Patient satisfaction with the use of an enhanced recovery programme for primary arthroplasty

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ABSTRACT

INTRODUCTION Enhanced recovery programmes (ERPs) are increasingly being used for arthroplasty. One of the core aims of an ERP is to improve the quality of patient experience. However, there is currently no published evaluation of patient satisfaction in relation to this new programme of care within orthopaedic surgery. The aim of this study was to compare the ERP against the standard care programme (SCP) at one centre.

METHODS A satisfaction survey addressing patient opinions on the key objectives of the ERP was conducted by telephone, using a set script. Of the 226 patients contacted, 143 (63.3%) responded (69 from the ERP and 74 from the SCP). Of the respondents, 71 received a total hip arthroplasty and 72 a total knee arthroplasty. Patients were contacted at a mean time from operation to survey of 27.2 weeks. They were asked to rate satisfaction on a five-point scale and complete the EQ-5D™ health questionnaire (EuroQol, Rotterdam, Netherlands) to measure healthcare outcomes.

RESULTS The mean patient satisfaction score of 4.07 for speed of recovery in the ERP group was significantly higher than the SCP group's score of 3.68 ($p=0.037$). Adjusting for the preoperative health score, the postoperative health score was higher for ERP patients at 74.1 compared with 64.7 for SCP patients ($p=0.0029$). Furthermore, the percentage of patients who had a better than expected recovery was significantly greater in the ERP group at 85.5% compared with 58.1% ($p=0.0004$) in the SCP group.

CONCLUSIONS We believe that the previously established reduction in length of hospital stay delivered by ERPs is not achieved at the expense of the patient's experience.

KEYWORDS

Orthopaedics – Hip arthroplasty – Knee arthroplasty – Recover – Patient satisfaction – Questionnaire

Accepted 3 August 2013

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Primary total hip and knee arthroplasty (THA and TKA) are well established, high volume procedures.^{1,2} Since the introduction of patient reported outcome measures (PROMs) in April 2009, it has been demonstrated that these procedures improve patients' lives significantly while remaining cost effective.^{3,4} The demand for these procedures continues to increase.⁵ To accommodate the increasing number of procedures, there has been a trend for decreasing the length of stay in hospital.

Care pathways have been designed to improve the implementation of evidence-based medicine in the context of local resources and patient groups. The enhanced recovery programme (ERP) is an example of a pathway used increasingly for arthroplasty. An ERP aims to produce fitter patients who sustain fewer complications while recovering from surgery at an accelerated rate. Central to an ERP is the improvement of the quality of patient experience.

The ERP comprises four main areas: 1) preoperative assessment, planning and preparation before admission;

2) reduction in the physical stress of the operation; 3) a structured approach to immediate postoperative and perioperative management; and 4) early mobilisation.⁶ Most importantly, the ERP incorporates techniques to reduce perioperative stress, based on a better understanding of the physiological stress of surgery combined with new methods of pain control. This approach has been shown to improve both the morbidity and mortality in surgical patients.⁷

To overcome the delay in mobilisation of patients following lower limb arthroplasty, multimodal techniques have been developed. A key technique is local infiltration analgesia (LIA) where adrenaline, local anaesthetic and an anti-inflammatory are infiltrated around the surgical field. This allows a decrease in postoperative morphine requirements as well as mobilisation within hours of surgery.⁸ Local infiltration techniques have been developed, with the introduction of intra-articular catheters, for the delivery of local anaesthetic postoperatively, resulting in accelerated postoperative recovery.^{9,10} In previous work carried out at

our centre, the introduction of the ERP including LIA delivered a mean reduction in length of stay of 4.25 days for THA and 1.02 days for TKA.¹¹

In the current tough economic climate, health authorities are looking for greater efficiency to meet the '18-week wait'.¹² The cancellation of elective lists due to lack of bed capacity is not uncommon.¹³ Programmes that decrease in-patient stay therefore allow greater efficiency while meeting targets.

It is important that increased patient turnover and the resulting financial benefits delivered by the ERP do not come at the cost of patient satisfaction. Currently, there is no evaluation of patient satisfaction in relation to this new programme of care within orthopaedic surgery. The aim of this study was to compare the ERP against the SCP at one centre.

Methods

Two groups of consecutive patients who had undergone primary THA and TKA between July 2010 and July 2011 at one centre were contacted retrospectively without exclusions to carry out a telephone questionnaire. The first group received a full ERP under the care of one surgeon; the second received a SCP under the care of three surgeons. Both groups received standard optimisation from primary care, preoperative assessment, patient education and early mobilisation protocols. In practice, this meant that the ERP group mobilised on the day of surgery and the SCP group on the day following surgery.

Surgical techniques did not differ markedly between groups as all surgeons used standard open approaches. Minimal access surgery was not employed. Areas 1, 2 and 4 of enhanced recovery are already offered as standard at our centre. However, the ERP group had a new structured approach to immediate postoperative and perioperative management, including multimodal pain relief with LIA.

Recovery programmes

The ERP group received 300mg gabapentin orally on the night prior to surgery. On the morning of surgery, a regime of 300mg gabapentin and 30mg lansoprazole was taken with 5–10mg OxyContin® (Napp Pharmaceuticals, Cambridge, UK) if required. Two hours before the operation, the group was given Preload™ (VitaFlo, Liverpool, UK). In theatre, these patients received a spinal anaesthetic with a light general anaesthetic from a propofol infusion. Local infiltration to the surgical field of a combination of 50ml 0.25% levobupivacaine, 30mg ketorolac and 0.5ml 1:1,000 adrenaline diluted up to 100ml in 0.9% saline was administered before closure.

The postoperative regime included one bolus through an intra-articular catheter of 20ml levobupivacaine 0.25% and 0.5ml 1:1,000 adrenaline diluted up to 40ml with 0.9% saline given 16–20 hours following surgery. An additional postoperative bolus was given through the intra-articular catheter in the recovery room if the patient required it. Postoperative analgesia included regular paracetamol and ibuprofen for two weeks, 300mg gabapentin twice daily for five days and a reducing dose of 5–20mg OxyContin® twice daily

for three days. Breakthrough analgesia included OxyNorm® (Napp Pharmaceuticals) and patient controlled analgesia (PCA) was offered only to patients with a poor response to oral analgesia.

The SCP group received its regular analgesia including paracetamol, non-steroidal anti-inflammatories and codeine-based analgesia. The majority (88%) received a general anaesthetic, with the remaining 12% having a spinal anaesthetic. The postoperative period commenced with PCA until pain could be controlled by a combination of paracetamol, non-steroidal anti-inflammatories and codeine-based analgesia, with morphine for breakthrough pain.

Both groups of patients had to meet the same criteria for discharge: pain control sufficient by oral medication to allow mobilisation; independence with activities of daily living; independent mobility, including the ability to climb a flight of stairs; no discharge from the wound dressing; and the patient happy to be discharged. On discharge, specialist nurses followed up the patients in the community until the wound was watertight and no longer required a dressing. The community physiotherapist also saw patients as required. After six weeks, patients were seen in clinic for full assessment.

Study questionnaire

A telephone questionnaire was designed including the main aims of the ERP on a five-point scale. Patients were asked about their preparation, speed of recovery and pain management. The questionnaire also incorporated the EQ-5D™ (EuroQol, Rotterdam, Netherlands), a generic health related quality of life tool used routinely as part of National Health Service PROMs to calculate health gain after a procedure. As part of the EQ-5D™, patients were asked to score their health prior to the procedure and on the day of the questionnaire. The difference between the pre and postoperative scores was used to calculate the patient's subjective change in health on a scale of 0–100.

Two surgeons not involved in the patient's care carried out the telephone questionnaire. A set script was followed and if the patient failed to respond to the first telephone call, a second call was made at a later date before the patient was excluded from the study.

Data analysis

Statistical analysis was carried out using R statistical software (<http://www.r-project.org/>). The primary statistical method used was analysis of covariance using the traditional approach of ordinary least squares.¹⁴ This allows the comparison of group means of the response variable while adjusting for the covariate; hence, it potentially reduces bias and increases the precision of the comparison.¹⁵ This method was used to compare means of the response variable postoperative health score while adjusting for the covariate preoperative health score.

The method can be described in terms of fitting regression lines to each of the groups. For statistical inference, the need for the usual distributional assumptions is avoided by employing computer intensive methods. The dataset is resampled 9,999 times to produce a distribution of statistics,

and its 2.5 and 97.5 percentiles are used as the 95% confidence limits.¹⁶ This is performed using function `two.boot` from the R package `simpleboot`.¹⁷ To improve the accuracy of the method, the limits are adjusted using bias correction and acceleration, employing function `boot.ci` from the R package `boot`.¹⁸ For statistical significance tests, *p*-values are obtained using 1,000,000 permutations of the data and for one-way analysis of variance, this is achieved using function `aovp` from the R package `lmPerm`.¹⁹

Results

A total of 226 patients were contacted, resulting in 143 responses (63.3% response rate). With one exception, all patients who were successfully contacted agreed to complete the questionnaire. The demographics of the responding patients were reviewed (Table 1.) Patients in the ERP group

Table 1 Patient demographics for enhanced recovery programme (ERP) and standard care programme (SCP)		
	ERP	SCP
Number of patients	101	125
Number of responses	69	74
Mean time in weeks from operation to survey (range)	26.8 (4–52)	27.7 (4–75)
Male-to-female ratio	32:37	33:41
Mean age in years (range)	62.7 (34–88)	66.6 (37–85)
Total hip arthroplasty	38	33
Total knee arthroplasty	31	41

Figure 1 Mean satisfaction score for enhanced recovery programme (ERP) and standard care programme (SCP) patients for speed of recovery (with bootstrap 95% confidence limits)

were contacted at 4–52 weeks (mean 26.8 weeks) following surgery. The SCP patients were contacted at 1–75 weeks (mean 27.5 weeks). The difference between the means of the ERP and SCP groups was 0.7 weeks (95% confidence interval [CI]: -5.3–6.5, *p*=0.84).

The mean satisfaction score for speed of recovery was higher for ERP patients at 4.07 compared with 3.68 for SCP patients (*p*=0.037) (Fig 1). Preoperatively, the mean health score was 46.2 for the ERP group and 50.1 for the SCP group. The mean postoperative health scores were 73.4 and 65.3 respectively. This allowed us to calculate a mean change in health score of 27.2 for the ERP patients and 15.2 for the SCP patients.

The mean postoperative health scores, adjusted for the preoperative health score, were 74.1 for the ERP group and 64.7 for the SCP group (Fig 2), resulting in an adjusted difference between the scores of 9.46 (95% CI: 3.49–15.34). Following adjustment, there was still a greater improvement in ERP patients than in SCP patients postoperatively (*p*=0.0029).

The percentage of patients who reported a recovery better than expected was greater in the ERP group with 59 patients (85.5%) having their expectations exceeded compared with 43 patients (58.1%) in the SCP group (Fig 3). The difference between the percentages was 27.4 percentage points (95% CI: 12.7–40.5 percentage points, *p*=0.0004). The mean patient satisfaction score for pain management was 4.36 in the ERP group and 4.12 in the SCP group (*p*=0.14). Finally, the mean patient satisfaction score for the preparation was 4.26 in the ERP group and 4.55 in the SCP group (*p*=0.031), with the difference between the mean scores being -0.29 (95% CI: -0.55–0.04).

Figure 2 Mean postoperative health scores for enhanced recovery programme (ERP) and standard care programme (SCP) patients, adjusted for preoperative health score (with bootstrap 95% confidence limits)

Discussion

The results of this study demonstrate that patients generally have a preference for the use of the full ERP over the SCP at our centre. There was significantly greater patient satisfaction when comparing the speed of recovery and a higher percentage of patients reported a better than expected experience in the ERP group. There was also a greater change in the health score and a higher postoperative health score when ERP patients completed the EQ-5D™. Despite a multimodal approach, LIA and an intra-articular catheter in the ERP, there was no significant difference in the patient satisfaction score for pain management. This may be due to the high levels of satisfaction with both programmes. The different approach to pain management of the ERP should not be judged in isolation. This approach to analgesia allowed patients to mobilise sooner, leading to a quicker recovery and improved reported patient satisfaction.

Our questionnaire revealed that patients preferred the preparation in the SCP. We note that our SCP incorporates a number of core principles of the ERP including preoperative preparation and stress reduction. Nevertheless, we believe our SCP was an appropriate control for a full ERP as it reflects current practice at many other centres. A possible explanation of this outcome is that the two pathways had different surgeons preparing them preoperatively and it may simply reflect patient preference for certain consultation styles.

Weaknesses of the study

As with most patient satisfaction studies, there is a risk of response bias. Despite this, a response rate of 65.3% compares sufficiently well with the literature to infer conclusions.²⁰

It is possible that confounders may have contributed to our results. For example, pre-existing co-morbidities, other joint disease and previous mobility could all have affected the patients' perception of their health, pain and recovery. Selection bias was minimised by contacting consecutive patients in both groups without exclusions. Another potential confounder is that one surgeon carried out the ERP whereas three surgeons were involved in the SCP. However, all procedures occurred at one centre and set protocols were followed for both programmes.

We acknowledge that there is a risk of recall bias with the variation in time between operation and questionnaire completion although the difference in mean time of operation to questionnaire completion was not statically significant. We also note that the distribution of THA to TKA varied between the two groups and this is due to the inclusion of consecutive lower limb arthroplasty patients for the study. Finally, only the health score questions taken from the EQ-5D™ have been validated.

Conclusions

We believe that the previously established reduction in length of hospital stay and, by implication, cost savings is not at the expense of the patient's subjective experience. Patients seem very satisfied with the ERP.

References

1. Malchau H, Garellick G, Eisler T *et al*. Presidential guest address: the Swedish Hip Registry: increasing the sensitivity by patient outcome data. *Clin Orthop Relat Res* 2005; **441**: 19–29.
2. Robertsson O, Knutson K, Lewold S, Lidgren L. The Swedish Knee Arthroplasty Register 1975–1997: an update with special emphasis on 41,223 knees operated on in 1988–1997. *Acta Orthop Scand* 2001; **72**: 503–513.
3. Finalised Patient Reported Outcome Measures (PROMs) – England, April 2009 – March 2010, Pre- and post-operative data: Experimental statistics: Annual refresh report. Health and Social Care Information Centre. <http://www.hscic.gov.uk/pubs/finalisedproms0910> (cited August 2013).
4. Chang RW, Pellisier JM, Hazen GB. A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip. *JAMA* 1996; **20**: 858–865.
5. National Joint Registry for England and Wales. *8th Annual Report 2011*. Hemel Hempstead: NJR; 2011.
6. Enhanced Recovery Programme. NHS Institute for Innovation and Improvement. http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/enhanced_recovery_programme (cited August 2013).
7. Kehlet H, Wilmore DW. Multimodal strategies to improve surgical outcome. *Am J Surg* 2002; **183**: 630–641.
8. Kerr DR, Kohan L. Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery. *Acta Orthop* 2008; **79**: 174–183.
9. Kinninmonth AW, Lamont E, Monaghan H *et al*. A perioperative regime, including high volume, intermittent ropivacaine via an intra-articular catheter, allowing early mobilisation in total knee arthroplasty. Presented at: Annual Meeting of the British Association for Surgery of the Knee; April 2009; Edinburgh.
10. Kinninmonth AW, Lamont E, Monaghan H *et al*. A perioperative regime, including high volume, intermittent ropivacaine via an intra-articular catheter, allowing early mobilisation in total hip arthroplasty. Presented at: Annual Meeting of the British Hip Society; March 2009; Manchester.
11. Carrannante J, Hearth MW. Enhanced recovery programme for primary joint replacement surgery. Presented at: Basildon Hospital Audit Meeting; April 2011; Basildon.
12. Department of Health. *Tackling Hospital Waiting: The 18 Week Patient Pathway*. London: DH; 2006.

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13. Robb WB, O'Sullivan MJ, Brannigan AE, Bouchier-Hayes DJ. Are elective surgical operations cancelled due to increasing medical admissions? *Ir J Med Sci* 2004; **173**: 129–132.
 14. Fisher RA. *Statistical Methods for Research Workers*. 14th edn. Edinburgh: Oliver & Boyd; 1970.
 15. Huitema BE. *The Analysis of Covariance and Alternatives*. 2nd edn. Hoboken, NJ: Wiley; 2011.
 16. Davison AC, Hinkley DV. *Bootstrap Methods and Their Application*. Cambridge: Cambridge University Press; 1997.
 17. Peng RD. Package 'simpleboot': Simple Bootstrap Routines. R package version 1.1-3.
 18. Canty A, Ripley B. boot: Bootstrap R (S-Plus) Functions. R package version 1.3-2.
 19. Wheeler B. Package 'ImPerm': Permutation Tests for Linear Models. R package version 1.1-2.
 20. Sapsford R, Abbot P. *Research Methods for Nurses and the Caring Professions*. Buckingham: Open University Press; 1992.