



Time Required for Same Day Discharge Following Unilateral Unicompartmental Knee Arthroplasty Performed in a Community Hospital Setting

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Abstract

Purpose: Community hospitals performing unicompartmental knee arthroplasty (UKA) face increasing financial pressure to transition these procedures to ambulatory surgery centers (ASC). This transition requires an understanding of the time required to safely discharge patients from the facility to comply with limited hours of operation of most ASCs. Therefore, the purpose of this study was to evaluate the average time required for same day discharge (SDD) following unilateral UKA. .

Method: This retrospective review included 201 consecutive UKA patients having achieved SDD from a high-volume community hospital. Patient demographics, time of surgical procedure and time of actual discharge from the hospital following surgical closure were recorded. Independent t-tests were performed to compare time to discharge between patients having an incision time prior to and after noon.

Results: The average surgical time was 56.8±8.6 minutes and the average time required for discharge was 259.7 ± 85.2 minutes. Eight patients experienced post-operative nausea, delaying discharge an average of 73.8 minutes (p = 0.016). Procedures starting after noon had significantly shorter time to discharge (185.9 ± 33.7 minutes) compared to those starting prior to noon (263.7 ± 83.1 minutes) (p < 0.001).

Conclusion: On average, discharge required four hours following surgery. Morning surgical volumes and post-operative nausea significantly increased the time required to discharge. Therefore, standard procedures should be evaluated to ensure these barriers can be modified when transitioning to an ambulatory surgical center.

Keywords: Rapid Discharge; Outpatient; Unicompartmental Knee Arthroplasty; Same Day Discharge

Introduction

Rapid discharge pathways following unilateral unicompartmental knee arthroplasty (UKA) have been thoroughly evaluated in ambulatory surgical centers (ASC), most of which report at or near 100% same day discharge success rates [1,2]. However, unselected patient populations have a much lower success rate of same day discharge (SDD) when performed in hospital settings.

According to the American College of Surgeons National Surgical Quality Improvement Program's registries, only 6.4% to 11.2% of patients undergoing unilateral UKA achieve SDD [3-5]. Due to the cost benefits of early discharge [2], rapid discharge protocols have been developed to increase the success rates of SDD [5,6]. A multi-departmental discharge protocol was established at the current study site and increased SDD rates from 11.2% to 84.2% [5,6]. The

primary reason for failure to achieve SDD was post-operative nausea, consistent with previous literature [7,8].

The inability to achieve 100% SDD, however, is concerning for hospital based surgeons considering transitioning unilateral UKAs to an ASC. Although discharge protocols may be similarly applied within an ASC, limited hours of operation commonly require discharge prior to 5:00pm [6]. The early discharge time constraint associated with many ASCs may be responsible for the establishment of suggested surgical start times to be prior to noon to be eligible for SDD [8,12]. The current study site consistently allowed for surgical start times after 1:00pm and up to approximately 4:00pm due to unlimited hours of operation. With earlier discharge times and the higher consequence for failing to discharge, determining the time required to discharge and potential reasons for a delay in discharge can assist in the successful transition from a community hospital setting to an ASC. Therefore, the purpose of the current study was to evaluate (1) the average time required following wound closure to discharge home and (2) the average delay time when previously identified barriers to discharge are faced following unilateral UKA in a community hospital.

Methods

This was a retrospective, institutional review board approved study examining discharge time data for patients successfully achieving SDD following unilateral UKA [5,6]. All procedures were performed at a high-volume multi-specialty community hospital with at least ten years of experience with rapid discharge arthroplasty service. All surgeries were performed by a single, high volume (approximately 700 arthroplasties each year) fellowship trained orthopedic surgeon. Surgical and discharge protocols were previously described [5], with the discharge protocol only described briefly here. All patients were informed to expect same day discharge following surgery. Surgery was scheduled prior to noon if possible, with no scheduling preference given to patients based on demographics or health status. An acute care nurse practitioner managed all adult arthroplasty patients and had sole responsibility for postoperative evaluation, medical co-management and preparation for efficient, safe discharge. Following surgery, all UKA patients were recovered in the surgical admission center (SAC) and were evaluated for discharge potential. As all procedures were performed in a community hospital setting, discharge was allowed up to 8:00pm on the day of surgery. Two experienced physical therapists were responsible for evaluating patients’ ability to safely discharge home. Discharge criteria required patients to have hemodynamic stability, adequate pain and nausea control and the ability to walk 50 feet with an assistive device and negotiate one flight of stairs if required in the home environment.

Data collected included patient demographics and surgical start and end time, which were defined by the recorded time of incision through wound closure and dressing application, respectively. Time to discharge was calculated from surgical end time to discharge time defined as patient physically exiting the hospital building. Descriptive statistics were created for each variable, including mean, standard deviation, range and frequency. Independent t-tests were performed to compare time to discharge between (1) patients having an incision time prior to and after noon and (2) patients experiencing post-operative nausea and those having an incision time prior to noon and not experiencing post-operative nausea. Pearson’s correlations were performed to evaluate the relationship between total time to discharge and patient demographics. All statistical procedures were performed using SPSS version 25, with a significant level set to $p < 0.05$.

Results

In total, 201 patients achieved same day discharge and were included in the final data analysis. Patient demographics are presented in table 1. Overall, 183 (91.0%) patients had a surgical start time prior to noon, while 18 (9.0%) patients had a start time following noon. The earliest incision time was 7:00am and the latest incision time was 3:00pm. The average surgical time was 56.8 ± 8.6 minutes and ranged from 36 minutes to 97 minutes. This resulted in closure time ranging from 8:00am to 4:00pm. The average discharge time was approximately 2:30pm and ranged from 11:00am to 7:30pm (Figure 1). It is important to note that 30 (14.9%) patients were discharged after 5:00pm.

Age (years)	69.7 (8.2)
BMI (kg/m ²)	29.6 (5.0)
Gender	
Male	99 (49.3%)
Female	102 (50.7%)
ASA	
2	93 (46.3%)
3	106 (52.7%)
4	1 (0.5%)
Diabetes	111 (55.2%)

Table 1: Demographics and ASA Classification for All Patients Successfully Achieving Same Day Discharge Following Unilateral Unicompartmental Knee Arthroplasty - Mean (SD)/Freq (%). SD: Standard Deviation; Freq: Frequency; BMI: Body Mass Index; ASA: American Society of Anesthesiology

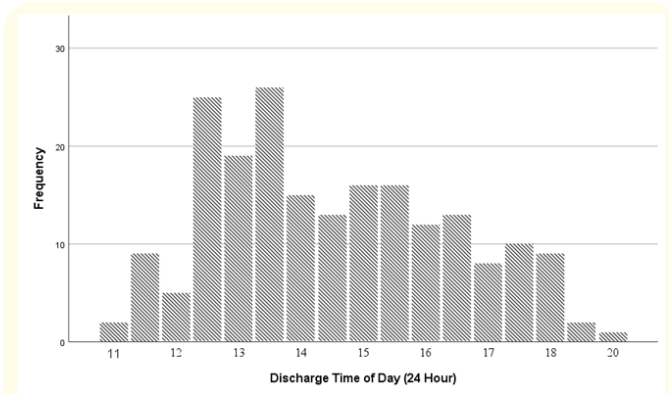


Figure 1: Distribution of the time of discharge for patients following unilateral UKA.

The average time to discharge for all patients was 259.7 ± 85.2 minutes and ranged from 106 to 556 minutes. Of the 201 patients, eight patients experienced postoperative nausea. When excluding those patients with postoperative nausea, time to discharge was significantly longer for those patients with an incision time prior to noon ($N = 175$; 263.7 ± 83.1 minutes) compared to those with an incision time after noon ($N = 18$; 185.9 ± 33.7 minutes) ($p < 0.001$).

All patients that experienced postoperative nausea had an incision time prior to noon, therefore, were compared to patients also having an incision time prior to noon. The average time to discharge was significantly longer for patients having experienced postoperative nausea ($N = 8$; 337.5 ± 108.1 minutes) compared to patients who did not experience post-operative nausea ($N = 175$; 263.7 ± 83.1 minutes) ($p = 0.016$). This relationship is further supported by a negative correlation between time to discharge and closure time ($r = -0.336$, $p < 0.001$) (Figure 2).

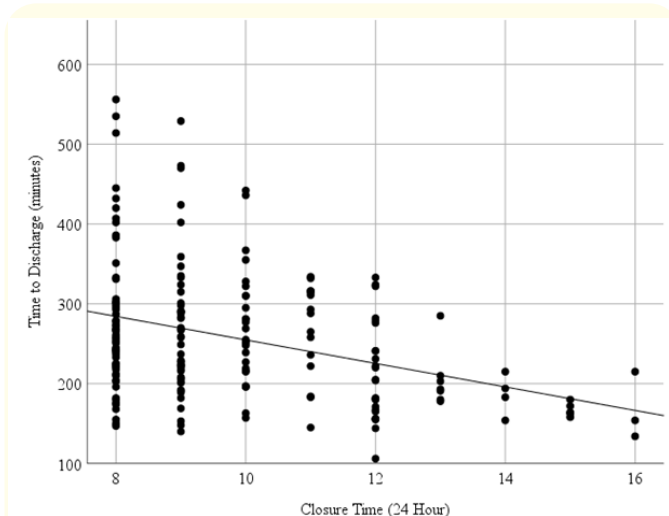


Figure 2: Correlation between closure time and time required for discharge following unilateral UKA.

The relationship between incision time and the age of the patient was very weak ($r = 0.037$). The correlation of patient age to discharge time, when incision time was controlled for, was also found to be very weak ($p = 0.079$, $r = 0.125$).

Discussion

The primary objective of this study was to determine the time required for unilateral UKA patients to meet discharge requirements and achieve SDD from a high-volume community hospital. With this information, reasons for delay and areas of potential improvement to discharge protocols can be identified prior to transitioning from a community hospital to an ASC. The average time from incision to discharge for patients achieving SDD in the current study was 316.5 minutes (5.25 hours). Interestingly, patients were discharged significantly faster when UKA started after noon, with an average time of 242.7 minutes (4 hours) from incision to discharge. The difference in discharge time is likely due to the high demand on medical staff in the morning hours, tasked with both discharging patients following morning surgical procedures and preparing patients for procedures scheduled in the afternoon. This demand is relieved in the afternoon hours, therefore, medical staff may be able to devote more attention to the patients entering the SAC. By design, the outpatient procedures at an ASC are designed to be efficient in processing patients preparing for and discharging from surgery [10]. Therefore, the time to discharge in the ASC may be comparable to the time to discharge for patients undergoing surgery past noon in the community hospital setting.

The time required for discharge in the current study was interestingly not influenced by patient demographics or comorbidities. This finding is even more unexpected since patients were generally in poorer health compared to previous studies [1,2,12]. The average age (69.7 years old) and BMI (29.6 kg/m^2) of patients in the current study was above the range previously reported for age (63 to 67.5 years) and BMI (27.5 kg/m^2 to 29.4 kg/m^2) in SDD literature [2-4,12,13]. Additionally, the patients in the current study had a higher comorbidity profile, with 55.2% of patients having diabetes and an average ASA score of 2.57 as opposed to 11.2% diabetic patients [3] and average ASA ranging from 1.61 to 2.26 [2-4,12,13]. Our results indicate that efficient care and postoperative processing of patients may be more important to successful SDD than health status or age of patients.

Post-operative nausea, previously found to be a barrier to SDD [6,8,14], delayed discharge by an average of 73.8 minutes. As outlined in the standard of care for the discharge protocol, antiemetic medication was given intraoperatively and symptomatically post-operatively. This process was coupled with a multimodal pain an-

algnesia regimen as recommended by previous studies to reduce opioid use and subsequent post-operative nausea [7,15]. However, postoperative nausea continues to be problematic and negatively impacts rapid discharge following surgery. Surgeons considering transitioning cases to an ASC should prioritize efforts to minimize postoperative nausea. Future studies should continue to investigate techniques to decrease post-operative nausea, which will further increase same-day discharge success rates and decrease delays to discharge.

There are several limitations of this study to consider. First, this represents a review of a single surgeon series in which nearly 40% of knee arthroplasty cases are unicompartmental arthroplasties. Furthermore, the medical facility reviewed represents a decade of experience performing fast track arthroplasty services. Therefore, the results may not be generalizable to lower volume institutions. Future studies should review SDD patterns from multiple surgeons to increase generalizability of this study. Second, this study reviewed a group of unselected patients who successfully achieved SDD following surgery and likely will not reflect results obtainable with highly selected, younger, healthier patients. Approximately 16% of unilateral UKA patients performed at the current study were unable to successfully achieve SDD and older females who required assistive walking devices prior to surgery were found to be most likely to require longer stays [6]. Results may be significantly different if highly selected patients with the greatest likelihood to achieve SDD were reviewed. Finally, while the purpose of this study was to estimate the time required for discharge following UKA performed in a hospital setting to estimate the time required for discharge following surgery performed at an ASC, the estimation could be inaccurate. Post-surgical patient processing could be significantly different between ASCs and or different hospital settings. Future studies need to be conducted to evaluate the time necessary for discharge in specific ambulatory surgery centers.

Conclusion

Patients who undergo unilateral unicompartmental knee arthroplasty prior to noon in a high-volume community hospital took significantly longer to discharge than patients having surgery after noon. This may reflect high morning hospital surgical volumes and high patient care demands which delay discharge. For surgeons considering transitioning to an ambulatory surgery center to perform unilateral unicompartmental knee arthroplasties, approximately 4 hours may be required for discharge from the facility following surgery. For patients who experience postoperative nausea, nearly 6 hours may be required.

Author Contributions

- **Aaron Shiinoki:** Writing - Original Draft, Writing-Review and editing.
- **Jonathan Horng:** Writing - Review and editing.
- **Dylan Lawton:** Data Curation.
- **Emily Unebasami:** Data curation.
- **Samantha Andrews:** Methodology, Formal Analysis, Writing-Review and Editing, Supervision.
- **Cass K. Nakasone:** Conceptualization, Methodology, Writing-Review and Editing, Supervision.

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Conflict of Interest Disclosures

- **Conflict of Interest:** The authors declare no competing interests.
- **Funding:** This research received no specific grant from any funding agency in the public, commercial or non-for-profit sectors.
- **Ethical Approval:** This retrospective chart review study involving human participants was in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Hawai'i Pacific Health Research Institute (local Western Institutional Review Board) approved this study.
- **Informed Consent:** This was a retrospective chart review and data collected were deidentified and presented as large scale, aggregate data. Therefore, no informed consent was obtained or required by the IRB.

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