Quality of hospital care and health outcomes after stroke
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Citation for published version (APA):
van Straten, A. (2000). Quality of hospital care and health outcomes after stroke
SUMMARY
Stroke is a major chronic disease both from the perspective of the patients and from that of the society in general. It is an important cause of death, hospital admission and long-term disabilities among the Dutch elderly. Subject of this thesis is the quality of hospital care and the health outcomes of patients who suffered a stroke. The study includes a cohort of 760 consecutive stroke patients admitted to 23 randomly selected hospitals in the Netherlands. Data were collected from the medical and the nursing records, and the surviving patients were interviewed 6 months, 3 years and 5 years after stroke. The data collection took place between June 1991 and December 1996.

In the introductory chapter of this thesis the quality of care concept is introduced. It is argued that care should be in concordance with the available scientific knowledge which is presented in guidelines. This is also known as 'evidence based medicine'. Improvement of quality of care is not a goal in itself but it serves as a mean to improve patients' health outcomes. The assessment of stroke outcomes should include survival while the functional health of the survivors may be hierarchically described according to the International Classification of Impairments, Disabilities and Handicaps (ICIDH) or in terms of Quality of Life (QoL).

Quality of hospital care

In Chapter 2 we studied the application of several aspects of the Dutch stroke guidelines in daily clinical hospital practice in the Netherlands. For this purpose we constructed an explicit review instrument (a 'criteria map'). The criteria were developed by expert physicians and represented as 'optimal care trajectories'. The care trajectories were dependent on the patient's clinical profile. The criteria map was applied in 738 stroke patients over 45 years of age. In 44% of the 738 patients we observed one or more deviations from the optimal care trajectory with respect to at least one of five important aspects of medical care. In summary, in 55% of all patients with an infarction in the carotid artery territory, the carotid arteries were not screened; 35% of all patients with a hemorrhage who used anticoagulants prior to hospitalization, was not treated adequately (reversal of anticoagulant therapy); 22% of the hypertensive patients were not treated with antihypertensive medication; 13% of the patients with ischemic strokes did not receive antiplatelet therapy, and 8% did not have a CT scan. The
frequency of deviations from optimal care increased with the age of the patients and with the level of disability. Deviations were observed in 19% of the youngest and least disabled patients and in 72% of the oldest and most disabled patients. Validity of the criteria map was evaluated by sending a structured postal questionnaire to the patient's neurologist, if one or more deviations from optimal care had been observed. According to the treating physicians, stroke severity, age, and comorbidity were the main reasons for the observed deviations of the optimal care trajectories. The interobserver reliability of the criteria map was good (89% agreement). It was concluded that the criteria map is a reliable tool to identify all patients with possible suboptimal care.

Chapter 3 is also concerned with quality of hospital care: the length of hospital stay and discharge delays. Many stroke patients in the Netherlands stay in hospital longer than necessary from a medical point of view because they have to wait for discharge placement. We quantified the number of days that patients stayed in hospital because of different medical and non-medical reasons. This prospective study included 6 hospitals, 29 neurologists, and 154 patients. In weekly interviews, the neurologists were asked to specify, on a day-to-day basis, the reason(s) for continued hospitalization for each patient during the last week. The mean length of hospital stay in this study was 28 days. According to treating physicians, 54% of this mean length of hospital stay (15 days) was essential for diagnostic or therapeutic procedures. Another 10% of the mean length of stay (3 days) also concerned essential medical or nursing procedures. However, these procedures could have been performed outside the hospital, provided that care for stroke patients is organized differently. The remaining days, 36% of the mean length of hospital stay (10 days), were superfluous from a medical point of view. Usually, these days were spent waiting for transfer to a nursing home. This practice prevents that patients receive adequate rehabilitation care, which is usually insufficient in acute care settings in the Netherlands. The discharge delays were not only due to lack of long-term care facilities, but also due to inefficient hospital discharge procedures. These data suggested that the length of hospital stay can be reduced without compromising the quality of care. This might be realized by increasing the capacity of long-term care facilities, improving the efficiency of the discharge procedures, or by creating "stroke services".
Health outcomes

Chapter 4 is focused on the development of an instrument to measure health outcomes after stroke. These outcomes include aspects of physical, social and emotional functioning. These three aspects of functioning are generally referred to as QoL. Currently, the Sickness Impact Profile (SIP) is one of the main measures to assess QoL after stroke. However, a major disadvantage of the SIP is its length. In stroke populations, it usually takes 30 minutes or more to complete the 136 SIP items. Therefore, we constructed a short stroke-specific SIP version (SA-SIP30). For the analyses, we used the SIP data of 319 communicative patients at 6 months after stroke. In a statistical 3 step procedure, the 12 subscales and the 136 items of the original SIP were reduced to 8 subscales with 30 items. Thereafter, the reliability and the validity of the new SA-SIP30 were studied.

Reliability was evaluated in term of homogeneity which refers to the statistical coherence of the scale items. Homogeneity of the new SA-SIP30 proved to be high (Cronbach's α 0.85). Validity reflects the degree to which a scale measures what it is intended to measures. In this study we assessed different types of validity: construct, convergent, clinical, and external validities. Construct validity, the extent to which the SA-SIP30 fits the theoretical concept of QoL, was assessed by Principal Component Analyses (PCA). Construct validity of the SA-SIP30 was supported because PCA identified the same two dimensions as in the original SIP (a physical and a psychosocial dimension). Convergent validity, which is a form of construct validity, measures the extent to which the results of the SA-SIP30 are in concordance with other scales that are purported to measure the same concept. Convergent validity of the SA-SIP30 was demonstrated because it could explain 91% of the variation in scores of the original SIP. Clinical validity, the extent to which the SA-SIP30 is able to distinguish between patients with different clinical profiles, was also supported. The SA-SIP30 was able to distinguish patients with lacunar infarctions from those with cortical or subcortical lesions. Finally, we examined external validity, i.e. the extent to which the results are applicable to other stroke patients. For this analysis we used SIP data from an independent stroke population. The community based cohort consisted of 88 stroke survivors.
who had had a stroke 6 months earlier. In this cohort, the SA-SIP30 could explain 89% of the variation in scores of the original SIP. We concluded that the SA-SIP30 is much more feasible than the SIP136, and equals the SIP136 in reliability and validity.

Chapter 5 is concerned with the clinical meaning of the continuous scale scores of the SA-SIP30 and the original SIP136. First, because the SIP136 (and consequently the SA-SIP30) measures aspects of physical, social and emotional functioning it is often considered as measure of QoL. However, since the SIP emphasizes observable behavior instead of more subjective health perceptions it is regarded by others as a measure of disability. Second, because clinical trials often use dichotomous endpoints (poor versus good health), more knowledge is needed about the clinical interpretation of the continuous scale scores of the (SA)SIP(30). To address both issues, we studied the associations between the (SA)SIP(30) scores on the one side and other frequently used outcome measures from the ICIDH (Barthel Index, Rankin scale) and QoL model (health perception items, Euroqol) on the other. We showed that the psychosocial dimension scores of both SIP versions were barely correlated with the ICIDH or QoL measures. However, the physical dimension scores of both SIP versions proved to be substantially associated with the disability measures derived from the ICIDH model, as well as with the physical domains of QoL. The results of the SIP total scores resembled closely those of the physical dimension scores. We demonstrated furthermore, that most patients with a SA-SIP30 total score of more than 28, or a SIP136 total score of more than 22, were ADL disabled, were unable to live independently, and experienced at least some problems with mobility and self-care. We conclude that the (SA)SIP(30) total scores basically measure disability and not QoL. We do recommend the (SA)SIP(30) in stroke research since they assess functional health outcomes far more comprehensively than the Barthel Index or the Rankin scale.

Chapter 6 describes the health outcomes after stroke up to five years in terms of mortality and the ability to live independently (Rankin scale; SIP data were not available after the first six months). The health outcomes were examined in relation to stroke subtype (infratentorial stroke, (sub)cortical infarctions, lacunar infarctions, and intracerebral hemorrhages). Cumulative mortality for all stroke patients was 34% after
6 months, 51% at 3 years, and 62% after 5 years. Six months after stroke 55% of the surviving patients were in poor functional health, 49% after 3 years, and 43% after 5 years. Mortality within the first 6 months was strongly dependent on stroke type: the highest mortality occurred in patients with a hemorrhage (46%), the lowest in patients with a lacunar infarction (8%). No independent impact of stroke type on five years mortality was observed. However, patients with (sub)cortical infarction or hemorrhage were more often in poor functional health after 5 years than patients with a lacunar infarction. We concluded that the overall prognosis after stroke is poor. The impact of stroke type on mortality is limited to the first 6 months after stroke, whereas the type of stroke influences long-term functional health.

In Chapter 7 the implications of the present study are discussed. The advantages and disadvantages of measuring the quality of care through process measures and outcome measures are presented. We concluded that there is a need for research evidence that is more applicable to individual patients, and that more efforts are needed to disseminate the available knowledge. Furthermore, suggestions are made how to improve care for future stroke patients. This includes setting up stroke units and stroke services. Care for stroke patients will have to be regularly monitored and evaluated. In this way, optimal care for the Dutch stroke patients in the future will be supported.