Comorbidity and outcomes in geriatric rehabilitation

Kabboord, A.D.

Chapter 8

Summary

SUMMARY

The general aim of this thesis was to study comorbidity and its assessment in patients admitted for geriatric rehabilitation and to investigate the association with rehabilitation outcomes such as intercurrent diseases, functional recovery and discharge destination.

In order to investigate the association between comorbidity and functional outcome after rehabilitation we performed a systematic review and meta-analysis (research question 1). We identified 20 studies: 14 on stroke patients, 5 on hip fracture patients, and 1 on both stroke and hip fracture. In these studies, one or more comorbidity indices were included as a determinant of functional outcome after rehabilitation. The studies included different comorbidity indices and some studies compared two or more comorbidity indices in their ability to predict functional outcome. In total, four indices were identified: the Charlson comorbidity index (CharlsonCI), the Liu comorbidity index (LiuCI), the Cumulative Illness Rating Scale (CIRS) and the Comorbidity Severity Index (COM-SI). The meta-analysis demonstrated a significant relation between comorbidity and functional outcome. However, we discovered that the effect size and statistical significance of this relation depended on which comorbidity index was included from studies that had investigated two or more indices. When indices were included that better reflected the functionally weighted severity of present comorbidities (LiuCI instead of CharlsonCI, CIRS severity index instead of CIRS cumulative index), the relation became stronger and statistically significant (**chapter 2**).
A comorbidity index that was unfortunately not detected in the literature search of the systematic review is the functional comorbidity index (FCI). Apparently, the FCI had not yet been used in studies investigating comorbidity in a rehabilitation setting. The FCI has specifically been designed in relation to functional outcome and is brief and easy to apply. However, it does not include a severity rating scale. We were interested in a severity-weighted version of the FCI (w-FCI) and its predictive validity in relation to functional outcome in geriatric rehabilitation (research questions 2 and 3). Therefore, we performed two studies: designing the w-FCI and testing its usability and reliability in order to present the new version of the w-FCI (**chapter 3**). Furthermore, we studied the predictive performance of this modified FCI in a prospective observational study (**chapter 4**).
At first, we modified the FCI by adding a functionally weighted severity rating scale based on the physician's assessment of impact on daily functioning of each comorbidity. We tested the reliability and usability of this w-FCI in a cohort of nursing home residents. The intra-rater reliability of the w-FCI was excellent (ICC: 0.94) and the inter-rater reliability was moderate (ICC: 0.55). Elderly care physicians (ECPs) were interviewed, from which five themes were extracted that helped to interpret the reliability results and provided input for the definitive version of the w-FCI. The themes 'what are the used sources of information' (1) and 'how to decide on the presence/absence of a comorbid condition' (2) apply to all comorbidity indices and not only to the w-FCI. When assessing comorbidity, inter-rater reliability of the index is related to how many different sources are used to collect data on

comorbidity. The more sources of information are used, the higher the chance of measurement error and disagreement between raters. Reliability will be higher when only one (retrospective) record, such as a hospital discharge summary, is used. ECPs suggested a threefold rating instead of a fourfold rating to increase reliability when deciding on the presence of comorbidity. Furthermore, 'rating disease severity' (3) may reduce reliability because severity is dynamic and changes over time and different diseases may cause similar symptoms and functional impairments. Nonetheless, the importance of rating functional severity was also recognized by the ECPs. Finally, some considerations regarding the 'usefulness and content' (4 and 5) were made with which the final version of the w-FCI is presented in **chapter 3**. This w-FCI was further studied in **chapter 4.** In a geriatric rehabilitation facility in Nottingham (UK) the w-FCI was compared with the original FCI and the CharlsonCI. The results of this study show that the w-FCI had a higher predictive validity than the FCI and the CharlsonCI when considering the correlations, the areas under the curve (ROC analysis) and the independent associations (multiple linear regression analyses) with function at discharge, mobility at discharge and mobility gain per day during rehabilitation.

In **chapter 5 and 6** the occurrence of comorbidities in patients admitted for geriatric rehabilitation was studied and the relationship between comorbidity and geriatric rehabilitation outcome was examined.

In a cohort of stroke patients (GRAMPS database) the relation between comorbidity (assessed using the Charlson index) and the occurrence of intercurrent diseases became evident (research question 4). Comorbidity in general and particularly diabetes mellitus was independently associated with the occurrence of one of more intercurrent diseases during rehabilitation. The higher the comorbidity total score, the higher the risk of developing more than one intercurrent disease. Finally, when comorbidity co-occurred with a lower functional level at the start of rehabilitation, a synergistic effect was found (**chapter 5**). In three consecutive cohorts of patients that were admitted for geriatric rehabilitation (SINGER database) the clustering of comorbidities (assessed using the FCI) and their relation to rehabilitation outcome was studied (research question 5). Six clusters were identified: no comorbidity (1), cardiovascular (2), degenerative & mental disorder (3), cerebrovascular (4), a rest group (5), and osteoarthritis (6). Patients in the cardiovascular cluster and the degenerative & mental disorder cluster had a higher risk of developing intercurrent diseases and were more often discharged to a nursing home instead of discharged home. Patients in the cardiovascular cluster also had a risk of unsuccessful functional recovery, i.e. an improvement of less than 4 on the Barthel index during rehabilitation. Finally, comorbidity in general was independently associated with all three outcomes although associations were more evident (higher odds ratios) when comorbidity was presented as comorbidity clusters (**chapter 6**).