



Fast track in hip arthroplasty

Torben Bæk Hansen

- ‘Fast-track’ surgery was introduced more than 20 years ago and may be defined as a co-ordinated peri-operative approach aimed at reducing surgical stress and facilitating post-operative recovery.
- The fast-track programmes have now been introduced into total hip arthroplasty (THA) surgery with reduction in post-operative length of stay, shorter convalescence and rapid functional recovery without increased morbidity and mortality. This has been achieved by focusing on a multidisciplinary collaboration and establishing ‘fast-track’ units, with a well-defined organisational set-up tailored to deliver an accelerated peri-operative course of fast-track surgical THA procedures.
- Fast-track THA surgery now works extremely well in the standard THA patient. However, all patients are different and fine-tuning of the multiple areas in fast-track pathways to get patients with special needs or high co-morbidity burden through a safe and effective fast-track THA pathway is important.
- In this narrative review, the principles of fast-track THA surgery are presented together with the present status of implementation and perspectives for further improvements.

Keywords: total hip arthroplasty; ‘fast-track’ surgery; morbidity

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Introduction

‘Fast-track’ surgery was introduced more than 20 years ago by Professor Henrik Kehlet¹ in abdominal surgery. It may be defined as a co-ordinated peri-operative approach aimed at reducing surgical stress and facilitating post-operative recovery.² Fast-track surgery does not only focus on early discharge, but also on enhanced recovery of the patient leading to early discharge from hospital to the patient’s home. Since its development in the early 1990s, data on the results of fast-track surgery have been collected, but implementation of these findings in clinical orthopaedic practice has generally been slow, probably due to the diversity of hospital settings, inadequate staffing of wards, use of opioid-based analgesia regimes,

insufficient post-operative mobilisation of patients, absence of well-defined discharge criteria and suboptimum pre-operative patient information.³

However, fast-track programmes have now been introduced into total hip arthroplasty (THA) surgery with reduction in post-operative length of stay (LOS), shorter convalescence and rapid functional recovery without increased morbidity and mortality. This has been achieved by focusing on a multidisciplinary collaboration with a general agreement on defined evidence-based peri-operative care principles, monitoring of data and adjustment of the programme based on scientific evidence. Fast-track THA surgery units have evolved with a well-defined organisational set-up tailored to deliver an accelerated peri-operative course of fast-track surgical procedures aimed at reduction of peri-operative morbidity, physiologically optimised anaesthetic procedures, optimised pain management and aggressive mobilisation.⁴

The aim of this narrative review is to present the principles of fast-track THA surgery, the current status of implementation and future perspectives of THA fast-track surgery research.

Pre-operative optimisation

A large number of patients scheduled for THA have a potential for pre-operative optimisation. In a Danish study, 45% of the patients had pre-operative risk factors such as smoking, alcohol consumption polypharmacy, anaemia, high BMI and low physical activity, that potentially may lead to complications or a prolonged LOS in hospital not fulfilling a fast-track patient path.⁵ In this relatively small study, the number of unintended patient paths not fulfilling the fast-track standard was significantly reduced from 35% to 18% by pre-operative screening and intervention with optimisation of risk factors such as anaemia and polypharmacy, combined with a motivational conversation to reduce smoking and alcohol consumption, increase physical activity and promote weight loss in patients with high BMI before operation. However, the effect of single factors on fast-track THA pathways was not investigated and seems more complex.

Smoking and alcohol consumption

These factors are among the most common potential optimisation areas and may represent an increased risk of complication after THA. In a Danish study of 3041

consecutive fast-track THA and total knee arthroplasty (TKA) patients, multiple regression analysis showed no relation between length of stay of more than four days and smoking or alcohol use. However, smokers had a general increased risk of re-admission but no increased risk was found in alcohol users. Looking at specific re-admissions (i.e. wound infections or pneumonia) typically related to smoking/alcohol use, surprisingly no increased risk was found in smokers or alcohol users at 90-day follow-up. So, the influence of smoking or alcohol use may be less pronounced in fast-track THA and TKA compared with published data from conventional care programmes.⁶

Pain 'catastrophising' and emotional disorders

There is an increasing understanding of the relationship between pain 'catastrophising' and emotional disorders (including anxiety and depression) and the negative influence on patient pathways in osteoarthritic patients undergoing total joint arthroplasty. Wood et al⁷ studied the association of these factors with pre-operative patient characteristics. The most important predictor of 'catastrophising', anxiety and/or depression is pre-operative pain and poor subjective function. At-risk patients were those with increased pre-operative pain but generally good clinical function, as well as younger women with significant co-morbidities. Such patients may be identified before surgery and targeted with psychological therapy pre-operatively, therefore optimising patient coping strategies and adaptive behaviour to reduce the potential for inferior outcomes, including pain and patient dissatisfaction after joint replacement surgery.

Pre-operative opioid use

Pre-operative opioid use increases the risk for post-operative pain at rest and during walking, and increased opioid consumption after TKA.⁸ This may also be seen in THA surgery, even if THA surgery generally is considered less painful. Many patients taking opioids before surgery continue to use opioids after arthroplasty and some even continue to use opioids without a change in joint pain.⁹

Malnutrition/high BMI

Malnutrition is a well-known risk factor for wound infection, delayed healing, prolonged hospitalisation, increased rehabilitation time and mortality after surgery. The effects of nutritional status on outcomes after TKA and THA are, however, less clear, but indicators of malnutrition status such as low albumin, total lymphocyte count and transferrin levels have been found to predict longer recovery times and hospital stay after joint arthroplasty.¹⁰ Traditionally, high BMI has been regarded as a risk factor for complications in major surgery. However, in fast-track surgery this seems less pronounced. In a large study by Husted et al¹¹ with 13 740 THA and TKA patients undergoing fast-track

surgery, when adjusted for pre-operative co-morbidity, only very obese and morbidly obese THA patients were associated with a LOS of more than four days, but not with re-admission. Therefore, in other words, a fast-track setting resulted in similar length of hospital stay and re-admission rates regardless of BMI, except for very obese and morbidly obese THA patients.

Pre-operative anaemia

The rate of pre-operative anaemia in patients scheduled for THA can be surprisingly high. In a study by Jørgensen et al including 5165 THA or TKA fast-track patients, 12.8% had pre-operative anaemia.¹² Pre-operative anaemia was associated with increased risk of receiving transfusion during admission, increased risk of re-admission within 90 days from surgery and increased risk of LOS of more than five days after adjustment for pre-operative patient-related risk factors. Most of the patients had simple iron-deficiency anaemia,¹³ and pre-operative anaemia may not be related to occult cancer *per se*. Therefore, as pre-operative anaemia in elective fast-track THA and TKA is independently associated with increased post-operative morbidity, it should be detected in the pre-operative evaluation and treated before surgery.

Diabetes

Co-morbidity with different medical conditions may in theory influence a fast-track patient pathway. Type 2 diabetes has, however, limited influence on post-operative morbidity in fast-track THA. Jørgensen et al¹⁴ found that although more type 2 diabetics (11.3%) than non-diabetics (8.1%) had a LOS of more than four days, there was no association between type 2 diabetes and LOS of more than four days when adjusting for co-variables. Type 2 diabetes was also not associated with 30- or 90-day re-admission. However, patients with type 1 diabetes may have an elevated risk of complications after THA surgery. Viens et al¹⁵ found that patients with type 1 diabetes had increased LOS and costs after surgery and also had significant increases in the incidence of myocardial infarction, pneumonia, urinary tract infection, post-operative haemorrhage, wound infection and death. Therefore, in this study with a conventional patient pathway, patients with type 1 diabetes had a significantly higher overall peri-operative risk and required more healthcare resources compared with patients with type 2 diabetes following THA and TKA. The influence of type 1 diabetes in a fast-track THA patient pathway has, however, not been extensively studied and may be different.

Advanced age

Jørgensen et al have studied the influence of advanced age on a fast-track patient pathway.¹⁶ They found that patient age and co-morbidity may increase LOS, re-admission, and mortality after THA surgery.¹⁶ However, more than 75% of

Table 1. Pre-operative optimisation before total hip arthroplasty surgery in a fast-track patient pathway

- Information on intended length of stay
- Multidisciplinary pre-operative patient clinic with patient education
- The social back-up of the patient should be optimised before admission for surgery
- Reduction in alcohol consumption and smoking
- Awareness of the special needs in pain treatment in patients with pain ‘catastrophising’, emotional disorders and pre-operative opioid users
- Optimisation of malnutrition and weight reduction in morbidly obese patients
- Treatment of pre-operative anaemia
- Diabetes regulation should be optimised especially in type 1 diabetes
- Awareness of the influence of psychiatric disorders on an optimal patient path and patient involvement

those aged over 80 years had a LOS of less than four days and fast-track THA with discharge to home is feasible in most patients aged 85 years and over. Starks et al¹⁷ found that in all age groups of THA and TKA patients, median LOS was reduced when compared with that before the introduction of a fast-track pathway. The reduction in LOS was most pronounced in patients aged 85 years and over and nearly all patients were discharged directly home. Re-admission rates were over 45% lower in patients aged 85 years and over in the fast-track THA programme when compared with national averages. A successful fast-track rehabilitation can therefore be achieved in the very elderly population undergoing elective joint replacement surgery, and this age group of vulnerable patients may actually have the most to gain from fast-track multidisciplinary recovery programmes. However, further attention to pre- and post-operative anaemia and the pathogenesis of medical complications is needed to improve post-operative outcomes further and reduce re-admissions in elderly THA patients.¹⁸ Unfortunately, although pre-operative identification of patients at high risk of preventable ‘medical’ but not ‘surgical’ complications is statistically possible, the clinical relevance is so far limited,¹⁹ and implementation into daily practice has so far not been possible.

Psychiatric disorders

Recent studies suggest that patients with psychiatric disorders tend to do worse than patients without a psychiatric diagnosis when undergoing THA,^{20,21} with longer LOS, increased re-admission rate and morbidity after THA. Therefore, it may be important to focus on a more thorough and individualised pre-operative evaluation in psychiatric patients; some patients with psychiatric disorders might be deemed unfit for surgery or be allocated to an optimised fast-track involving a more vigilant post-operative regime.

Low pre-operative function

Patients with low pre-operative functional status may in theory represent a challenge in post-operative mobilisation and discharge in a fast-track patient pathway after THA and TKA. Holm et al²² assessed hip and knee pain, lower-extremity muscle power, functional performance and physical activity before surgery in an attempt to

predict readiness for hospital discharge. Age, however, was the only independent predictor of discharge readiness in THA and TKA patients and these results support the idea that fast-track THA and TKA, with a LOS of about two to four days, can be achieved for most patients independently of pre-operative functional characteristics.

A summary of the possible pre-operative optimisation areas before THA surgery in a fast-track patient pathway is presented in Table 1.

Peri-operative optimisation

The surgical procedure

After pre-operative optimisation and patient education, the patient should be admitted on the day of THA surgery.⁴ The surgical procedure does not differ from a conventional pathway. Whether using an anterior, lateral or posterior surgical approach would influence fast-track THA surgery has been debated together with the influence of minimally invasive surgery. However, at present there is insufficient evidence to indicate that surgical technique alone makes a significant difference to recovery or reduces soft-tissue trauma.²³

Simultaneous bilateral THA

Simultaneous bilateral THAs have varying results in the literature when performed using conventional post-operative care routines. Otte et al²⁴ did a small study on 50 consecutive fast-track simultaneous bilateral THA procedures. The median LOS was four days. Mortality within 90 days was 4% and 8% required a further operative procedure. The overall complication rate was 22% and 55% of the complications were considered to be caused by failures in surgical technique, indicating that bilateral simultaneous hip arthroplasty may have a high complication rate in a fast-track setting. However, in a larger nationwide study in Denmark, Lindbergh-Larsen et al²⁵ found significantly lower re-admission rates and shorter total LOS in the simultaneous bilateral hip arthroplasty group compared with the bilateral staged hip arthroplasty group, probably reflecting selection bias. So, if patients are carefully selected for bilateral simultaneous THA, the procedure appears to be safe in a fast-track protocol.

Spinal versus general anaesthesia

Traditionally spinal anaesthesia has been advocated over general anaesthesia in THA due to reduced cardiopulmonary and thromboembolic morbidity, but at the potential cost of reduced capability for early post-operative mobilisation, urinary bladder dysfunction, and rare but potentially severe neurological complications.²⁶ However, the evidence is based on studies without rapid mobilisation and optimised peri-operative care with multimodal pain treatment, and the difference between modern general anaesthesia and spinal anaesthesia in a fast-track THA set-up may be different.

Local wound infiltration analgesia versus peripheral nerve blocks

Relief of acute pain after hip and knee replacement represents a major therapeutic challenge as post-operative pain hinders early mobilisation and rehabilitation with subsequent consequences on mobility, duration of hospitalisation and overall recovery. Local wound infiltration analgesia techniques at the end of the operation have been tested and described in THA operations with a combined administration of local anaesthetics, non-steroidal anti-inflammatory drugs (NSAIDs) and epinephrine. However, many studies have been conducted without a placebo control group or with comparable systemic analgesia provided in the investigated groups, and at present there is little evidence to support the use of local wound infiltration analgesia in hip replacement either intra-operatively or with a post-operative wound infusion catheter technique, provided that multimodal oral pain treatment is used.^{27,28} Although single-dose or continuous peripheral nerve blocks can optimise analgesia, the risk of muscle weakness and falls might preclude their continued use.³

Systemic pain treatment

Oral treatment should be a combination of a NSAID and paracetamol plus short-acting opioids for breakthrough pain.⁴ Gabapentin and escitalopram have been tested in TKA without any significant effect on post-operative pain and nothing indicates a better effect in THA.^{29,30} However a change in dose or the length of treatment may reveal other results, and further research is needed. Steroids, however, seem to reduce peri- and post-operative pain. A single dose of 125 mg methylprednisolone given peri-operatively was tested in a randomised study with THA patients and reduced post-operative pain during the first 24 hours.³¹

Mobilisation and thromboprophylaxis

Mobilisation on the day of THA surgery is mandatory and significantly increases the probability of early discharge

compared with mobilisation on the day after surgery and decreases the time to readiness for discharge.³² The length and type of thromboprophylaxis after THA has been debated intensively during the last 20 years. Most of the evidence has been provided from studies with long LOS and without intensive early mobilisation as used in fast-track THA surgery. This may be an important factor in the low risk of clinical deep vein thrombosis (DVT) and of fatal and non-fatal pulmonary embolism (PE) that has been described after THA and TKA following a fast-track set-up. Husted et al³³ found that the incidence of thromboembolic complications with early mobilisation, short LOS and short duration of DVT prophylaxis with low molecular weight heparin (LMWH) compares favourably with published regimes with extended prophylaxis (up to 36 days) and hospitalisation up to 11 days. In a larger study including 4659 procedures, with a LOS of five days or less and thromboprophylaxis only during hospitalisation, Jørgensen et al found the incidence of thromboembolic events (TEE) and venous thromboembolic events (VTE) to be at the same level or below what has been described in traditional THA/TKA patient pathways suggesting that in-hospital prophylaxis with LMWH only is safe in fast-track THA and TKA patients with a LOS of five days or less.³⁴ There is therefore a solid indication that thromboprophylaxis until discharge from hospital after THA is sufficient in patients without elevated risk of thromboembolic events.

Post-operative in-hospital care

Well-defined discharge criteria are crucial for enhancing rehabilitation,³ by setting defined goals for the patient and the interprofessional team managing post-operative care which therefore reduces LOS. Rapid restoration of normal pathophysiology should be the goal and careful assessment of patient status several times daily is mandatory.

Post-operative anaemia/urine retention/thrombotic events

Severe post-operative anaemia should be corrected, but Jans et al³⁵ found that despite a weak correlation between post-operative haemoglobin and recovery, moderate post-operative anaemia has limited impact on early functional recovery after fast-track THA. Post-operative urinary retention was found in 40% of THA and TKA patients by Bjerregaard et al,³⁶ especially in males with pre-operative voiding problems, and patients with spinal analgesia had increased risk. Intermittent catheterisation should be used instead of permanent catheterisation with a safety limit of 800 cc before catheterisation.³⁷ The incidence of post-operative early thrombotic events within the first week after fast-track THA and TKA is very low; however, thrombotic events in hospital should be expected even in patients receiving recommended thromboprophylaxis.³⁸

Post-operative dizziness, delirium and cognitive dysfunction

Fast-track surgery may reduce the incidence of post-operative cognitive decline after surgery. Krenk et al^{39,40} looked at post-operative delirium after fast-track THA and TKA surgery in a prospective multicentre study to evaluate post-operative cognitive dysfunction including 225 non-demented patients with a mean age of 70 years undergoing either THA or TKA in a fast-track set-up. None of the patients developed post-operative delirium and furthermore the incidence of post-operative cognitive dysfunction was reduced by more than 50% after the first week post-operatively compared with previous studies. However, late post-operative cognitive dysfunction occurred with an incidence similar to data from published studies of major non-cardiac elective surgery. Surprisingly, no association between early and late post-operative cognitive dysfunction could be verified.⁴¹ Dizziness and nausea may represent a major problem in early mobilisation. Orthostatic intolerance has been suspected to play a role and Jans et al⁴² found orthostatic intolerance in 42% of patients six hours after surgery and 19% 24 hours after surgery. There was no difference in post-operative haemoglobin concentrations or opioid use between orthostatic intolerant and tolerant patients. Early post-operative orthostatic intolerance is common in patients undergoing THA and TKA and may be associated with an impaired cardiovascular orthostatic response and decreased cerebral oxygenation. So far no specific treatment has been found, but restriction in the use of opioids, correction of fluid balance and anaemia may be advocated to avoid aggravation of the symptoms of orthostatic intolerance. Oral midodrine hydrochloride for prevention of orthostatic hypotension has been tested in a placebo-controlled study without any effect on the incidence of orthostatic hypotension, but further studies on dose and timing are needed to rule out any positive effect.⁴³

Delay of discharge after THA

Even well-defined fast-track pathways will eventually end up with patients where discharge is not executed as planned and outcome not as expected. Husted et al⁴⁴ found that age, sex, marital status, co-morbidity, pre-operative use of walking aids, pre- and post-operative haemoglobin levels, the need for blood transfusion, ASA score and time between surgery and mobilisation all influenced post-operative outcome in general, and LOS and patient satisfaction in particular. In another study by Husted et al,⁴⁵ they found that pain, dizziness and general weakness were the main clinical reasons for being hospitalised 24 hours and 48 hours post-operatively after THA and TKA, while nausea, vomiting, confusion and sedation delayed discharge to a minimal extent. Waiting for blood transfusion, for start of physiotherapy and for post-operative

radiographic examination delayed discharge in 20% of the patients. Gulotta et al⁴⁶ found that barriers to a two-day discharge were post-operative pain, nausea and dizziness. The only pre-operative factor that was predictive of a two-day discharge was hypertension. Napier et al⁴⁷ confirmed that non-medical reasons were important in delaying discharge from a fast-track unit after THA and TKA surgery. The major factor within both groups for delayed discharge was attributed to inadequate social support. In a recent Dutch retrospective study with 477 patients of advanced age, living alone and surgical approach were factors that were significantly associated with increased LOS (> 2 days) in hospital.⁴⁸

Therefore, delayed discharge should not only be avoided through medical interventions but also by tailoring the organisational part of the patient pathway and by optimising the social support of the patient before admission for surgery.

Post-operative restrictions

Rigorous post-operative restrictions may interfere with a fast-track pathway and rapid mobilisation. In a comparative study with 365 fast-track THA patients, Mikkelsen et al⁴⁹ compared the outcome in a group of patients undergoing rehabilitation with restrictions in hip movement plus a standard package of assistive devices with a group of patients with less restricted hip movement and use of assistive devices according to individual needs. This study surprisingly showed slightly slower recovery in patient-reported function after reduction in movement restrictions and use of assistive devices, but the difference was eliminated after six weeks. Reduced movement restrictions did not affect the other patient-reported outcomes and led to earlier return to work. Therefore, it seems possible to reduce movement restrictions and use of assistive devices considerably, but the study was underpowered to detect the effect of unrestricted rehabilitation on hip dislocation. That a reduction in restrictions may be followed by an increase in luxations is illustrated by the fact that in a study with 2734 consecutive unselected THA procedures from six dedicated fast-track departments, the one department without restrictions had more dislocations than the five departments with recommendations for activity restrictions.⁵⁰

Post-operative physiotherapy

Post-operative physiotherapy is an integral part of mobilisation after surgery, but the extent and type of training in fast-track THA surgery after discharge has been debated extensively. Holm et al⁵¹ found that hip muscle strength and leg-press power decreased substantially in the first week after THA. The muscle strength loss and power loss were not related to changes in hip pain, systemic inflammation or thigh swelling. By contrast, self-reported

symptoms and function improved. Larsen et al⁵² also found that self-reported symptoms and function improved in a group of THA patients that did not receive any physiotherapy after fast-track surgery and only home-training exercises. At three months post-operatively the patients had reached a health-related quality of life (HRQOL) level similar to the population norm, whereas they exceeded the population norm at 12 months post-operatively. For SF36, self-reported physical function at three months post-operatively was lower than the population norm but similar to the population norm 12-months post-operatively. This may explain why it has not been possible to produce any solid evidence for the effect of physiotherapy after discharge in fast-track THA.

Re-admission after discharge

One of the risks of early discharge from hospital is a higher frequency of re-admission. Fast-track THA and TKA surgery do not, however, increase the re-admission rate compared with conventional patient pathways.⁵³ One of the most common causes of re-admission is falls. The overall incidence of surgery-related falls among these patients is, however, low, but specific patient groups are at an increased risk due to medical conditions. Hospital re-admission after fast-track THA due to falls are most frequent within the first month. They then decline after the first month and are related to patient characteristics rather than short LOS. Interventions aimed at reducing post-operative falls should focus on the first 30 days after surgery and include prevention through optimisation of medical conditions.⁵⁴

Another specific patient group with increased risk of complications and re-admission is patients with psychiatric diseases.^{20,21} Jørgensen et al looked at a total of 2734 consecutive THA procedures, of which 65 (2.4%) had dislocations within 0 to 90 days. Patients 75 years and over and with pharmacologically treated psychiatric disease appeared to be at increased risk of dislocations after fast-track THA.⁵⁰

A summary of peri-operative optimisation areas and post-operative care in a fast-track patient pathway is presented in Table 2.

Status in 2016

Henrik Kehlet first described fast-track surgery in abdominal surgery in Denmark more than 20 years ago, and after dissemination into other surgical specialties, fast-track procedures have been introduced extensively in THA patients during the last decade in Denmark. Dedicated fast-track departments have been able to optimise the fast-track programme further without any rise in re-admission, re-operation and mortality rates, and nationwide the LOS has been reduced through involvement of most hospitals^{4,33,53,55,56} with very high patient satisfaction.⁵⁷

Fast-track THA surgery has also been introduced in other countries. In the United Kingdom, Schneider et al in 2009⁵⁸ presented a small series of THA patients and concluded that successful fast-track rehabilitation is possible without pre-selection and does not seem to compromise clinical safety. However, a good social and physiotherapy community set-up should be available. Maempel et al,⁵⁹ in a recent study, compared 611 THA patients undergoing a traditional patient pathway with 550 undergoing a fast-track programme, found a reduction in LOS using fast-track surgery without adversely affecting functional outcomes, dislocation rates or mortality. Khan et al⁶⁰ reduced short-term complications and mortality following Enhanced Recovery primary hip and knee arthroplasty in a large study of patients from Northumbria. Similar experiences have recently been published from The Netherlands,⁶¹ Canada⁶² and China.⁶³ Good results have been published from Norway,⁶⁴ but also a study showing that the implemented fast-track elements were significantly associated with increased risk of THA revision surgery⁶⁵ without being able to identify any specific reason.

Future perspectives

Overall, the future strategy for further improvement of surgical outcomes after THA in a fast-track set-up will require studies with well-established and validated pre-operative risk indices, use of established complication score systems and a multidisciplinary collaborative effort.⁶⁶

As fast-track THA surgery has proven cost-effective,⁶⁷ and with a LOS of stay of only one day for a large proportion of fast-track THA patients, the idea of doing THA surgery as an outpatient procedure seems straightforward as the next step, in the quest for reducing hospital costs. Hartog et al⁶⁸ did a study including 27 patients with THA surgery as an outpatient procedure with a fast-track protocol. They succeeded in discharge on the day of surgery in 24 patients and found that outpatient THA was feasible in selected patients with satisfying results up to three months post-operatively, without any outpatient procedure-specific complications or re-admissions. Lovecchio et al⁶⁹ compared 1476 fast-track THA patients with 492 outpatient surgery THA patients and found that outpatients experienced higher rates of post-discharge complications. After matching, outpatients had higher rates of medical complications (6.3% versus 1.1%), and the most common complication was bleeding requiring transfusion, which occurred at higher rates post-discharge in outpatient surgery. There was, however, no difference in re-admission rate.

Even if outpatient THA surgery seems more feasible than TKA due to fewer problems with pain management, the cost reduction achieved by day-case surgery needs to be balanced against any increase in morbidity and

Table 2. Peri-operative optimisation and post-operative care in a 'fast-track' patient pathway

- Careful selection for simultaneous bilateral total hip arthroplasty (THA)
- Spinal analgesia may not be superior to general anaesthesia in a fast-track set-up
- Local wound infiltration analgesia may be superior to peripheral nerve block in terms of pain reduction combined with preventing falls during early mobilisation
- Oral treatment should be a combination of NSAID, paracetamol and short-acting opioids for breakthrough pain
- Consider using a single dose of methylprednisolone 125 mg to reduce the peri-operative stress inflammatory response as adjuvant pain treatment
- Mobilisation on the day of THA surgery is mandatory
- Thromboprophylaxis until discharge from hospital after THA is sufficient in patients without elevated risk of thromboembolic events
- Only severe post-operative anaemia should be correct in patients without severe co-morbidity
- Intermittent catheterisation should be used instead of permanent catheterisation
- A fast-track pathway with early mobilisation may reduce post-operative dizziness, delirium and cognitive dysfunction
- Well-defined functional discharge criteria
- Physiotherapy after discharge is not indicated in all patients

Table 3. Future perspectives in 'fast-track' total hip arthroplasty (THA) surgery research

- *THA surgery as an outpatient procedure:* Studies with careful estimations of cost-effectiveness of THA outpatient procedures are needed and surgeons wishing to implement outpatient total joint arthroplasty clinical pathways must focus on preventing post-discharge medical complications and include blood management strategies
- *Lack of evidence of the effect of post-operative physiotherapy in THA patients as a group:* Further studies are needed to identify patients with individual needs for training and rehabilitation after THA surgery especially in patients with co-morbidity or advanced age
- *A rise in elderly frail patients and patients with severe co-morbidity receiving a THA:* This group of patients also have a potential benefit of fast-track surgery and future studies should focus on introducing fast-track patient paths and reducing morbidity plus mortality in elderly frail patients and patients with severe co-morbidity receiving a THA
- *Increased risk of complications and re-admission in patients with psychiatric diseases:* Further studies aimed at a more thorough and individualised pre-operative evaluation in psychiatric patients receiving a THA are needed to optimise a fast-track patient pathway for this high-risk patient group
- *Individualised fast-track strategies:* Fast-track THA surgery works extremely well in the standard THA patient. Patients are, however, different and future studies should focus on fine-tuning the multiple areas in fast-track pathways to get patients with special needs or a high co-morbidity burden through a safe and effective fast-track THA pathway

mortality and the cost of change in follow-up with more early controls. Therefore, studies with careful estimations of cost-effectiveness of THA outpatient procedures are needed and surgeons wishing to implement outpatient total joint arthroplasty clinical pathways must focus on preventing post-discharge medical complications and include blood management strategies.⁷⁰

In a socio-economic long-term study in patients undergoing THA, a significant annual increase in all aspects of healthcare costs post-operatively was found compared with an age- and socio-economically matched reference population.⁷¹ The reason seems unclear and more detailed studies of strategies for enhanced rehabilitation are needed.⁷² Furthermore, there is a lack of evidence of the effect of post-operative physiotherapy in THA patients as a group, so further studies are needed to identify patients with individual needs for training and rehabilitation.

The mortality following both THA and TKA has decreased during the last decades and Pedersen et al⁷³ found that the overall risk of all-cause mortality after THA and TKA in Denmark decreased from 1% in 1997 to 0.6% in 2011. This might be due to the introduction of fast-track enhanced recovery programmes. However, the majority of THA patients are well-functioning patients without severe co-morbidity and we have seen a rise in elderly frail patients and patients with severe co-morbidity receiving a THA. This group of patients is easily deemed unfit for fast-track surgery even if the benefits of fast-track surgery are

potentially needed in this group. Future studies should therefore focus on introducing fast-track patient paths and reducing morbidity and mortality in elderly frail patients and patients with severe co-morbidity receiving a THA.

With increased risks of complications and re-admission in patients with psychiatric diseases,^{20,21} further studies aimed at a more thorough and individualised pre-operative evaluation in psychiatric patients receiving a THA are needed, to optimise a fast-track patient pathway for this high-risk patient group (Table 3).

In conclusion, fast-track THA surgery has overall been proven safe and effective in enhancing recovery, but it still needs to be fine tuned to offer a fast-track patient path for all individual patients with different co-morbidities and needs.

AUTHOR INFORMATION

Aarhus University and The Lundback Centre for Hip and Knee Arthroplasty, Denmark

Correspondence should be sent to: Torben B. Hansen, University Clinic for Hand, Hip and Knee Surgery, Regional Hospital Holstebro, Laegaardvej 12, 7500 Holstebro, Denmark.

Email: torben.baek.hansen@vest.rm.dk

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