

# Optimizing quality of care in fracture patients at high risk of new fractures and patients with drug-resistant epilepsy eligible for resective brain surgery

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## **Summary**

To further improve quality of health care, a stronger focus on patient-centeredness and efficiency of current health care is required. The aim of this thesis was to contribute to these components of the Quality of Care framework for two patient groups: i.e. fracture patients with a high risk for subsequent fractures due to a recent fracture and patients suffering from drug-resistant epilepsy (DRE) undergoing resective brain surgery. For fracture patients at high risk for subsequent fractures, we developed and evaluated a patient-centered intervention to improve anti-osteoporosis medication (AOM) adherence and patients' experiences with the decision-making process. For patients with DRE, we studied the effects of resective brain surgery (resective epilepsy surgery, RES) on patients' health-related quality of care and resource utilization.

In Part I of this thesis, related to patients at high risk of subsequent fractures (chapters 2-5), we investigated the clinical effectiveness, patient experiences, and health economic consequences of a newly developed patient-centered intervention provided by nurses within the fracture liaison services (FLS). Due to the remaining low AOM adherence in osteoporosis patients attending the FLS, a patient-centered multi-component adherence intervention (MCAI) was developed for patients eligible for AOM and attending the FLS with a recent fracture. To fully appraise the effect of the MCAI, clinical outcomes (adherence), patient experiences, and cost-effectiveness were evaluated. In particular, cost-effectiveness analysis of this MCAI was performed to balance long-term health benefits against the changes in societal costs associated with the care innovation. In Part II (chapters 6-7), we reported on the clinical and economic outcomes for patients with DRE undergoing RES. The nature of the pre-surgical workup preceding brain surgery consists of several steps already requiring/implying high levels of patient-centeredness and shared decision-making procedures. As clinical outcomes (quality of life and seizure frequency) and the monetary impact of RES in the Netherlands is still lacking, therefore limiting the possibility of providing robust cost-effectiveness analyses of RES, health economics data are worthwhile.

In **chapter 2**, the societal costs of patients eligible for AOM and visiting the FLS with a recent fracture were estimated as there was a lack of longitudinal data on costs in patients visiting the first FLS visit. This analysis was possible as resource utilization was collected in the usual care group in the quasi-experimental Improvement of osteoporosis Care Organized by Nurses (ICON) study. The societal costs were substantial in the four months preceding the FLS visit, but dropped significantly in the next four months to remain then stable. This results from the fact that the period preceding the first FLS visit includes the resource utilization and costs related to fracture treatment and fracture after care (e.g. physiotherapy informal home care). Patients of all fracture types were included. Over the course of one year, no statistical effect was found between fracture type and societal or healthcare costs.

As part of the development of the patient-centered MCAI, in **chapter 3** a patient decision aid (PDA) was developed to enhance the suboptimal AOM adherence in FLS care. Based on the International Patient Decision Aids Standards (IPDAS) recommendations, an 8-page PDA was designed for patients eligible for AOM treatment who visited the FLS. The PDA was specifically intended to be administered by a healthcare professional (i.e., the osteoporosis nurse) rather than a tool that stands by itself and can be used by the patient without support. The PDA included information on (i) fractures and osteoporosis, on (ii) risk factors for subsequent fractures, on (iii) the role of lifestyle and importance of AOM, on (iv) the personalized risk of a subsequent fracture with and without AOM treatment, on (v) AOM drug treatment options and their characteristics in the form of an option grid and finally the PDA asked patients (vi) to write down their needs to make a decision and preferences. Three versions of the PDA were created based on levels of future fracture risk and evidence of the effectiveness of treatment options was added. All patients and Dutch Osteoporosis Association (DOA) members recommended the usability of the PDA in FLS setting. Preferences and needs of patients and inclusion of lifestyle changes were adequately represented, however some patients during the alpha testing expressed a preference for the paternalistic model of the physician-patient relationship.

Once the PDA was developed, in **chapter 4** the PDA was combined with motivational interviewing into a MCAI, which was compared to usual care (UC) in a quasi-experimental study in patients attending the FLS with a recent fracture and eligible for AOM. No significant effects were found on persistence (MCAI: 80.4% vs UC: 76.7% at one year), adherence, and decisional conflict. This could be explained due to the high adherence in the usual care group resulting from already well-organized FLS's. MCAI had however a significant positive effect on the shared decision-making process compared to usual care in FLS care. Further stratification by health literacy highlighted that patients with limited, compared to adequate, health literacy had experienced slight worsening in AOM persistence by a larger improvement in perceived SDM process four months after the first FLS visit. **Chapter 5** presented the cost-effectiveness of the MCAI. An individual level, state-transition Markov model with a societal perspective was used to estimate the long-term cost-effectiveness of MCAI compared to usual care at FLS. Although the clinical effectiveness of MCAI with regards to persistence and adherence were small and non-significant, MCAI was associated with lower costs and more quality-adjusted life year (QALY) than usual care, and therefore was dominant. Sensitivity analyses revealed that additional costs of the MCAI, for e.g. maintenance and updating sources in the tool, was a key driver of cost-effectiveness. Nonetheless, MCAI remained cost-effective below +€60 of annual MCAI maintenance costs with a threshold of €50,000/QALY gained. The cost-effectiveness was also dependent on whether patients receiving MCAI required an additional phone consultation,

however also maintained cost-effectiveness even if all patients receiving MCAI required an additional phone consultation.

Due to the lacking information on care utilization directly after RES in the Netherlands, in **Chapter 6** the societal costs of RES three months before surgery up until one year after were estimated in Dutch patients with DRE. The average societal costs of one patient from three months prior to surgery until the first year post-surgery entailed €54,376 and decreased over time. The first three months after surgery, which included costs of surgery itself, were highest (€33,816), while total costs in the second half year decreased substantially. In addition to the care utilization, the clinical effectiveness of RES was assessed, with approximately 50% of patients reaching a clinically significant increase in both disease-specific and generic health-related quality of life and 73% of patients reached seizure freedom in the first year after RES.

Due to the limited information on the long-term total costs of patients with DRE undergoing RES, in **Chapter 7** healthcare and societal resource utilization was estimated the moment the patient visited the hospital with debut of epilepsy up to two years after undergoing RES. Additionally, determinants of post-surgical costs were identified. Complete costs from diagnostics or treatment strategies before referral for pre-surgical evaluation up until the two-year follow-up ranged from €42,394 to €371,133 per patient. Total costs 12- and 24-months after RES significantly decreased compared to three months before RES. Higher post-surgical costs were associated with a clinically relevant increase in disease-specific quality of life after RES, previous ketogenic diet, RES in the left hemisphere, previous RES, and higher costs of diagnostics and treatment strategies before referral for pre-surgical evaluation. For both disease-specific and generic quality of life, 20 (45%) patients reached a clinically relevant quality of life increase two years after surgery compared to before RES.

In conclusion, this thesis combines patient-centered and economic studies in two disease areas. Linking patient-centered care and economic assessments provides insights into patient-centered outcomes and care utilization from a patient and societal perspective and provides a better understanding on improving quality of care in post-fracture care in patients with a recent fracture over the age of 50 and in patients with DRE undergoing RES. The considerations in this thesis are based on methods of economic assessments, patient-centered outcomes, and variation in patient-centered care. While the studies in the individual diseases addressed relevant care and knowledge gaps, focusing on two disease areas in this thesis further provided novel insights into common hurdles, challenges, and future prospective in health economic research for patient-centered care.