Measurement and evaluation of hip fracture care

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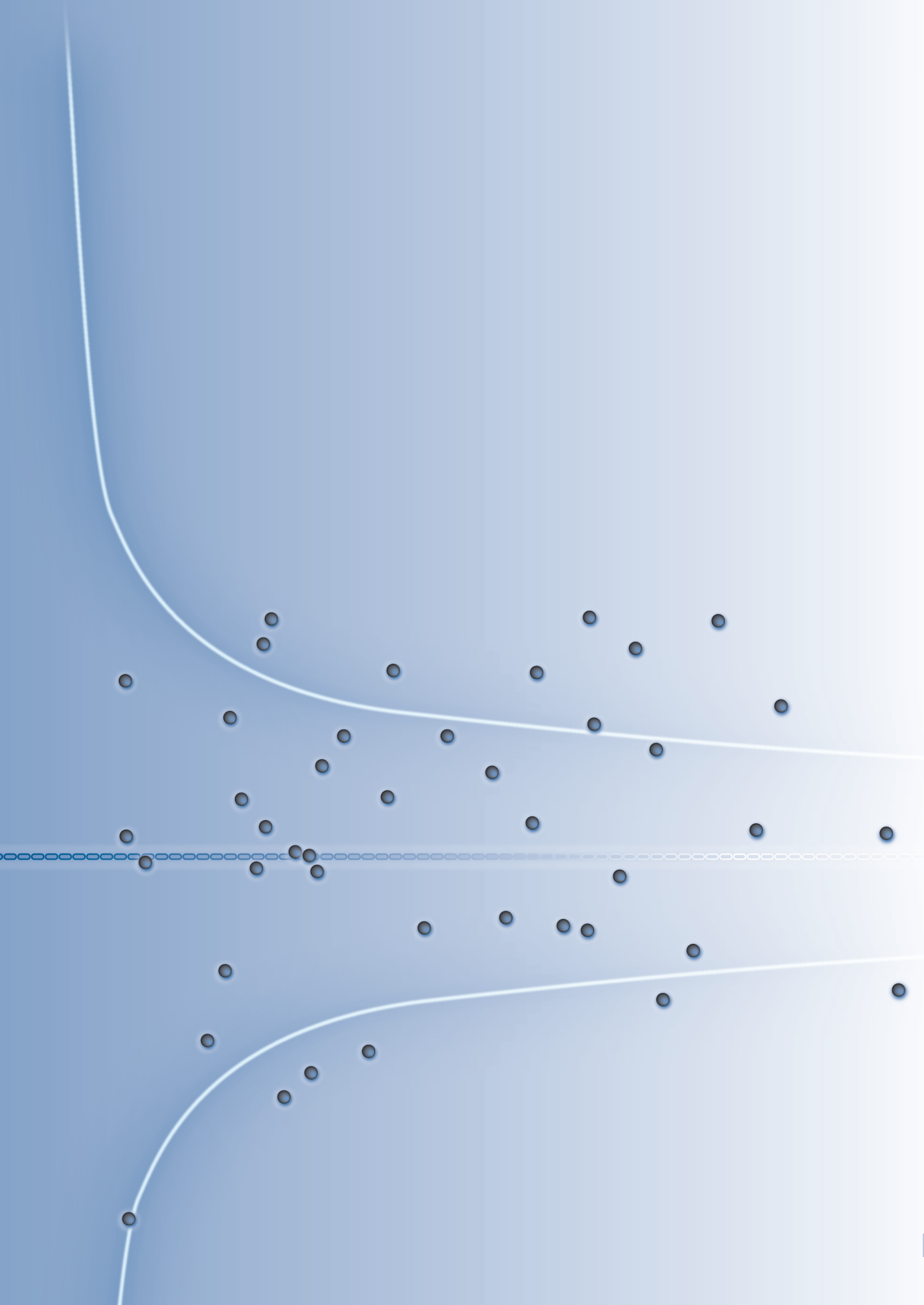
Summary



Chapter 1 presents a general introduction into quality indicators and clinical auditing, and describes the aim and outline of this thesis. The principal aim is to define how the quality of hip fracture care should be measured and evaluated through a nationwide clinical hip fracture audit. The thesis consists of two parts. Part I focuses on the measurement of hip fracture care and Part II on the evaluation of hip fracture care.

Part I: Measurement of the quality of hip fracture care

To measure the quality of hip fracture care, adequate quality indicators are needed and the parameters in the audit database must be valid. Chapters 2 to 5 deal with quality indicators, while Chapter 6 addresses the validity of one of the audit database parameters.

Chapter 2 presents a review of the hip fracture quality indicators described in the literature, hip fracture audits and guidelines. In total, 97 unique quality indicators were identified: 9 structure indicators, 63 process indicators and 25 outcome indicators. Since the methodological quality of the identified quality indicators was not assessable, a set of adequate (i.e. clinically relevant, scientifically acceptable, feasible and usable) indicators could not be composed. Instead, a set of nine quality indicators based on quantitative criteria is proposed as the starting point for further clinical research.

The quality indicator that was most frequently described and correlated with outcome measures was the process indicator 'time to surgery within a specific timeframe'. **Chapter 3** provides an overview of the available systematic reviews and meta-analyses regarding timing of hip fracture surgery. Time to operation varied from 6 to 168 hours, but the optimal time to surgery for hip fracture patients depends on the presence of reversible preoperative comorbidities. Once the condition of the patient has been optimized, or cannot be further optimized, the operation should no longer be delayed.

Chapter 4 describes 4,552 hip fracture patients from two regional trauma registries. Analysis showed that surgery by trauma surgeons was associated with less postoperative complications compared to surgery by general surgeons (odds ratio 0.75, 95% confidence interval 0.58 – 0.96, $p = 0.02$). Lower complication rates were also seen in high-volume hospitals compared to low-volume hospitals (odds ratio 0.99, 95% confidence interval 0.99 – 0.99, $p = 0.01$). Surgeon volume was not associated with complications (odds ratio 1.01, 95% confidence interval 0.99 – 1.02, $p = 0.16$).

In **Chapter 5**, the process quality indicators proposed in Chapter 2, insofar as included in the DHFA, are combined into one composite process quality indicator, namely the textbook process indicator for hip fracture care. Using the DHFA data of five Dutch non-academic hospitals, an analysis corrected for patient, treatment and hospital characteristics showed

that hip fracture care according to textbook process was associated with significantly lower complication rates (odds ratio 0.66, 95% confidence interval 0.52 – 0.84, p < 0.01) at patient level. There was no association with length of hospital stay (odds ratio 1.01, 95% confidence interval 0.78 – 1.30, p = 0.96). The textbook process indicator enabled the identification of hospital variation.

Chapter 6 presents the assessment of the validity of the Fracture Mobility Score. Five hospitals participating in the DHFA collected both the Fracture Mobility Score and the validated Parker Mobility Score in 2018. The scores were strongly correlated, with a Spearman correlation index of 0.73 (95% confidence interval 0.70 – 0.77, p = < 0.01). The Fracture Mobility Score could therefore be considered a valid score to measure hip fracture patient mobility.

Part II: Evaluation of the quality of hip fracture care

Implementing a nationwide clinical audit is a challenging process. The DHFA was started in April 2016, with the overall aim of evaluating and improving the quality of hip fracture care in the Netherlands.

The initiation and the development of the DHFA are described in **Chapter 7.** In the first full year of registration, the audit dataset completeness was 74% on hospital participation, 58% on case ascertainment and 77% on data completeness: 91% at discharge and 30% at 3 months. The median time to operation was 18 hours (IQR 7 – 23) for ASA 1-2 patients. The percentage of operations on ASA 1-2 patients performed within 18 hours varied from 29% to 75% per hospital, with two hospitals significantly outperforming and five hospitals significantly underperforming. For ASA 3-4 patients the median time to operation was 21 hours (IQR 13 – 27), with the percentage of operations within 21 hours ranging from 20% to 71% per hospital. Two hospitals significantly outperformed, whereas four others significantly underperformed. Of patients aged 70 years and older, 78% received orthogeriatric management. Compared to this mean, thirteen hospitals had a significantly higher percentage of patients with orthogeriatric management and seven a significantly lower percentage. Six hospitals had a special comprehensive orthogeriatric ward.

Interviews were held and a survey was conducted to explore whether facilitators and barriers experienced by hospital staff were associated with hospital participation in the DHFA. The findings are presented in **Chapter 8**. Only data delivery to relevant external parties (odds ratio 3.19, 95% confidence interval 1.14 – 8.95) was found to be a facilitator for active participation. The factors that the highest percentages of respondents agreed to influence hospital participation in the DHFA are availability of staffing capacity for data collection

and automated data import from the Electrotronic Health Record (*Elektronisch Patiëntendossier* – EPD) into the DHFA. To improve participation in a nationwide clinical audit, data collection should either be performed by additional staff or be automated.

The systematic data verification process of seven Dutch audits is described in **Chapter 9**. After approximately two years, the data completeness of the audits varied from 97.2% to 99.4%, and the accuracy of the audit data ranged from 88.2% to 100%. Data verification may help to achieve higher case ascertainment and accuracy in audits, which contributes to a higher quality of the datasets. The most important lesson derived from the data verifications is the need for clear definitions and descriptions of variables.

Based on the findings of the studies in this thesis, **Chapter 10** describes the most suitable measurements to assess the quality of hip fracture care through a clinical audit and whether the dataset of the DHFA in its present form is adequate to evaluate the quality of hip fracture care. In the start-up phase of an audit, the preferred way of measuring the quality of hip fracture care would be the use of a composite *process* indicator alongside the underlying individual indicators. Once quality improvement projects, based on the results of process indicator analyses, have contributed to better hip fracture care and a case-mix correction model is in place, *outcome* indicators should become the preferred measures. But first and foremost, in order to use the DHFA to its full capacity as a quality improvement tool, the DHFA dataset completeness needs to be improved and data accuracy checks should subsequently be implemented. Future developments should also address the measurement and evaluation of the complete and transmural chain of hip fracture care.