Optimization of the Patient Undergoing Total Knee Arthroplasty – The Rapid Recovery Program

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ABSTRACT

There is traditionally an unnecessary “medicalization” of the orthopedic patient undergoing total knee arthroplasty. Such procedures are commonly performed under general anesthesia with difficulties in managing postoperative analgesia requirements resulting in slow mobilization and recovery. In-patient stays of 2 weeks are commonplace and care is often disjointed with limited interaction between the different groups of health care providers. Changing demographics and an ever-increasing demand for joint replacement dictate that the processes be streamlined to maximize efficiency. Rapid Recovery is an evidence-based means of providing the best possible patient care, while at the same time optimizing the use of resources. It promotes patient centered care with a focus on patient education and prehabilitation. The preoperative, intraoperative, and postoperative stages of Rapid Recovery are described. The significant reduction in the length of in-patient stay, the considerable cost savings, and the low complication rates are discussed as well as the favorable patient satisfaction scores. Rapid Recovery should now be thought of as the gold standard for the treatment of all patients undergoing hip and knee replacement.

Keywords: Rapid Recovery, fast track surgery, enhanced recovery knee, hip, arthroplasty, LIA

INTRODUCTION

There is traditionally an unnecessary “medicalization” of the orthopedic patient undergoing total knee arthroplasty. Such procedures have commonly been performed under general anesthetic with difficulties in managing postoperative analgesia requirements resulting in slow mobilization and recovery. In-patient stays of 2 weeks are commonplace and care is often disjointed with limited interaction between the different groups of health care providers.

Changing demographics have resulted in an increase in the number of older patients with degenerative joint disease and this has necessitated an ever-increasing need for joint arthroplasty and the subsequent socioeconomic pressures placed on hospital trusts.1

Hospitals face daily pressures in achieving targets on waiting times for patients requiring surgery. With a finite number of in-patient beds available, it has become essential to improve patient turnover to meet the demands. At the same time there is a desire from health care professionals to provide individualized care to optimize patient’s experiences, recovery, and outcomes. This must all be achieved with a fixed (and possibly reducing) budget and has therefore necessitated newer ways of providing patient care. It is on this background that the enhanced recovery program was initiated and has been implemented in our hospital with the title of the Rapid Recovery Program.2 6

RAPID RECOVERY

Rapid Recovery aims to increase the quality of patient care, improve outcomes while reducing the length of in-patient hospital stay and thus the costs to the hospital by optimizing the use of resources. The central tenet of Rapid Recovery is making the patient an active participant in their treatment rather than a passive figure as is traditionally the case. A multimodal approach is taken involving a multidisciplinary team consisting of surgeons, anesthetists, preassessment, and ward nursing staff, physiotherapists, occupational therapists, pharmacists, and even previous patients. This approach can be separated into preoperative, intraoperative, and postoperative stages.

PREOPERATIVE PREPARATION

Patient education begins immediately the decision is made to proceed with surgery. An information handout is provided that outlines the indications for surgery, the anesthetic options available, the operative detail itself, pain management techniques, and the postoperative course and rehabilitation.

Patients undergoing total knee replacement are then grouped together and attend a “joint school” at least 1 week prior to their planned surgery to prepare them physically, psychologically, and logistically. They are met by members of the multidisciplinary team and are educated on what to expect at each stage of their surgical pathway and what is requested of them to ensure an optimal outcome.
The aims of knee replacement and the surgical steps are outlined in detail. Patients’ are informed of the available forms of anesthesia and the merits and drawbacks of these so that they can reach an agreement with the anesthetist on which is best for them. They are taught their postoperative exercises in advance so as to facilitate rapid mobilization. Occupational therapists can investigate patients’ home set-up and likely needs so that any equipment can be arranged in advance to prevent unnecessary delayed discharge. It is essential to manage patients’ expectations so that they are prepared for appropriate early mobilization and discharge. This knowledge facilitates matters for when they are admitted for surgery. Educating patients in this manner serves to empower patients, to involve them in their active rehabilitation, and to reduce anxiety, which then impacts positively on their recovery to meet a planned discharge date.

Patients have the option to meet individuals who have previously undergone a knee replacement, to speak with them, and to share their experiences. They are also encouraged to bring a friend or relative to joint school to act as a “coach” to help motivate them through the surgical process. This gives the coach the opportunity to further discuss and raise any questions or concerns.

All patients undergo a thorough preassessment to ensure they are physically optimized for surgery with any comorbidities addressed and investigated accordingly in conjunction with the anesthetist. This significantly reduces the number of patients having their surgery cancelled on the day of admission. In particular, if a patient is found to be anemic preoperatively, then the surgery is postponed while the cause is investigated and treated. It has been shown that the major determinant as to whether patients undergoing joint replacement require a transfusion is the initial hemoglobin concentration. It is our experience that with this approach, along with intraoperative measures that will be discussed later, we have significantly reduced transfusion requirements during and after surgery.

**INTRAOPERATIVE MEASURES**

One of the main pillars of Rapid Recovery involves innovative perioperative multimodal anesthesia. This combines analgesics with varying modes of action to interrupt the noxious transmitters and pathways. This allows a reduction in the dose of opioid analgesia required and its subsequent side effects such as nausea, vomiting, confusion, constipation, urinary retention, and allergy. It is essential to reduce these as postoperative pain adversely affects patient recovery, increase the risks of an ischemic cardiac event, limits their mobility, and increases the risk of venous thromboembolism. The adverse effects of opioids also prevent early mobilization and positive patient well-being.

The vast majority of patients undergoing total knee replacement receive spinal anesthesia. This is a marked change compared with prior to Rapid Recovery when the majority of patients received a general anesthetic with or without a nerve block. This change has resulted in a significant improvement in pain scores and physiotherapy compliance in the immediate postoperative period. Studies have shown that the use of spinal anesthetic with opioid results in significantly lower pain scores in the first 24 hours, a reduction in the use of additional analgesia for breakthrough pain, and a longer period before the first analgesic request. The use of spinal anesthesia also reduces postoperative morbidity and mortality from venous thromboembolism, respiratory depression, pneumonia, and myocardial infarction.

A further method of advancing pain management is with the infiltration of high volume local anesthetic intraoperatively (LIA technique). In our unit a modified technique is used from that described in the literature. This consists of 100 ml 0.2% Ropivicaine mixed with 1 ml of 1:1000 adrenaline. 50 ml syringes with 18 G needles are used to infiltrate half of this mixture into the posterior capsule, gutters, and extensor mechanism prior to the insertion of implants. The second half is infiltrated into the same areas following insertion of the arthroplasty components. A further 50 ml of plain 0.2% Ropivicaine is infiltrated into the skin and subcutaneous tissues at the end of the operation after wound closure. The LIA technique provides continual local analgesia for up to 6 hours postoperatively, thereby allowing early mobilization and preventing the rapid onset of pain that usually occurs following traditional anesthetic techniques.

It is essential to limit blood loss for a quicker, uncomplicated recovery. Anemia and blood transfusions delay mobilization of the patient and increase hospital costs as well as exposing the patient to the potential hazards of blood transfusions. The use of spinal anesthesia reduces the risk of the patient requiring blood transfusion and pharmacological prophylaxis with tranexamic acid has been shown to reduce perioperative blood loss and transfusion requirements.

Tourniquets are used to control bleeding and to permit a dry interface for optimal bone and cement bonding. Traditionally the tourniquet is deflated at the end of the operation after wound closure and the application of compressive bandages. It is recommended that deflation of the tourniquet is performed prior to wound closure so that any bleeding can be controlled to minimize blood loss and prevent hematomas that may lead to infection. A compressive bandage (Actico, Activa Healthcare Ltd, Staffordshire) is applied over a layer of wool from groin to toe using a simple spiral technique with 50% overlap to further limit blood losses and to fix the local anesthetic in the surrounding soft tissues. This technique has been shown to decrease pain in the first 8 hours postoperatively compared with noncompressive bandages.

Intra-articular drains are also avoided as these have been shown to increase the need for blood transfusion and have no significant effect on the occurrence of wound infections, hematomas, wound healing limb swelling, venous thrombosis, or length of hospital stay. Drains can also limit
postoperative mobilization, increase the “medicalization” of patients and thus delay recovery and discharge.

POSTOPERATIVE MANAGEMENT

Patients are encouraged to start rehabilitation exercises immediately after surgery by the theater recovery nursing staff. Standardized protocols are followed for postoperative pain management, physiotherapy, and wound care. There is daily multidisciplinary review to ensure patients meet preset discharge criteria.

There is close communication with primary care advisers and electronic discharge summaries are faxed within 24 hours of discharge. Once patients are discharged, they initially receive a 48-hour telephone follow-up to monitor their progress and are brought back for review should there be any concerns.

ACHIEVEMENTS

The length of stay for total knee replacement over a 3-year period following the implementation of Rapid Recovery has seen an ongoing linear reduction from a mean of 11 days down to 4 days with over 50% of patients being discharged in 3 days or less. Auditing has confirmed there has been no increase in the readmission rate in the first 30 days following discharge.

COSTS

Rapid Recovery has been audited by independent external auditors and has been shown to be cost neutral to implement and to offer significant savings over previous “traditional” practices.

COMPLICATIONS

In the past financial year, 538 total joint replacements were performed (hip and knee) with a low rate of complications, which compares favorably with published data.²⁰,²¹

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>3</td>
<td>0.5%</td>
</tr>
<tr>
<td>Any DVT</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Superficial infection</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Deep infection</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Hematoma (requiring evacuation)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Dislocation</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
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PATIENT SATISFACTION

An anonymous questionnaire is used to record ongoing patient satisfaction scores. The results from 100 consecutive patients were analyzed to attain a snapshot of patients’ experiences and opinions.

- How well were you prepared for your in-patient stay, operation, and rehabilitation? 56% reported excellent preparation, 32% felt well prepared, 8% adequately prepared, 4% did not complete this question.
- Did the Joint School reduce your anxiety or apprehension regarding your hospital admission? 76% replied yes, 10% no, and 14% did not complete this question.
- Did it go according to plan? 84% said yes, 9% no, and 8% did not complete this question.
- Did you feel you were encouraged to mobilize and get back to normal as quickly as possible? 95% responded yes, 5% did not complete this question.
- Knowing that you will be contacted by the ward nurse within the next 48 hours, how confident are you about going home? 72% felt very confident, 24% fairly confident, 2% not confident, and 2% did not complete this question.
- How would you rate your experience of Rapid Recovery? (1 = poor, 10 = excellent)
  
  | 10 | 19% |
  | 9  | 20% |
  | 8  | 21% |
  | 7  | 5%  |
  | 6  | 2%  |
  | 5  | 1%  |
  
  7% did not complete this question.
- Would you recommend Rapid Recovery to relatives or friends needing a joint replacement? 97.8% replied that they would recommend it.

CONCLUSION

Rapid Recovery represents a significant improvement over traditional methods of joint replacement. It should now be considered the gold standard for the treatment of patients undergoing hip or knee replacement.

It has been commonplace for patients to be admitted for surgery with little idea of the planned procedure and the process in store. The lack of “prehabilitation” makes it extremely difficult for them to be active participants in their own care.

New subjects may be broached for the first time during the consenting process immediately prior to surgery. Often patients are cancelled on the morning of surgery as medical comorbidities requiring further investigation or treatment are identified. Surgery is traditionally performed under general anesthesia with no intra-articular infiltration. Drains are commonly used and on occasion patients have to undergo a further general anesthetic to remove these. Postoperative analgesia is often opioid and this can cause multiple obstacles to early mobilization ranging from nausea, constipation, and vomiting to confusion and hypotension. Patients are usually on bed rest on the day of surgery and may not mobilize for several days until drains are removed and they are fit to stand. Discharge may be delayed for a considerable period should the patient require additional
mobility aids to be installed at their residence or interim care prior to returning home.

Rapid Recovery aims to positively address each of these obstacles. It empowers patients and their relatives by placing them at the heart of the surgical pathway with simple education and preparation. It serves to optimize the use of resources and capacity while reducing the costs to the hospital. The greater efficiency permits a quicker turnover of in-patient beds and, thus, the opportunity to achieve greater income for the hospital. Patient satisfaction is seen to be extremely high with patient questionnaires also reporting excellent preparation for the journey ahead, a reduction in anxiety, and strong confidence about going home, with 97.8% keen to recommend the program to relatives and friends needing a joint replacement.

Rapid Recovery is simple and cost neutral to implement and results in considerable savings once established while at the same time increasing turnover and revenues. However, more important than the financial aspects is finally the ability to incorporate evidence-based medicine to joint replacement surgery and introduce “best-practice” to achieve the best outcome, all the time providing patient-centered care.

In our unit, this program is currently used in hip and knee arthroplasty surgery but it is clearly transferrable to other orthopedic procedures and other surgical specialties. It should now be thought of as a standard level of treatment for all patients undergoing hip and knee arthroplasty surgery. Rapid Recovery aims to positively address each of these obstacles.

Disclosure: The senior has received or will receive benefits for personal or professional use from a commercial party related directly or indirectly to the subject of this article. In addition, benefits have been or will be directed to a research fund, foundation, educational institution, or other nonprofit organisation with which one or more of the authors are associated.

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REFERENCES