggests that either very little change took place, or that we were unable to detect the improvement on a process level. However, other measurement tools might have been needed to capture the specific improvements being made, instead of the more general assessments of these different domains.

Despite the small improvements on the process level, the effect evaluation in the total population resulted in more ADL independency after 1-year of implementation of the national program, compared with the start of the program. However, the combined outcome (independency in ADL, discharge home and short length of stay) was higher only in patients with traumatic injuries. The efforts of the participating skilled nursing facility to improve the quality of geriatric rehabilitation seem to have yielded a positive movement towards improving the quality of geriatric rehabilitation. Participation in the program seems to have energized the skilled nursing facilities to organize projects aimed to improve or develop integrated care. Evidence on the effectiveness and cost-effectiveness of interventions in geriatric rehabilitation is scarce. Developments of more specific interventions are needed to further develop the four main domains (team cooperation, alignment with patient needs, care coordination, and care quality) and to explore which active ingredients lead to successful outcomes.

4. Early discharge planning

Timely home discharge is thought to improve functioning in ADL after discharge, in both stroke and trauma patients.[3] Patients may be more encouraged to resume ADL in their own home. The BACK-HOME study **(Chapter 6)** shows that structured scoring of supporting nursing tasks during the evenings and nights has the potential to lead to earlier discharge from a skilled nursing facility in patients for whom no new adjustments of the home environment are required. This implies that nursing staff can play a prominent role in detecting patients for possible discharge with structured scoring of the supporting nursing tasks during evening and night and discussing this in the multidisciplinary team meetings. However, more research is needed to explore the potential benefits of early discharge in geriatric rehabilitation on long-term outcomes on patient functioning, participation and the amount of healthcare resources used.

Besides patient-related factors (e.g. mental or physical capacity), environmental factors (e.g. delay of home adjustments) play an important role in discharge delay. These

factors should be discussed with the patient and informal caregiver early in rehabilitation, and evaluated in the multidisciplinary team to set rehabilitation goals and consider discharge possibilities. Development of instruments for early identification of possible barriers for discharge, such as environmental factors (e.g. home adjustments), could avoid discharge delay. Also, regulations to purchase home adjustments could delay timely discharge. More research is needed on the (predictive) validity of the nursing support scorecard and to explore patient-related and environmental barriers for discharge to improve tailored and efficient discharge planning **(Chapters 3 and 6).** In addition, further development and exploration of the feasibility and effectiveness of outpatient or home rehabilitation programs following post-acute care are needed.

5. Early assessment of barriers for discharge

Insight in (pre-operative) predictors for functional outcome in geriatric rehabilitation provides information on rehabilitation potential and can help improve discharge planning.[46] In this thesis, greater preoperative quadriceps strength was a predictor for better short-term functional outcome measured with the self-reported WOMAC physical functioning scale[20] in patients undergoing a total hip replacement **(Chapter 3).** In that study, no association was found with performance-based measures (e.g. Timed Up and-Go[47], 6-Minute Walking Test[48]). Additional research is needed to confirm this finding in larger samples and to examine the optimal timing for surgery and effects of preoperative strength training on successful rehabilitation outcomes in patients with joint replacement. A recent systematic review showed that preoperative pain and physical functioning, higher body mass index, presence and amount of comorbidity, worse general health and lower radiographic osteoarthritis severity were also associated with poor outcomes.[46] However, the strength of these associations could not be assessed due to heterogeneity between the studies.[46] Because joint replacements are 'planned care', in contrast to acute events such as stroke or trauma patients, this group of patients are particularly suitable for preoperative screening and assessment of overall functioning. Although better preoperative functioning may be associated with improved outcomes, until now there is no clinical consensus or strong empirical evidence about the necessity, optimal timing and effect of preoperative strength training in patients with a unilateral total hip replacement.[46]

6. Systematic evaluation with standardized measures

To further develop geriatric rehabilitation, it is important to analyze the outcomes of geriatric rehabilitation when changing or developing the structure and processes of care **(Chapter 4).** Internationally, there has been a shift from focusing on patient safety as an outcome, towards patient-related outcomes.[26] However, no common outcome measurement has been established between skilled nursing facilitates providing

post-acute geriatric rehabilitation and rehabilitation service organizations (hospital, skilled nursing facility, home care agencies).[27] Systematic evaluation with standardized measures at fixed moments is needed to evaluate individual rehabilitation goals and the quality of care within and between geriatric service organizations. Such a standardized outcome measurement set could facilitate research and knowledge exchange in geriatric rehabilitation.[27] Recently, the University Network for the Care sector South-Holland (UNC-ZH) developed the first measurement set for the evaluation of outcomes in geriatric rehabilitation on both patient and facility level. Future research should focus on development and validation of a measurement set for the geriatric rehabilitation population. The domains of the WHO model of International Classification of functioning, disability and Health (ICF) can be used to select and develop these measurement scales.[22, 28] In addition to the ICF framework, Jesus et al. developed a conceptual framework for the development of quality of care in post- acute geriatric rehabilitation. In this framework, also macro-outcomes measured after discharge are included, such as patients' and caregivers' health-related quality of life, consumers' experience, place of discharge, healthcare utilization, and functional performance. These various outcomes can provide us with a broader view on geriatric rehabilitation in general.

REFERENCES

1. Donohue K, Hoevenaars R, McEachern J, et al. Home-Based Multidisciplinary Rehabilitation following Hip Fracture Surgery: What Is the Evidence? *Rehabil Res Pract* 2013; 2013:875968.
2. Crotty M, Whitehead CH, Gray S,et al. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomized controlled trial. *Clin Rehabil* 2002; 16:406-13.
3. Langhorne P, Taylor G, Murray G, et al. Early supported discharge services for stroke patients: a meta-analysis of individual patients' data. *Lancet* 2005; 365:501-6.
4. Geddes JM, Chamberlain MA. Home-based rehabilitation for people with stroke: a comparative study of six community services providing co-ordinated, multidisciplinary treatment. *Clin Rehabil* 2001; 15:589-99.
5. Shepperd S, Lannin NA, Clemson LM, et al. Discharge planning from hospital to home. *Cochrane Database Syst Rev* 2013; 1:CD000313.
6. Bachmann S, Finger C, Huss A, et al. Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2010; 340:c1718.
7. Schouten LM, Hulscher ME, Akkermans R, et al. Factors that influence the stroke care team's effectiveness in reducing the length of hospital stay. *Stroke* 2008; 39:2515-21.
8. Kus S, Muller M, Strobl R, et al. Patient goals in post-acute geriatric rehabilitation--goal attainment is an indicator for improved functioning. *J Rehabil Med* 2011; 43:156-61.
9. Dutch federation of patients and consumers organizations (NPCF) [in Dutch]. Pathways for restorative care; What do patients consider important? 2010.
10. Wressle E, Eeg-Olofsson AM, Marcusson J, et al. Improved client participation in the rehabilitation process using a client-centred goal formulation structure. *J Rehabil Med* 2002; 34:5-11.
11. Kristensen HK, Tistad M, Koch L, et al. The Importance of Patient Involvement in Stroke Rehabilitation. *PLoS One* 2016; 11:e0157149.
12. Baillie L, Gallini A, Corser R, et al. Care transitions for frail, older people from acute hospital wards within an integrated healthcare system in England: a qualitative case study. *Int J integr Care* 2014; 14:e009.
13. Mastellos N, Gunn L, Harris M, et al. Assessing patients' experience of integrated care: a survey of patient views in the North West London Integrated Care Pilot. *Int J integr Care* 2014; 14:e015.
14. Mirzaei M, Aspin C, Essue B, et al. A patient-centred approach to health service delivery: improving health outcomes for people with chronic illness. *BMC Health Service research* 2013; 13:251.
15. Law M, Baptiste S, McColl M, et al. The Canadian occupational performance measure: an outcome measure for occupational therapy. *Can J Occup Ther* 1990; 57:82-7.
16. Turner-Stokes L. Goal attainment scaling (GAS) in rehabilitation: a practical guide. *Clin Rehabil* 2009; 23:362-70.
17. Kiresuk TJ, Sherman RE. Goal attainment scaling: A general method for evaluating comprehensive community mental health programs. *Community Ment Health J* 1968; 4:443-53.
18. Kyte DG, Calvert M, van der Wees PJ, et al. An introduction to patient-reported outcome measures (PROMs) in physiotherapy. *Physiotherapy* 2015; 101:119-25.
19. Black N. Patient reported outcome measures could help transform healthcare. *BMJ* 2013; 346:f167.
20. Roorda LD, Jones CA, Waltz M, et al. Satisfactory cross cultural equivalence of the Dutch WOMAC in patients with hip osteoarthritis waiting for arthroplasty. *Ann Rheum Dis* 2004; 63:36-42.
21. Levenson SA. Past as prologue: applying enduring evidence to improve rehabilitative care. *J Am Med Dir Assoc* 2013; 14:715-6.

22. Gladman JR. The international classification of functioning, disability and health and its value to rehabilitation and geriatric medicine. *J Chin Med Assoc* 2008; 71:275-8.
23. Plant SE, Tyson SF, Kirk S, et al. What are the barriers and facilitators to goal-setting during rehabilitation for stroke and other acquired brain injuries? A systematic review and meta-synthesis. *Clin Rehabil* 2016; 30:921-30.
24. Taylor NF, Brusco NK, Watts JJ, et al. A study protocol of a randomised controlled trial incorporating a health economic analysis to investigate if additional allied health services for rehabilitation reduce length of stay without compromising patient outcomes. *BMC Health Serv Res* 2010; 10:308.
25. Achterberg WP, Gussekloo J, van den Hout WB. [Cost-effectiveness research in elderly residents in long-term care: prevention is better than cure, but not always cheaper]. *Ned Tijdschr Geneeskd* 2015; 159:A8903.
26. Jesus TS, Hoenig H. Postacute rehabilitation quality of care: toward a shared conceptual framework. *Arch Phys Med Rehabil* 2015; 96:960-9.
27. Heinemann AW. State of the science on postacute rehabilitation: setting a research agenda and developing an evidence base for practice and public policy. An introduction. *Assist Technol* 2008; 20:55-60.
28. Hoenig H, Siebens H. Research agenda for geriatric rehabilitation. *Am J Phys Med Rehabil* 2004; 83:858-66.
29. Horn SD, DeJong G, Ryser DK, et al. Another look at observational studies in rehabilitation research: going beyond the holy grail of the randomized controlled trial. *Arch Phys Med Rehabil* 2005; 86:S8-S15.
30. Achterberg WP, Caljouw MAA, Husebø BS. Towards academic nursing home medicine: a Dutch example for Norway? *OMSORG* 2015;10-5.
31. Achterberg WP, Schols J, Hertogh C, et al. Guideline geriatric rehabilitation [In Dutch]. Consortium Geriatrische Revalidatie LUMC/VUmc/MUMC 2013.
32. Li Y, Cai X, Yin J, Glance LG,et al. Is Higher Volume of Postacute Care Patients Associated With a Lower Rehospitalization Rate in Skilled Nursing Facilities? *Med Care Res Rev* 2011.
33. Halm EA, Lee C, Chassin MR. Is volume related to outcome in health care? A systematic review and methodologic critique of the literature. *Ann Intern Med* 2002; 137:511-20.
34. Shahin J, Harrison DA, Rowan KM. Relation between volume and outcome for patients with severe sepsis in United Kingdom: retrospective cohort study. *BMJ* 2012; 344:e3394.
35. Sund R. Modeling the volume-effectiveness relationship in the case of hip fracture treatment in Finland. *BMC Health Serv Res* 2010; 10:238.
36. Benzinger P, Lindemann U, Becker C, et al. Geriatric rehabilitation after hip fracture. Role of body-fixed sensor measurements of physical activity. *Z Gerontol Geriatr* 2014; 47:236-42.
37. Moffet H, Tousignant M, Nadeau S, et al. Patient Satisfaction with In-Home Telerehabilitation After Total Knee Arthroplasty: Results from a Randomized Controlled Trial. *Telemed J E Health* 2016.
38. Jones ML, Cifu DX, Backus D, et al. Instilling a research culture in an applied clinical setting. *Arch Phys Med Rehabil* 2013; 94:S49-S54.
39. Nieboer AP, Strating MM. Innovative culture in long-term care settings: the influence of organizational characteristics. *Health Care Manage Rev* 2012; 37:165-74.
40. Sander AM, Van Veldhoven LM, Backus D. Maximizing usability of evidence in rehabilitation practice: tips for researchers. *Arch Phys Med Rehabil* 2013; 94:S43-S48.
41. Grone O, Garcia-Barbero M. Integrated care: a position paper of the WHO European Office for Integrated Health Care Services. *Int J integr Care* 2001; 1:e21.

42. Barnett K, Mercer SW, Norbury M, et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012; 380:37-43.
43. Boston Working Group on Improving Health Care Outcomes Through Geriatric Rehabilitation. *Med Care* 1997; 35:JS4-20.
44. Chen LM, Ayanian JZ. Care continuity and care coordination: what counts? *JAMA Intern Med* 2014; 174:749-50.
45. Hartgerink JM, Cramm JM, van Wijngaarden JD, et al. A framework for understanding outcomes of integrated care programs for the hospitalised elderly. *Int J integr Care* 2013; 13:e047.
46. Lungu E, Maftoon S, Vendittoli PA,et al. A systematic review of preoperative determinants of patient-reported pain and physical function up to 2 years following primary unilateral total hip arthroplasty. *Orthop Traumatol Surg Res* 2016; 102:397-403.
47. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc* 1991; 39:142-8.
48. Enright PL. The six-minute walk test. *Respir Care* 2003; 48:783-5.