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## Audit

# Thirty-Day mortality after elective hip and knee arthroplasty



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## ABSTRACT

**Background:** Hip and knee arthroplasties are very common operations in the UK with over 150,000 hip and knee arthroplasties taking place in England and Wales in 2011. Fortunately mortality following these operations is rare. This study aimed to evaluate the incidence and causes of death within 30 days after undergoing hip or knee arthroplasty in our unit and to highlight possible risk factors.

**Methods:** We looked at 30-day mortality in all patients undergoing hip or knee arthroplasty in our institution between 2005 and 2011. Data on post-operative deaths was requested from the Information Services Division (ISD) and correlated with procedural and demographic data from our hospital Patient Administration System (PAS). The notes of all patients who died within 30 days were reviewed to collect data on co-morbid conditions, pre-operative investigations, post-operative thromboprophylaxis and cause of death. All primary and revision knee and hip arthroplasties including bilateral procedures were included. Arthroplasty for trauma was excluded.

**Results:** 12,243 patients underwent hip or knee arthroplasty within the study period. The male:female ratio was 2:3. The mean age was 68 with a range of 21–91. Ten patients died giving a 30-day mortality rate of 0.08%. The most common cause of death was myocardial infarction (7/10 patients).

**Conclusions:** Our finding of a mortality rate of 0.08% is similar or lower to those found in previous studies. To our knowledge this is the first series of this size looking at mortality from hip and knee arthroplasty within a single centre in the UK.

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## Background

Hip and knee arthroplasties are extremely common operations in the UK. The Scottish Hip Arthroplasty Project reported that almost 7000 primary hip replacements and over 6500 primary

knee replacements were carried out in Scotland in 2011.<sup>1</sup> In England and Wales, 71,672 primary hip arthroplasties and 84,653 primary knee arthroplasties were undertaken in 2011.<sup>2</sup>

Mortality is very rare following hip and knee arthroplasty. However it is important to understand the incidence and risk

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factors for mortality associated with hip and knee arthroplasty especially given the elective nature of this surgery and the large numbers of patients involved.

Published 30-day and in-hospital mortality rates vary from 0.1 to 0.5%.<sup>3–6</sup> A systematic review by Singh et al.<sup>6</sup> looked at 80 studies of early postoperative mortality following hip or knee arthroplasty. Twenty-eight studies provided 30-day mortality rates and the overall 30-day mortality rate was 0.3%. The National Joint Registry has reported a 30-day mortality rate of around 0.2% for both primary hip and primary knee replacement.<sup>2</sup>

Although several authors have published 30-day mortality rates following hip and knee arthroplasty these tend to be either relatively small single centre cohorts or using registry data. As a large dedicated elective arthroplasty unit we have had the opportunity to evaluate early post-operative mortality in a large group of patients within a single centre. This audit aims to measure the incidence and assess the causes of mortality within 30 days after undergoing elective hip or knee arthroplasty in our unit. We also wished to highlight any possible risk factors.

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## Methods

We looked at 30-day mortality in all patients undergoing hip or knee arthroplasty in our institution between 1st January 2005 and 31st December 2011. Details of patients who had died within 30 days of arthroplasty were requested from the Information Services Division (ISD) via the Scottish Arthroplasty Project. This was correlated with procedural and demographic data from our hospital Patient Administration System (PAS). The notes of all patients who had died within a period of 30 days post-operatively were reviewed to collect data on comorbid conditions, pre-operative investigations, post-operative thromboprophylaxis and cause of death. All primary and revision knee and hip arthroplasties including bilateral procedures were included. Arthroplasty for trauma was excluded.

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## Results

During the 6-year period studied 12,243 patients underwent an elective hip or knee arthroplasty. There were 5278 primary hip replacements, 6419 primary knees, 289 revision hip procedures and 257 revision knee procedures. Overall the male:female ratio was 2:3. The mean age was 68 with a range of 21–91.

There were ten deaths which occurred within 30 days of surgery. This gives a 30-day mortality rate of 0.08%. The mean age of patients who died was 76 (range 65–90) and the male:female ratio was 4:1. Two of the patients died after primary hip replacement, 7 after primary knee arthroplasty and one after a revision knee procedure.

### Cause and time of death

The cause of death was ascertained from documentation in the medical notes. One patient had a post mortem. In one

other case a post mortem was requested but the patient's family declined. The most common cause of death was myocardial infarction which was the cause in 7 out of 10 cases. One patient died of pulmonary embolism and one from a cerebrovascular accident. In one case the medical records were not available for review therefore we were not able to find the cause of death.

The mean time from operation to death was 7.3 days with a range of 1–13 days. 60% of deaths occurred in-hospital, 40% after discharge.

### Pre-operative evaluation and post-op thromboprophylaxis

All patients underwent a standardised multi-disciplinary pre-operative assessment which includes nurse-led health questionnaire, examination by a junior doctor, routine blood tests and electrocardiogram. Patients with significant medical history were then reviewed by an anaesthetist and further investigations such as echocardiogram or pulmonary function tests carried out. Eight out of 10 patients who died had at least one pre-operative risk factor, such as hypertension, diabetes or a history of ischaemic heart disease. One patient (who died of pulmonary embolism) had no significant past medical history except benign prostatic hypertrophy. For one patient this information was not available. During the time period of this audit the standard protocol in our unit was to use aspirin 150 mg for 6 weeks as thromboprophylaxis. Seven of the 10 patients received aspirin and 2 dalteparin (one patient's notes not available).

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## Discussion

We have shown a 30-day mortality rate of 0.08% in 12,243 patients undergoing elective lower limb arthroplasty. The most common cause of death was myocardial infarction (MI) and all patients who died of MI had previously identified cardiac risk factors. The rate of fatal pulmonary embolism (PE) was extremely low, with at most 2 fatal PEs in over 12,000 patients. When comparing the group of patients who died to the cohort as a whole there was a higher percentage of male patients and the mean age was higher.

Our finding of a 30-day mortality rate of 0.08% is lower than in several other previously published papers.<sup>2–6</sup> Although several authors have published mortality rates following hip and knee replacement arthroplasty these tend to be either small cohorts from single centres or data from national databases. We have not found any other papers demonstrating such a large patient population from a single centre in the UK.

Given the low rate of post-operative mortality in elective lower limb arthroplasty it may be considered that this simply reflects the background mortality rate in this population. However, several studies have shown that mortality is raised in the early post-operative period.<sup>4,7,8</sup> A recent study from the UK by Parry et al.<sup>4</sup> found a 30-day mortality rate of 0.37% in 2695 patients undergoing primary knee arthroplasty in comparison to 0.07% in a control group of 5857 patients added to the waiting list for knee arthroplasty, suggesting an increased risk of mortality associated with surgery.

In our study the most common cause of death was myocardial infarction. This is consistent with the published

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