

## Quality assurance in revision total hip arthroplasty

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### ABSTRACT

**Objective:** To compare two different methods of clinical outcomes prospective documentation after revision hip arthroplasty: external and internal.

**Methods:** Chi-squared test, Fisher's exact test and binary logistic regression analyses were performed.

**Results:** Eighty one patients experienced a complication (520 arthroplasties). A significant difference was found between the two documentation methods in the variable "hematoma and postoperative hemorrhage", and a significant reduction of the internally and externally documented "total complication rate". Furthermore, the "length of hospital stay" and "duration of operation" predicted independently the occurrence of complications.

**Conclusion:** Further improvement of documentation methods is required to measure the perioperative morbidity.

### 1. Introduction

Quality assurance (QA) aims to analyze processes and outcomes in order to develop and improve patients' healthcare. It focuses on the provision of confidence that the quality requirements in healthcare delivery are met.<sup>1</sup> QA may be internal (institutional) or external (database). The objective of internal QA is to document the outcomes in the context of self-monitoring, identify shortcomings in the provision of healthcare and encourage the implementation of corrective measures. External QA is particularly valuable in the hospital benchmarking process and the evaluation of the provision of healthcare in national or international level.

There are no studies comparing the external and internal documentation methods for revision hip arthroplasty procedures. Primary aim of the present study was to compare the external and internal documentation after revision total hip arthroplasty. Secondary aim was to evaluate the incidence of postoperative complications across the study period and to investigate a possible association with gender, duration of operation, duration of hospital stay and age.

### 2. Methods

Data of patients subjected to revision hip arthroplasty in the Orthopedic Department of the university-affiliated Hospital Essen-

Werden between 2004 and 2014 were prospectively collected from internal and external documentation databases. Institutional review board approval was obtained for this study.

External documentation was performed through an electronic form according to Part V of the German Social Security Code.<sup>2</sup> Electronic submission of the quality assurance data in Germany are required to be submitted yearly. Incomplete forms are not allowed to be submitted. The documentation was completed in our department by the attending surgeon of each patient within 4 weeks from the date of discharge. The records were maintained and evaluated by the Federal Office for Quality Assurance (BQS)<sup>3</sup> from 2001 to 2008 and by the AQUA-Institute<sup>4</sup> from 2009 to 2014. Data from the hospitals in North Rhine-Westphalia are first collected by the office quality assurance NRW (qs-nrw).<sup>5</sup> This external quality assurance documentation was launched and implemented in our Department since 2001.

The internal documentation was conducted with pen and paper by physicians on the day of discharge. The records have been kept in our Department and were thoroughly scrutinized in the case of suspected increase in complication rates. Both documentation form templates are available upon request.

The Pearson's chi-squared test or the Fisher's exact test was performed to compare internal with external data and the incidence of complications observed during the five-year periods 2005–2009 and 2010–2014. The Mann-Whitney *U* test was used to compare continuous

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outcomes in the two periods. Binary logistic regression analyses were performed in SPSS 22.0 (SPSS Inc., Chicago, Illinois, USA) with the event of complication as dependent variable and gender, normalized duration of operation, normalized length of hospital stay and normalized patient age as independent variables. The transformation of continuous variables to normal was conducted through a two-step process in SPSS described by Templeton,<sup>6</sup> as indicated according to Kolmogorov–Smirnov test. Statistical significance was set at a p-value of 0.05 for all tests.

### 3. Results

The total number of revision hip arthroplasties was 520. The median age of patients who have experienced a complication was 76 years (range: 38–91) and 27.2% were male. The number of patients having experienced at least one postoperative complication was 52 and 63, documented in the internal and external databases, respectively (after exclusion of patients with postoperatively ambiguously defined changes in mobility). The median postoperative length of stay of patients having experienced a complication was 21 days (range: 0–101) and the median duration of operation was 166 min (range: 60–483).

Complication events observed in our internal and external quality assurance datasets are presented in the bar chart of Fig. 1. The most frequent complications were reintervention (18.5%, external data), fracture (14.8%, external data) and cardiovascular complications (13.6%, internal data). A statistically significant difference between the internal and external datasets was detected in the “inability to walk at discharge” (p = 0.0004).

A statistically significant reduction of the complication rate was observed during the second period of observation (2010–2014) according to the internally (p < 0.0001, OR 5.5 and CI 2.6–11.6) and

externally (p = 0.02, OR 2.1 and CI 1.2–3.6) documented “total complication rate”. The absolute numbers of complications in the two study periods are presented in Table 1. The median of length of hospital stay for the time periods 2005–2009 and 2010–2014 were 19 and 23 days, respectively. This difference was non-significant according to Mann-Whitney U test (p > 0.05).

Furthermore, binary logistic regression analysis after removal of insignificant independent variables demonstrated that the variable „normalized length of hospital stay” independently predicted the occurrence of several complications, including reintervention (internal), complications (internal) and wound healing disorders. The variable “duration of operation” was associated with the occurrence of a reintervention (external). Table 2 shows the results of the binary logistic regression analyses. Post hoc binary logistic regression analyses with ASA score as independent binary variable (ASA-score 1–2 or ASA-score 3–4) suggested that ASA score was not associated with the occurrence of complications.

### 4. Discussion

The main finding of this study is a substantial difference between internal and external documentation in a key parameter of quality assurance, namely the “inability to walk at discharge” (p = 0.0004). A significant reduction of the complication rate was observed during the period 2010–2014 in both datasets. Furthermore, the incidences of hematoma and postoperative hemorrhage were significantly different in the two time periods. Finally, the length of hospital stay and the duration of operation were independent factors predicting the risk of complications, suggesting increased risk of postoperative morbidity in patients subjected to total hip arthroplasty.

The reduction of complication rates (2010–2014) may be due to the

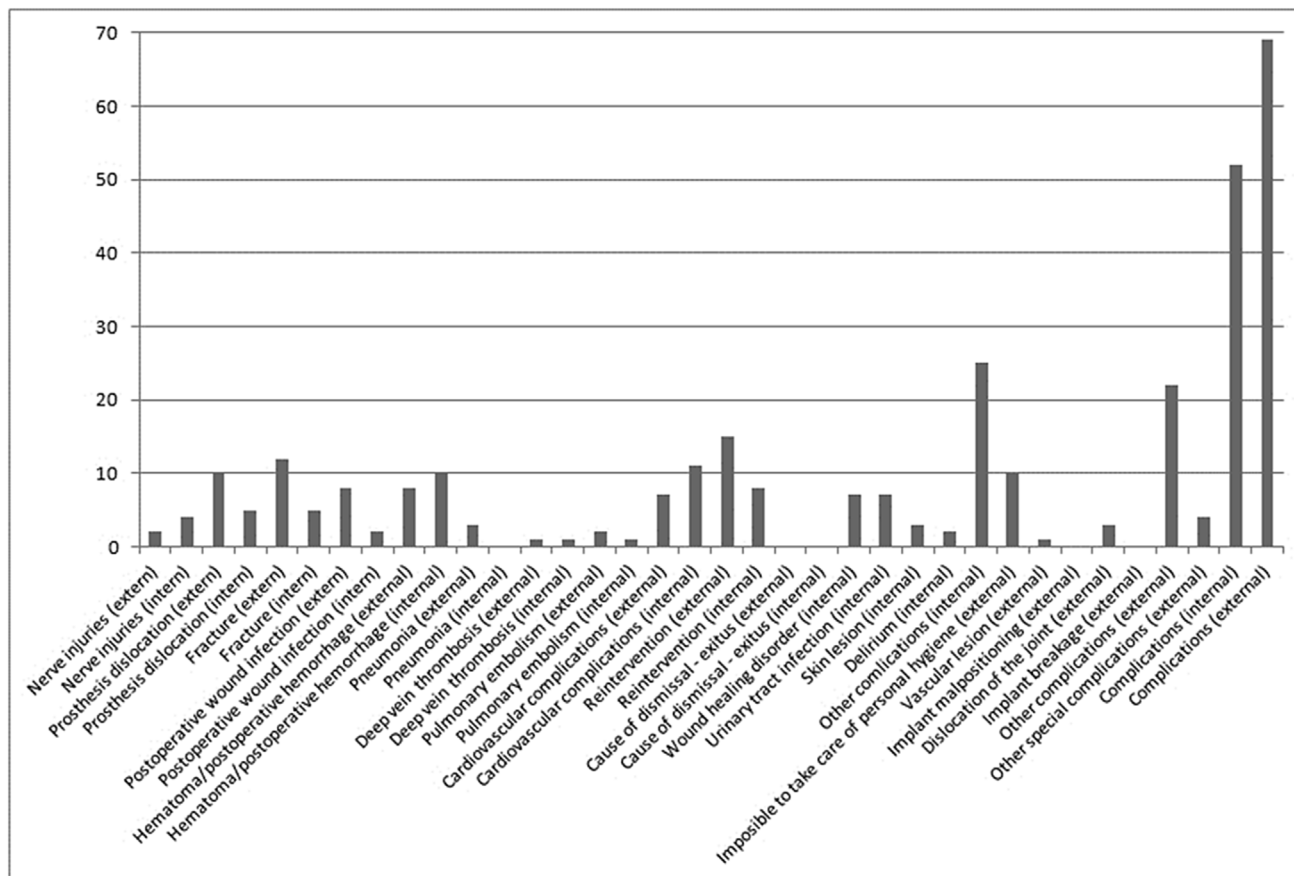


Fig. 1. Number of patients with internally or externally documented complications.

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