

A prospective study of day of surgery discharge in 368 consecutive patients with unicompartmental knee replacement

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ABSTRACT

INTRODUCTION: There has been an increased focus on fast-track (FT) programmes and the potential to convert unicompartmental knee replacement (UKR) from short-term admission to outpatient surgery. However, relatively few studies have been presented and with differences in selection criteria and completion rates. The purpose of this study was to describe patient selection and completion rates in a patient group undergoing UKR in two high-volume FT knee surgery clinics.

METHODS: All consecutive patients (n = 368) referred to and selected for UKR were screened for eligibility for outpatient surgery with discharge on the day of surgery (DOS).

Reasons why the patients were not discharged were recorded in patients not completing the outpatient pathway, and readmissions and complications were recorded until three months postoperatively.

RESULTS: Among all referred and screened patients, 69% were considered eligible for outpatient surgery. DOS discharge occurred in 59% of the operated patients and in 37% of all referred and screened patients. Main reasons for why patients were not discharged were active wound drainage and lack of mobilisation due to pain, nausea and vomiting. Two patients were readmitted during the first 24 hours due to wound drainage. One patient had a lung embolus and one patient an acute myocardial infarction during the follow-up period.

CONCLUSIONS: This study illustrates that not all patients in a consecutive patient group for UKR were feasible for outpatient surgery. Further studies should focus on optimising pain treatment and reducing postoperative nausea.

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Recent years have seen increased focus on the cost of healthcare delivery along with increasing financial pressure and decreasing reimbursement, all of which have stimulated further research into finding methods safely reducing the length of hospital stay after elective surgery [1, 2]. Fast-track (FT) programmes have evolved during the past 15 years with the aim of opti-

mising the perioperative management of patients and enhancing patient care, leading to an earlier hospital discharge [3, 4]. Additionally, reduced length of hospital stay has been combined with a decreased morbidity and similar rates of readmission or adverse events even in elderly patients [4-6]. Therefore, FT programmes have proven beneficial for the patient, the arthroplasty surgeon as well as the health insurance system.

Unicompartmental knee replacement (UKR) is normally followed by rapid mobilisation and early discharge from hospital [7, 8]. Logically, the next step would be to perform this operation as an outpatient procedure with same-day admission and discharge without an overnight stay in a hospital bed. However, evidence for patient selection criteria for outpatient surgery is limited, and few studies have analysed the feasibility of day of surgery (DOS) discharge in UKR patients [9-13]. In the studies performed to date, a high rate of DOS discharge has been observed. However, most of the studies included only a limited number of patients, and selection criteria and completion rates have been varying. Therefore, the question remains if outpatient UKR is feasible in all patients or only in well-selected groups of patients, and if outpatient surgery is associated with increased morbidity rates and readmissions.

The purpose of this observational study was to describe the feasibility of an outpatient UKR patient pathway in two clinics with fully implemented FT programmes, and to determine how many patients in a consecutive patient group undergoing UKR would be suited for and capable of completing DOS discharge. In addition, the study aimed to provide further knowledge on postoperative morbidity and readmissions following DOS UKR surgery.

METHODS

All patients referred to and selected for a medial or lateral UKR at the two participating clinics were screened for inclusion between October 2015 and March 2017. The two orthopaedic clinics are located in public hospitals and situated in the same area of the country. Both clinics had a high caseload (> 100 UKR/year) and a

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high UKR usage (> 30% knee arthroplasties were UKR) [14, 15]. The inclusion criteria were patients in American Society of Anesthesiologists (ASA) classification group 1 and 2, patients motivated for outpatient surgery and not living alone. Patients in ASA group 3-4 were excluded and operated in a traditional FT pathway with an overnight stay at the hospital.

Patients eligible for outpatient surgery received no special or additional treatment or care and all patients followed the same FT programme for elective UKR with preoperative multidisciplinary education [7]. Outpatient UKR patients were operated as the first or second patient on the programme in general or spinal anaesthesia. All procedures were performed by experienced surgeons specialised in minimally invasive Oxford UKR surgery. Cefuroxime (1.5 g) or dicloxacillin (2 g) and methylprednisolone (125 mg) were administered intravenously before surgery, and tranexamic acid (1 g) was administered intravenously at the end of surgery. Standard local infiltration analgesia (LIA) was used intraoperatively [16]. No drains were used. Postoperative pain control was maintained with a well-defined, optimised multimodal oral pain treatment for one week including 1 g paracetamol (6-hourly), 200 mg celecoxib (12-hourly) and oxycodone (5 mg) for pain rescue. Low-molecular-weight heparin (5,000 IU) was given as a single dose 6-8 hours after surgery. After the patients had returned to the ward, they were allowed full weight bearing and attempted mobilised 2-4 hours after surgery, guided by a physiotherapist. The nurse and physiotherapist then continuously followed and screened the patients for fulfilment of the discharge criteria (**Table 1**). Patients who were discharged on the DOS were given written advice on potential adverse effects with a 24-hour emergency contact telephone number. All patients were contacted by telephone within 24 hours after discharge.

To fulfil the outpatient surgery criteria, the patient

should leave the hospital on the DOS and be discharged to their own home. The reasons why patients were not discharged were recorded for patients not completing the outpatient pathway. If several discharge criteria were not met, the primary reason was recorded.

All patients were seen at the outpatient clinic after one and two weeks, and at the outpatient physiotherapy unit after four weeks. Patient satisfaction was recorded after three months using a 0-10-point Likert scale, where 0 was complete dissatisfaction and 10 was full satisfaction. Patients were asked about satisfaction with the hospitalisation and the overall outcome of the treatment. Complications (infection and reoperation) and readmission were recorded until three months after surgery.

No approval from the Central Denmark Region Committee on Health Research Ethics was necessary as this was a non-interventional observational study. The study was approved by the Danish Data Protection Agency (entry no. 1-16-02-746-18).

All continuous data were tested for normality (Shapiro-Wilk test) and, if normal, were tested further for equal variance (f test). Statistically significant differences between the two clinics were analysed with a two-sample t test for continuous variables and categorical data by a Chi-squared test or Fisher's exact test if the cells with the expected observations had five or fewer cases. p values < 0.05 were considered statistically significant. Statistical analyses were performed in Stata (version 14.0, StataCorp LP, College Station, TX).

Trial registration: not relevant.

RESULTS

A total of 368 consecutive patients were referred to and screened for inclusion at the two participating clinics. As shown in Figure 1, 69% were eligible for outpatient surgery. The proportion of patients eligible for outpatient surgery was 123/169 (73%) in clinic 1 and 132/199 (66%) in clinic 2 (p = 0.18). Of the 255 patients eligible for outpatient surgery, 26 were excluded due to causes presented in Figure 1. Among the remaining 229 patients, 59% were discharged on the DOS. This accounts for 37% of all referred and screened patients. The proportion of patients not discharged on the DOS was 51/117 (44%) at clinic 1 and 43/112 (38%) at clinic 2 (p = 0.42). The most common reason for prolonged hospital stays and not being discharged on the DOS was active wound drainage, postoperative nausea and vomiting (PONV) and dizziness or malaise interfering with mobilisation of the patient (**Table 2**).

Patients from the two clinics were comparable with respect to age, gender and lateral/medial UKR distribution (**Table 3**). There was no difference in patient satis-

TABLE 1

Discharge criteria for outpatient surgery in patients undergoing unicompartmental knee replacement.

Back in the patient ward before 3 p.m.
The patient should be mobilised using crutches
No active bleeding through the wound dressing ^a
No clinical signs of anaemia with dizziness
Pain, VAS score < 3 in rest and < 5 at activity
Spontaneous urinary bladder function
Patient still motivated for discharge

VAS = visual analogue scale.

a) Defined as drainage from the wound requiring repeated dressing changes beyond planned discharge.

fraction according to hospitalisation between the two clinics, whereas patients were generally more satisfied with the treatment at clinic 1 than at clinic 2 (Table 3). General anaesthesia (65%) was more common than spinal anaesthesia (35%), but there was no significant difference in DOS discharge in proportion to type of anaesthesia ($p = 0.56$). No significant association was found between gender and DOS discharge, but a higher proportion of females (47%) than males (36%, $p = 0.10$) had an overnight hospital stay.

Two patients were readmitted during the first 24 hours due to wound drainage. One patient had a lung embolus and one patient an acute myocardial infarction during the three-month follow-up period. There were no infections.

DISCUSSION

In this observational study of a consecutive group of patients undergoing UKR, we found that not all patients were suitable for outpatient surgery, as only about a third of all referred and screened patients were discharged on the DOS. However, the DOS surgery pathway had a high level of patient satisfaction and low morbidity with few complications.

These findings run contrary to results reported from previous studies. In a study by Kort et al, DOS discharge was accomplished in 17 patients (85%) operated in a DOS pathway compared with 20 patients operated in a conventional FT pathway. The main reasons for an overnight stay were pain and fear of going home [13]. In a similar setup by Hoorntje et al, 90% were discharged on the DOS. One patient had an overnight stay due to a history of cardiac events, and in the other case the operation was delayed so that rehabilitation could not be completed [12]. Berger et al followed 25 UKR patients for the feasibility of same-day discharge. One patient required an overnight stay because of nausea, so 96% were discharged on the DOS [9]. These prospective studies only included a small number of patients. Two larger studies included retrospective data. Cross et al reviewed 105 patients in whom outpatient UKR was indicated and found that all patients (100%) could be discharged on the DOS [2]. The other study collected data on 207 UKR patients during a 10-year period. DOS discharge was planned in 160 selected patients and all patients (100%) returned to their home on the DOS [11]. The selection criteria in these studies are, however, not described in detail. Our findings are in accord with those of a study by Gromov et al [17]. In a similar setup with the same selection and discharge criteria, they found low completion rates in DOS discharge in patients undergoing total hip and knee arthroplasty. The higher discharge rate for DOS observed in previous studies than in our study might be explained by referral of more selective patients suitable

TABLE 2

Primary reasons why patients were not discharged on the day of surgery ($n = 94$). Number of patients and (percentage) at the two clinics.

	Clinic 1 n (%)	Clinic 2 n (%)	Total n (%)	p value
Active wound drainage ^a	12 (23.5)	13 (30.2)	25 (26.6)	0.12
Lack of mobilisation ^b	26 (51.0)	12 (27.9)	38 (40.4)	0.07
Back in the ward after 3 p.m.	5 (9.8)	8 (18.6)	13 (13.8)	0.22
Others ^c	8 (15.7)	10 (23.3)	18 (19.2)	0.46

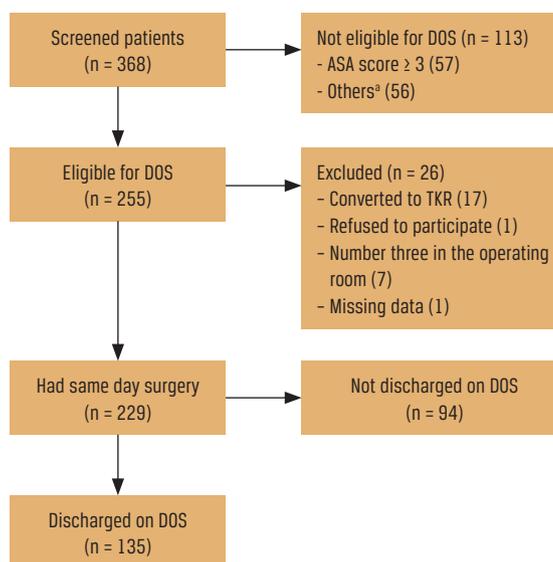
- a) Drainage from the wound requiring repeated dressing changes.
- b) Due to pain, postoperative nausea and vomiting.
- c) No relative or family present at home, fear or insecurity, medical disease.

for outpatient surgery, differences in discharge criteria, differences in home care, and the opportunity for readmission which might differ between private surgery centres compared with our results recorded in a public hospital.

The discharge criteria used in previous studies have been general well-being, sufficient pain and nausea control, and adequate mobilisation. In the study by Kort et al, discharge criteria also included a dry wound [13]. In addition, our criteria included that patients should be back in the ward before 3 p.m. The main reasons why patients were not discharged in our study were active wound drainage and lack of mobilisation

FIGURE 1

Flow chart illustrating the number of unicompartmental knee replacement patients included for day of surgery discharge.



- a) Living alone, language problems, chronic pain, bilateral UKR.
- ASA = American Society of Anesthesiologists' physical status assessment score; DOS = day of surgery; TKR = total knee replacement; UKR = unicompartmental knee replacement.

TABLE 3

Demographics and clinical outcome scores among day of surgery patients (n = 229) at the two clinics.

	Clinic 1	Clinic 2	p value
Age, years, mean (SD)	63.5 (7.6)	65.1 (8.1)	0.15
Gender, ratio, female/male	1.34	0.96	0.23
Female, n (%)	67 (57.3)	55 (49.1)	
Male, n (%)	50 (42.7)	57 (50.9)	
UKR, ratio, medial/lateral	18.5	27	0.75
Medial, n (%)	111 (94.9)	108 (96.4)	
Lateral, n (%)	6 (5.1)	4 (3.6)	
Patient satisfaction, treatment, mean (SD)	8.7 (1.6)	8.2 (1.7)	0.03
Patient satisfaction, hospitalisation, mean (SD)	8.7 (2.4)	8.9 (1.4)	0.45

SD = standard deviation; UKR = unicompartmental knee replacement.

due to pain or PONV. Active bleeding through the wound dressing is a common finding after knee arthroplasty surgery and might be more frequent due to faster mobilisation. We chose to include this criterion to minimise fear and potential readmission due to active bleeding after discharge. In addition, discharge of these patients places a greater burden of care on the community due to extra need for home care. Possible solutions to this problem may include restricted knee flexion or the use of tissue adhesive as a supplement to wound closure [18]. PONV, sedation, dizziness and malaise are all potential adverse effects associated with the use of opioid analgesia, which can be counterproductive to early discharge. In this study, we used systemic glucocorticoid preoperatively, LIA intraoperatively and non-opioid analgesic medication postoperatively for nausea and pain control. Oral opioids were only used for pain rescue. However, despite a multimodal analgesia regimen, pain and PONV were still a challenge in the early postsurgical period. The use of peripheral nerve blocks provides localised analgesia with a potential reduction of opioid consumption and opioid-related adverse effects. A few studies have shown the advantage of femoral nerve blocks in outpatient UKR [10, 11].

Therefore, the transition of a traditional UKR pathway to a feasible and successful DOS pathway depends on several aspects, especially attention to applicable inclusion and exclusion criteria, and a change in the medical and organisational mindset for both the patient and the multidisciplinary team [13, 19]. In a recent review, Kort et al presented results based on current literature that inform patient selection criteria for outpatient surgery [20]. They found that patients who were able and willing to participate, who had a low ASA classification (< 3), age < 75 years and who had support at home during the first postoperative day were eligible candidates for outpatient surgery. Another key aspect

for successful DOS discharge seems to be completion of surgery early in the day to allow time for proper medication adjustments and mobilisation [9]. Our results support these findings as only about one third of all referred and screened patients were discharged on the DOS.

The main strength of this study is the large group of patients screened for eligibility of outpatient surgery. In the Danish socialised healthcare system, there are few (< 5%) “private” patients and all patients were referred randomly without selection [15]. Our study therefore represents findings in an unselected healthcare population. Furthermore, both clinics are high-volume UKR users and located in the same area of the country, and bias due to differences in surgical experience and patient demographics seems unlikely. However, we cannot preclude that DOS discharge may have been influenced by the ability to stay overnight in the hospital ward in both hospitals instead of using an ambulatory surgery unit that closes at night. Limitations include the lack of an objective criterion for active wound drainage, the influence of recall bias on patient satisfaction as this was recorded 3 months after surgery, and the inherent flaws associated with patient and healthcare worker-reported data.

CONCLUSIONS

In summary, this study illustrates that operation in an outpatient UKR pathway is feasible, but not in all patients, even if they were considered suitable for outpatient surgery preoperatively after screening. Our results support previous findings that there is a need for further research to identify which patients will do better in a traditional in-hospital care pathway.

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