The role of a multidisciplinary pre-assessment clinic in reducing mortality after complex orthopaedic surgery

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ABSTRACT

INTRODUCTION This paper describes an audit loop. The aim of this study was to audit the effect of a specialised preoperative anaesthetic assessment clinic after hip and knee arthroplasty and revision arthroplasty.

PATIENTS AND METHODS We studied patients undergoing hip and knee surgery (arthroplasty and revision arthroplasty). We collected data concerning postoperative admissions to the high dependency unit (HDU), intensive care unit (ICU) and post-anaesthesia care unit (PACU) (planned and unplanned rates of admission, length of stay). We also noted mortality. In the first part of the study (April 2005 to March 2006) we studied 298 patients. All patients were assessed independently by an anaesthetist on the day of surgery. A multidisciplinary preoperative assessment clinic commenced in April 2006. After this date all patients were assessed preoperatively by a multidisciplinary anaesthetic lead team. In the second part of the study (May 2006 to April 2009) a further 1,147 arthroplasty patients were studied. Data were again collected regarding HDU, ICU, PACU and mortality, as noted above.

RESULTS We found statistically significant ($p=0.001$) reductions in the admissions to PACU (22% down to 10%) and in mortality (6.1% down to 1.2%) after the introduction of the pre-assessment clinic. There was also a statistically significant ($p=0.01$) reduction in the HDU length of stay (2.1 days to 1.6 days), ICU unplanned admissions (1.3% to 0.4%) and the ICU length of stay (2.3 to 1.9 days). We estimated cost savings of nearly £50,000 in the second part of the study. This is based on the average decrease in HDU and ICU length of stay.

CONCLUSIONS We recommend the use of a multidisciplinary pre-assessment clinic for complex orthopaedic surgery.

KEYWORDS

Pre-assessment clinic – Orthopaedic surgery – Audit loop

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The British Orthopaedic Association guidelines for hip arthroplasty state that it is desirable to have postoperative access to a high dependency unit (HDU) or intensive care unit (ICU) with orthopaedically trained nursing.¹

In 1991 the Association of Anaesthetists of Great Britain and Ireland defined an HDU as an area for patients who required more intensive observation, treatment and monitoring than can be provided on a general surgical ward.² Several publications (including the confidential enquiry into perioperative deaths)^{3,4} have emphasised the role of HDU in providing postoperative care.⁵

The occupancy rates and costs of HDU and ICU in the UK are high with surgical patients accounting for more than 65% of HDU occupancy.¹ In hospitals without adequate HDU facilities surgical patients are often managed inappropriately, ie for prolonged periods in the post-anaesthesia care unit (PACU), in ICU or on a normal surgical ward.¹ Patients

managed on the ward may not receive optimal care, with adverse outcome and higher mortality and morbidity.⁴ Inappropriate admissions to ICU are expensive: the cost of treatment in ICU is £1,350 per day (and in HDU £880 per day).¹

The aim of this study was to audit the effect of a specialised preoperative anaesthetic assessment clinic after hip and knee arthroplasty and revision arthroplasty. We studied the postoperative care of orthopaedic hip and knee arthroplasty patients in HDU, ICU and PACU as well as mortality. We also assessed the costs.

Patients and Methods

Study group

We studied patients undergoing 'complex elective' orthopaedic surgery at the Princess Royal Hospital in Haywards Heath between April 2005 and April 2009. Higher risk pa-

TABLE 1 Results of data collection for HDU, ICU, PACU and mortality

		April 2005 – March 2006; n=298	May 2006 – April 2009; n=1,147	Statistical significance
HDU	Admissions	14/298 (4.7%)	85/1,147 (7.4%)	$p=0.1$
	Unplanned admissions	4/298 (1.34%)	20/1,147 (1.7%)	$p=0.1$
	Length of stay	2.1 days	1.6 days	$p=0.01$
ICU	Admissions	4/298 (1.3%)	18/1,147 (1.6%)	$p=0.1$
	Unplanned admissions	4/298 (1.3%)	4/1,147 (0.4%)	$p=0.01$
	Length of stay	2.3 days	1.9 days	$p=0.01$
PACU	Admissions (all unplanned)	65/298 (22%)	111/1,147 (10%)	$p=0.001$
Mortality	HDU, ICU and PACU	18/298 (6.1%)	14/1,147 (1.2%)	$p=0.001$

tients only were operated on at this site. In total 1,445 patients were included: all patients underwent either primary or revision knee or hip arthroplasty on an elective basis. All patients were assessed as either ASA grade 3 or 4 or had a body mass index of more than 40. All surgery was undertaken by orthopaedic consultants or their appropriately supervised junior staff in the department. We excluded any patient requiring operation after traumatic injury.

Study design

The study consisted of an audit loop:

1. Prior to the commencement of a specialised preoperative anaesthetic assessment clinic

Data were collected prospectively between April 2005 and March 2006 (11 months) regarding the postoperative care of orthopaedic patients undergoing hip arthroplasty and knee arthroplasty (both primary and revision surgery). We studied data concerning 108 primary hip replacements, 39 revision hip replacements, 123 primary knee replacements and 28 revision knee replacements (298 patients in total).

There was no consultant-led preoperative anaesthetic assessment clinic during this time. Patients were reviewed by assessment nurse in preoperative clinic and assessed by a consultant anaesthetist on the day of operation. Postoperatively orthopaedic patients were managed in PACU on the day of surgery and then discharged either to the ward, to HDU or to ICU. We monitored usage of HDU, ICU and PACU by postoperative orthopaedic patients and whether their admissions were planned or unplanned. Any extended management in PACU after hours (7pm) was deemed an unplanned PACU admission.⁶

Data were collected regarding:

- a) HDU: The number of admissions
The percentage of unplanned admissions
The length of stay in days
- b) ICU: The number of admissions
The percentage of unplanned admissions
The length of stay in days

c) PACU: The number of patients undergoing extended management in PACU due to lack of HDU or ICU bed

d) Mortality: Number of deaths prior to return to the ward, during the stay in HDU, ICU or PACU

2. Introduction of preoperative anaesthetic assessment clinic

In April 2006 the above mentioned clinic was started. After this date all patients were assessed preoperatively by a multidisciplinary anaesthetic lead team (anaesthetist, orthopaedic senior house officer, nurse practitioner). The need for an HDU or ICU bed was assessed and the bed was booked as part of the preoperative plan. If the booked bed was not available, the planned surgery did not proceed.

3. After the commencement of a specialised preoperative anaesthetic assessment clinic

Between May 2006 and April 2009 (72 months) data were again collected regarding HDU, ICU, PACU and mortality, as noted above. Data concerning 1,147 patients was collected prospectively: 436 primary hip replacements, 113 revision hip replacements, 499 primary knee replacements and 99 revision knee replacements were included.

We calculated both the total savings and savings per patient after implementation of the preoperative assessment clinic.

Results

The results are shown in Table 1. The Student's t-test was used to calculate probability values. We found statistically significant changes in the reduction of (unplanned) admissions to PACU and in mortality prior to the return of patients to the ward ($p=0.001$). Other statistically significant results included reduction in the HDU length of stay (2.1 days to 1.6 days), ICU unplanned admissions (1.3% to 0.4%) and the ICU length of stay in days (2.3 to 1.9 days) ($p=0.01$).

The cost savings overall between the first and second parts of the study were calculated as follows:

Cost for first part of the study:

ICU: 2.3 days x £1,330 x 18 patients = £55,062
 HDU: 2.1 days x £880 x 85 patients = £157,080
 Total = £55,062 + £157,080 = £212,142

Cost for the second part of the study:

ICU: 1.9 days x £1,330 x 18 patients = £45,486
 HDU: 1.6 days x £880 x 85 patients = £119,680
 Total = £45,486 + £119,680 = £165,166

Difference in costs = £212,142 – £165,166 = £46,976

The total savings in the second part of the study were £46,976.

The savings per patient were calculated as follows:

Cost per patient for first part of study:
 £212,142 / 105 = £2,059.63

Cost per patient for second part of study:
 £165,166 / 105 = £1,573.01

Difference in costs = £2,059.63 – £1,573.01 = £486.62

The saving per patient in the second part of the study was £486.62.

Discussion

Previous studies concerning preoperative assessment clinics have documented a reduction in cancellation rates in both general and orthopaedic surgery⁷⁻⁹ but have not addressed changes in patient care.

Regarding patient care, our study demonstrated statistically significant reductions in admissions to HDU, ICU and PACU after a change in preoperative assessment clinics. There was also statistically significant reduction in both HDU and ICU average length of stay.

Regarding patient mortality, there was a significant reduction in mortality rate ($p=0.001$) with the introduction of a pre-assessment clinic. During the second part of our audit loop (after the introduction of a pre-assessment clinic) there were 56 fewer deaths than might otherwise have been expected.

During the course of the study, the numbers of patients undergoing surgery gradually increased. This may have led to a corresponding increase in expertise and an effect on the data independent of the pre-assessment clinic.

In addition to the clinical benefits noted above, there was also a reduction in costs of nearly £50,000 and a saving per patient of £486.62.

Conclusions

We recommend preoperative assessment clinics for complex orthopaedic joint surgery.

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