Performing urological inpatient procedures as same-day procedures during the COVID pandemic: A retrospective feasibility study

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ABSTRACT

Introduction: In line with Canadian provincial directives due to the COVID-19 pandemic, certain elective urological surgical cases that are normally performed as inpatient procedures, were performed as same-day discharge procedures to reduce hospitalization and the usage of scarce healthcare resources. Since the pandemic, we began performing laser enucleation of the prostate (LEP), robotic-assisted radical prostatectomy (RARP), and percutaneous nephrolithotomy (PCNL) as outpatient surgeries. This was supported by recent evidence demonstrating the safety and feasibility of performing these minimally invasive surgeries as same-day procedures. As such, we sought to retrospectively evaluate the clinical outcomes and safety during the COVID-19 era at our institution for same-day discharge LEP, RARP, and PCNL procedures.

Methods: All patients operated for LEP, RARP, or PCNL between May 2020 and March 2022 at two academic institutions were included. Surgeries were classified as planned same-day discharge or inpatient surgery. Same-day discharge patients were compared to inpatients for each

KEY MESSAGES

- Most patients undergoing LEP, RARP, and PCNL have normal postoperative recovery.
- Performing LEP, RARP, and PCNL as same-day procedures appears to be safe and feasible.
- Factors, such as distance to hospital, surgical timing, and frailty, that may determine same-day success need to be further studied to improve patient selection for same-day procedures.

procedure type. This comparison assessed the occurrence of same-day failure, postoperative complications, and re-admission rates at 30 days. This study was approved by the scientific ethics committee of the Centre de Recherche de l'Université de Montréal (CRCHUM).
Results: A total of 413 subjects were included in this study. Among LEP patients (n=169), 104 (62%) were identified as same-day procedures and 65 (38%) were inpatient. Among RARP patients (n=194), 46 (24%) were identified as same-day procedures and 148 (76%) inpatient. Among PCNL patients (n=50), 38 (76%) were identified as same-day procedures and 12 (24%) were inpatient. Of the patients who underwent planned same-day LEP, RARP, and PCNL, 77.9%, 73.9%, and 71.1% were successfully discharged home, respectively. Patients who underwent LEP as inpatient had a higher incidence of overall postoperative complications compared to same-day LEP (23.1% vs. 8.7%, p=0.017). The rates of 30-day emergency department (ED) visits and hospital re-admission were similar between inpatient and same-day LEP (9.2% vs. 3.8%, p=0.27; and 4.6% vs. 1.0%, p=0.32, respectively). Inpatient RARP, however, was associated with more 30-day ED visits compared to same-day procedures (17.4% vs. 4.1%, p<0.01). No statistically significant differences were found for postoperative complications (15.2% vs. 6.1%, p=0.097) and re-admission rates (1.4% vs. 4.3%, p=0.51). There were no significant differences on overall postoperative complications, 30-day ED visits, and re-admission rates in inpatient vs. same-day PCNL.
Conclusions: Our results suggest that same-day discharge for LEP, RARP, and PCNL is safe and feasible in select patients with an acceptable complication rate. These results should be validated in a larger, prospective clinical trial comparing same-day and inpatient procedures.

INTRODUCTION

The ongoing COVID-19 pandemic has represented an unprecedented burden on healthcare systems globally resulting in a reduction of available resources, reducing access to healthcare, and delaying surgeries [1-3]. At the onset of the pandemic, government directives dictated that low-moderate risk oncologic surgeries and elective surgeries be delayed, with resumption of these procedures occurring gradually as restrictions began to relax. Even after the end of the pandemic, these directives are likely to have persistent ramifications including an estimated surgical backlog of 245 400 procedures in Canada's largest province as of March 2021 [4,5]. In an effort to reduce resource usage, Canadian provincial directives have allowed certain urological procedures such as laser enucleation of the prostate (LEP), robotic assisted radical prostatectomy (RARP), and percutaneous nephrolithotomy (PCNL), that typically required at least one day of postoperative hospitalization, to be converted to day surgeries[5-7]. These directives were based on recent literature that supported the safety of performing these procedures in an ambulatory setting [8-18]. For instance, based on a retrospective review of 473 males who underwent LEP at a

tertiary centre, Agarwal et al. demonstrated a same-day discharge rate of 87.4% and an overall 90-day postoperative complication rate of 18.2% with no difference between planned inpatient and same-day surgery patients[16]. In 2020, a multi-institutional study in France demonstrated that amongst 358 patients who underwent RARP 95.8% were able to be successfully discharged the same-day with a 30-day complication rate of 16.8%[13]. Finally, Beiko et al. performed a retrospective analysis on 50 patients who underwent ambulatory PCNLs. All patients were discharged on the same-day with 6 patients returning for ED visits and two patients readmitted[9]. Based on this evidence and the enduring pandemic, two institutions affiliated with the University of Montreal began performing LEP, RARP, and PCNLs as same-day procedures in an effort to reduce resource usage and reduce a growing surgical backlog. This provided an opportunity to analyze these patient cohorts to determine if these same-day procedures would demonstrate similar safety and feasibility in a Canadian cohort and in the context of the COVID pandemic. We hypothesized that our outcomes would demonstrate that performing these surgeries as same-day procedures would be safe with similar complication postoperative complication rates as described in the current literature.

METHODS

This is a retrospective cohort of all patients who underwent LEP, RARP, and PCNL between April 2020 and March 2022 at two academic Canadian centres (Centre Hospitalier de l'Universite de Montreal and Hospital Sacre-Coeur de Montreal). All patients who were ≥18 years of age who underwent one of the procedures as planned same-day or inpatient were included. Data were collected by chart review.

Technical details

Energy sources for LEP patients included both Holmium (with Moses™ technology) and Thulium fiber lasers. More specifically, LEP patients at the CHUM underwent Thulium fiber LEP and patients at the Hospital Sacre-Coeur de Montreal underwent Holmium (Moses™) LEP. For PCNL, sheath size was standardized at 30 Fr. No mini-PCNLs were included in our cohort. Dual-energy lithotripter (ultrasound-pneumatic), Holmium laser and/or Thulium fiber laser were used in PCNL cases at the discretion of the operating surgeon.

Characteristics and outcomes

Baseline characteristics collected included age, American Society of Anesthesiologist classification (ASA), Revised Cardiac Risk Index (RCRI) score, type of anesthesia, and anticoagulation status. Surgical factors were also identified including rate of perioperative complications defined as those complications occurring during the procedure. For LEP, we also collected prostate volume on pathology. For RARP, prostate volume on pathology, pathological stage, blood loss, and lymph node dissection were collected. For PCNL, laterality of stone, stone load, and largest diameter of the largest stone were recorded.

The primary outcome was same-day discharge success rate and secondary outcomes included the rate of emergency visits within 30 days, readmission rates within 30 days, and postoperative complication rates within 30 days. Planned same-day patients were discharged if they met the modified Post Anesthesia Care Unit (PACU) discharge criteria based on six factors including vital signs, ambulation, nausea/vomiting, pain, bleeding and voiding[19]. Postoperative complications were defined as any complication requiring hospitalization, emergency visit or readmission within 30 days and were classified according to the Clavien-Dindo classification[20]. Secondary outcomes also included duration of hospitalization and duration of readmission, as well as reasons for hospitalization, emergency visits, and readmission.

Statistical analysis

Patient characteristics and outcomes were compared between patients who were planned as inpatients versus as same-day procedures across all surgery types. Descriptive statistics such as mean, standard deviation (SD), ranges were defined for continuous variables. Comparisons of continuous variables were performed using two-sided t-test, while categorical variables were analyzed with Chi-squared test. All statistical analyses were performed using the R programming language version 4.0.2 in R Studio[21]. The level of significance was set at p=0.05.

RESULTS

LEP cohort

Baseline characteristics

Mean age was 70 (SD=7.56) and 72 (SD=9.01) years in planned same-day and planned inpatient procedures respectively. Most patients were categorized as ASA 2 (48.1% planned same-day LEP, 60% planned inpatient LEP), had an RCRI of 0 (82.7% planned same-day LEP, 80% planned inpatient LEP), and underwent regional anesthesia(69.2% planned same-day LEP, 64.6% planned inpatient LEP . The percentage of patients on antithrombotic therapy was 23.1% in both planned same-day LEP and planned inpatient LEP. The type of antithrombotic treatment differed between planned same-day LEP and planned inpatient LEP with 21.2% planned same-day LEP under antiplatelet therapy and 1.9% anticoagulated versus 10.8% and 12.3% respectively in planned inpatient LEP. Duration of surgery was 1.48 hours in planned same-day LEP compared to 1.78 hours in planned inpatient LEP ($p<0.01$). Prostate volume, BMI, timing of surgery, distance from hospital, surgical indication, concomitant cystolithopaxy, preoperative catheter dependance, and rate of perioperative complications did not differ significantly.

Outcomes

Amongst 104 planned same-day LEP, 77.9% were discharged successfully on the same-day. The majority of unsuccessful discharges had an uncomplicated postoperative evolution (73.9%), with 17.4% hospitalized for hematuria and 8.7% for infection/sepsis. Similarly, 81.5% of planned

inpatient LEP patients had a unremarkable postoperative evolution. Amongst those hospitalized, average duration was 1.39 days (SD =0.99) for failed planned same-day LEP and 2.0 days (SD = 2.62) for planned inpatient LEP (p=0.12). Rates of overall postoperative complications, emergency visits, and readmission within 30 days were 8.7%, 3.8%, 1.0% in planned same-day LEP versus 23.1% (p=0.017), 9.2% (p=0.27), 4.6% (p=0.32) in planned inpatient LEP. In both planned same-day LEP and planned inpatient LEP most postoperative complications were classed as Clavien-Dindo 1 (66.7% planned same-day LEP vs 53.3% planned inpatient LEP, p=0.73). Reasons for emergency visits and readmission included postoperative lower tract urinary symptoms (LUTS), hematuria, urinary retention, and urinary tract infection (table 3a).

RARP cohort

Baseline characteristics

Mean age was 62 years (SD = 6.33) amongst RARP planned same day (planned same-day RARP) and planned inpatient (planned inpatient RARP) procedures. Most patients were categorized as ASA 2 (82.6% planned same-day RARP, 62.2% planned inpatient RARP), had an RCRI of 0 (93.5% PSD, 93.2% PIP), and were not on antithrombotic therapy (95.7% planned same-day RARP vs 93.2% planned inpatient RARP)(Table 1b). Planned inpatient RARP had a higher number of ASA 3 patients at 18.9% vs. 4.3% in planned same-day RARP. No planned same-day RARP patients underwent lymph node dissection, while 20.3% of planned inpatient RARP did. Duration of surgery was 2.9 hours in planned same-day RARP compared to 3.2 hours in planned inpatient RARP. There were no significant differences detected in terms of pathological prostate volume, pathological stage, blood loss, BMI, timing of surgery, distance from hospital, and perioperative complications.

Outcomes

Amongst planned same-day RARP, 73.9% were successfully discharged on the same-day. Of the unsuccessful discharges, 91.7% had a normal postoperative course. Similarly, 95.9% of planned inpatient RARP patients had an unremarkable postoperative course. Average hospital duration was 1.17 days (SD=0.39) for failed planned same-day RARP and 1.21 days (SD= 0.70) for planned inpatient RARP (p=0.74). Rate of overall postoperative complications, ≤30 day emergency visits, and readmission were 15.2%, 17.4%, 4.3% in planned same-day RARP versus 6.1% (p=0.097), 4.1% (p≤0.05), 1.4% (p=0.512) in planned inpatient RARP. In both planned same-day RARP and planned inpatient RARP most postoperative complications were classified as Clavien-Dindo 1 (85.7% planned same-day RARP vs 77.8% planned inpatient RARP, p=0.24). There were numerous reasons for emergency visits and readmission including abdominal pain, pelvic abscess, catheter blockage, hematuria, and retention (table3b).

PCNL cohort

Baseline characteristics

Mean age was 52 (SD=13.7) and 61 (SD=10.4) years in planned same-day (planned same-day PCNL) and planned inpatient (planned inpatient PCNL) procedures respectively. Most patients were categorized as ASA 1 in planned same-day PCNL (50%) and ASA 2 in planned inpatient PCNL (58.3%) (p=0.30). Most patients had an RCRI of 0 (92.1% planned same-day PCNL vs 75.0% planned inpatient PCNL) and were not on antithrombotic therapy (89.5% planned same-day PCNL vs 75%). Most PCNL cases were unilateral (97.4% planned same-day PCNL vs 100% planned inpatient PCNL). Most patients also had staghorn stones (94.7% planned same-day PCNL vs 75% planned inpatient PCNL), with largest stone diameter on average being 2.53 cm (SD=1.17) in planned same-day PCNL versus 3.15cm (SD=1.56) in planned inpatient PCNL. There were no significant differences in BMI, duration of surgery, timing of surgery, distance from hospital, type of postoperative drainage, stone free rate, timing of postoperative scans, and rate of perioperative complications.

Outcomes

Amongst 38 planned same-day PCNL, 71.1% were discharged successfully on the same-day. Of unsuccessful discharges, 35.4% had an uncomplicated postoperative evolution, with others being hospitalized for unalleviated renal colic, hematuria, hematoma, infection, and infundibulum tear. Amongst planned inpatient PCNL patients, 66.7% had a normal postoperative evolution. Average hospitalization was 1.4 days for failed planned same-day PCNL procedures versus 1.5 days for planned inpatient PCNL (p=0.73). Rates of overall postoperative complications, emergency visits, and readmission within 30 days were 21.1%, 7.9%, 2.6% in planned same-day PCNL versus 16.7% (p=1.0), 8.3% (p=1.0), 8.3% (p=0.97) in planned inpatient PCNL, respectively. In both planned same-day PCNL and planned inpatient PCNL most postoperative complications were classified as Clavien-Dindo 1 (62.5% planned same-day PCNL vs 100% planned inpatient PCNL, p=0.59). Reasons for emergency visits and readmission included urinary tract infection and renal colic (table 3c).

DISCUSSION

In our study, we report same-discharge rates for planned same day surgeries at 77.9% for LEP, 73.9% for RARP, and 71.1% for PCNL. While this rate is similar in literature previously reported for PCNL, it is lower than that reported from certain studies for same-day LEP and RARP. When looking more closely at failed same day discharges in LEP and RARP, the majority of PSD patients had normal post operative course (73.9% planned same-day LEP, 91.7% planned same-day RARP). A number of these failures were due to patient's living far from the hospital, having inadequate support at home, or due to patient preference requesting prolonged postoperative care for reassurance. These findings suggest that ensuring the patient has the logistical supports necessary is imperative for same-day discharge success. In fact, most

studies evaluating same day discharge specifically evaluate these socioeconomic factors as criteria for inclusion, which would explain why our results are lower when compared to current literature[13,15,22]. Unfortunately within our cohort, the reason for hospitalizing PSD patients with no postoperative complications was not systematically noted in the charts and so could not be reliably collected for all patients. Further analysis of the reasons for hospitalizing patients who had normal postoperative course is required to determine the social and logistic factors that could be improved to increase our same-day discharge rate.

In terms of secondary outcomes, rates of ED visits and readmission within 30 days were comparable between same day and inpatient cohorts for both LEP and PCNL. However, in our RARP cohort, we noted that planned same-day RARP had a higher ≤30 day emergency return visit rate at 17.4% vs 4.1% planned inpatient RARP ($p<0.05$). The reason for return emergency visit included urinary retention (37.5%), unalleviated abdominal pain (25.0%), hematuria (12.5%), catheter blockage (12.5%), and hematuria (12.5%). All cases of acute urinary retention were after catheter removal at postoperative day 7, which is standard at our institution. A previous study in a RARP patient cohort at the CHUM reported that 2.2% of patients had acute urinary retention post RARP compared to 37.5% in our planned same-day RARP cohort[23]. This would seem to suggest that the elevated frequency in our cohort could simply be due to chance. Meanwhile, the patients who presented for unalleviated abdominal pain presented due to insufficient use of analgesics and the patient who presented for hematuria simply required reassurance. The latter cases could be prevented in the future with better postoperative counselling and reassurance. In a recent meta-analysis by Mukkala et al. examining unplanned hospital visits and readmissions post RARP suggested that interventions such as standardized patient education and nurse-centered follow-up program are useful in reducing unplanned visits and thus should be integrated as part of a same-day discharge program[22]. Furthermore, performing same-day procedures requires a PACU and ambulatory surgery unit that is accustomed and trained in the immediate post-operative care of urologic patients. Anesthesia and nursing teams should be familiar with the normal immediate postoperative evolutions of urologic procedures to allow for same-day discharge to occur safely[16,22,24].

Patient selection

Previous retrospective studies analyzing same-day discharge for LEP, RARP, and PCNL used strict inclusion criteria such as ASA <2, negative antithrombotic status, or absence of perioperative complication to choose patients eligible for same-day discharge[10,12,14-18,25]. In our analysis, selection of patients for same-day discharge was at the discretion of each surgeon's evaluation of baseline patient characteristics. As a result, our analysis did not use any strict inclusion criteria and all patients regardless of comorbidity, anticoagulation status and perioperative complication were included for consideration for same-day discharge. For this reason, our same-day cohorts included patients of ASA≥2 and those on antithrombotic therapy. The inclusion of more comorbid patients in our PSD cohorts could contribute to why we had

higher failed same-day discharge rates for LEP and RARP. However, as previously mentioned, amongst failed planned same-day LEP and planned same-day RARP, the majority still had normal postoperative courses despite no strict selection criteria. In fact, the use of strict inclusion criteria based on preoperative characteristics has recently been questioned in a study by Hosier et. al. In a cohort of 118 ambulatory PCNL patients, Hosier et al compared the use of strict selection criteria (i.e. age >75 years, ASA >2, solitary kidney, pre-existing nephrostomy tubes/stents, etc.) to a more relaxed standard exclusion criteria focused on perioperative complications (ex: significant pelvicalyceal injury, significant intraoperative bleeding, hemodynamic instability, etc). Their results showed no difference in complication, emergency department visit, or re-admission rates between strict and relaxed selection criteria. Taken together with our data, this would suggest that preoperative factors (e.g. ASA, comorbidities, age, etc.) may be less important in predicting postoperative outcomes than previously thought.

COVID surgical backlog

Performing LEP, PCNL, RARP surgeries as same-day procedures has the potential to greatly reduce resource usage and surgical wait times, not to mention decreasing overall costs[24,26-28]. For example, during 2020-2021, the Canadian Institute for Health Information (CIHI) reported that 15 392 prostatectomies occurred making it the sixth most frequent inpatient surgery for patients 65 years and older in Canada; the average hospital stay was 3.1 days[29]. The CIHI also estimated that the average patient-day cost on medical-surgical ward was 519 Canadian dollars (CAD), meaning performing same-day RARPs could potentially save 519 CAD per patient-day saved[30].

Limitations

There are a number of limitations to our study. Firstly, our study was performed retrospectively, which prevented us from accounting for all potential confounding factors. Secondly, selection of patients to be performed as same day was at the surgeon's discretion based on their global evaluation including anticipated case difficulty as estimated, for example, by prostate volume, anticoagulation status and other comorbidities. Given that selection was not standardized, there could be a selection bias favoring those who were performed as same day. Thirdly, it is possible that complication rates for same-day patients were underreported as they could only be counted if patients returned to the hospital. However, serious complications would necessitate medical attention and thus these patients would likely have returned for medical care. Fourthly, due to inconsistent recording certain variables that could impact surgical outcomes, such as preoperative functional status, surgical time, and history of previous urinary tract infections could not be comprehensively tallied. Fifthly, in the context of RARP, a previous study emphasized that concomitant lymph node dissection (LND) is a predictive perioperative factor for failed same day discharge[13]. In fact, Ploussard demonstrated in a cohort of 353 patients, that same day discharge failure in those who had LND was at 7.8% compared to 1.5% in those who did not have LND. In our cohort, all lymph node dissections were hospitalized and thus its effect

on same-day discharge could not be assessed. Despite that all lymph node dissections were included in planned inpatient RARP, this did not translate into higher postoperative complication rates. Sixthly, no comparison of patient satisfaction between same day and inpatient cohorts was performed. Finally, during the period of our study we were only able to analyze 50 PCNL patients and thus analyses related to this cohort could be underpowered.

CONCLUSIONS

Our results suggest that same-day discharge for LEP, RARP, and PCNL is safe and feasible with an acceptable complication rate. These results should be validated in a larger, prospective clinical trial comparing same-day and inpatient procedures.

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Conflicts of interest: *Dr. Bhojani is a consultant and investigator for Boston Scientific, Olympus, and PROCEPT BioRobotics. Dr. Lattouf has served as a consultant and advisory board member for Astellas Pharma, BMS, Sanofi, and Merck and conducted clinical research for Janssen, Merck, BMS, AstraZeneca, Progenics, Pfizer, Astellas, Aragon Pharmaceuticals, Tokai Pharmaceuticals, Myovant and Bayer. Dr. Zorn is a consultant and investigator at Procept BioRobotics, Boston Scientific, Zenflow. Dr. Duceppe reports research grants and honoraria for participation in an advisory board meeting from Roche Diagnostics and research grants from Abbott Laboratories. All other authors report no relevant conflicts of interest.*

FIGURES AND TABLES

Table 1A. Baseline characteristics for LEP patients			
	Planned same-day (n=104)	**Planned inpatient (n=65)**	**p**
Age			
Mean (SD)	70.0 (7.56)	72.2 (9.01)	0.11
BMI			
Mean (SD)	28.5 (6.00)	29.4 (7.82)	0.47
Missing	17 (16.3%)	5 (7.7%)	
ASA			
1	36 (34.6%)	15 (23.1%)	0.24
2	50 (48.1%)	39 (60.0%)	
3	18 (17.3%)	11 (16.9%)	
RCRI			
0	86 (82.7%)	52 (80.0%)	0.59
1	17 (16.3%)	11 (16.9%)	
2	1 (1.0%)	2 (3.1%)	
Anesthesia			
General	32 (30.8%)	23 (35.4%)	0.65
Regional	72 (69.2%)	42 (64.6%)	
Anticoagulated			
No	80 (76.9%)	50 (76.9%)	<0.01
Antiplatelet	22 (21.2%)	7 (10.8%)	
Anticoagulated	2 (1.9%)	8 (12.3%)	
Prostate volume			
Median [min, max]	73.0 [10.0, 203]	84.0 [8.00, 310]	0.026
Missing	1 (1.0%)	0 (0%)	

Duration of surgery (hours)			
Mean (SD)	1.48 (0.508)	1.78 (0.742)	<0.01
Timing of surgery			
AM	81 (77.9%)	43 (66.2%)	0.134
PM	23 (22.1%)	22 (33.8%)	
Distance from hospital (km)			
Mean (SD)	48.2 (110)	39.3 (55.3)	0.49
Catheter			
No	75 (72.1%)	47 (72.3%)	0.99
Yes	29 (27.9%)	18 (27.7%)	
Indication			
Hematuria	1 (1.0%)	4 (6.2%)	0.073
Hematuria and stones	0 (0%)	2 (3.1%)	
LUTS	33 (31.7%)	14 (21.5%)	
Retention	62 (59.6%)	40 (61.5%)	
Retention and stones	8 (7.7%)	4 (6.2%)	
UTI	0 (0%)	1 (1.5%)	
Cystolithopaxy			
No	92 (88.5%)	59 (90.8%)	0.83
Yes	12 (11.5%)	6 (9.2%)	
Perioperative complications			
No	100 (96.2%)	62 (95.4%)	0.99
Yes	4 (3.8%)	3 (4.6%)	

ASA: American Society of Anesthesiologist; BMI: body mass index; LEP: laser enucleation of the prostate; LUTS: low urinary tract symptoms; RCRI: revised cardiac risk index; UTI: urinary tract infection; SD: standard deviation.

Table 1B. Baseline characteristics for RARP patients			
	Planned same-day (n=46)	**Planned inpatient (n=148)**	**p**
Age			
Mean (SD)	62.4 (6.33)	62.0 (6.12)	0.67
BMI			
Mean (SD)	27.4 (5.67)	26.8 (5.00)	0.57
Missing	2 (4.3%)	36 (24.3%)	
ASA			
1	6 (13.0%)	28 (18.9%)	0.021
2	38 (82.6%)	92 (62.2%)	
3	2 (4.3%)	28 (18.9%)	
RCRI			
0	43 (93.5%)	138 (93.2%)	0.85
1	3 (6.5%)	9 (6.1%)	
2	0 (0%)	1 (0.7%)	
Anesthesia			
General	46 (100%)	148 (100%)	NA
Anticoagulated			
No	44 (95.7%)	138 (93.2%)	0.13
Antiplatelet	0 (0%)	8 (5.4%)	
Anticoagulated	2 (4.3%)	2 (1.4%)	
Blood loss			
Mean (SD)	232 (203)	298 (262)	0.075
Missing	0 (0%)	1 (0.7%)	
Prostate volume			
Mean (SD)	48.3 (18.3)	53.1 (21.7)	0.14
Stage			
T2	23 (50.0%)	84 (56.8%)	0.60
T3a	19 (41.3%)	56 (37.8%)	

T3b	4 (8.7%)	8 (5.4%)	
Surgery			
RARP	46 (100%)	116 (78.4%)	<0.01
RARP LND	0 (0%)	32 (21.6%)	
Duration of surgery (Hours)			
Mean (SD)	2.90 (0.445)	3.21 (0.774)	<0.01
Timing of surgery			
AM	27 (58.7%)	89 (60.1%)	0.99
PM	19 (41.3%)	59 (39.9%)	
Distance from hospital (km)			
Mean (SD)	63.4 (126)	55.9 (131)	0.73
Perioperative complications			
No	45 (97.8%)	139 (93.9%)	0.51
Yes	1 (2.2%)	9 (6.1%)	

ASA: American Society of Anesthesiologist; BMI: body mass index; LEP: laser enucleation of the prostate; LND: lymph node dissection; LUTS: low urinary tract symptoms; RARP: robotic assisted radical prostatectomy; RCRI: revised cardiac risk index; UTI: urinary tract infection; SD: standard deviation.

Table 1C. Baseline characteristics for PCNL patients			
	Planned outpatient (n=38)	**Planned inpatient (n=12)**	**p**
Age			
Mean (SD)	52.2 (13.7)	60.5 (10.4)	0.035
BMI			
Mean (SD)	26.5 (6.82)	30.5 (6.19)	0.089
Missing	7 (18.4%)	1 (8.3%)	
ASA			
1	19 (50.0%)	3 (25.0%)	0.30
2	14 (36.8%)	7 (58.3%)	
3	5 (13.2%)	2 (16.7%)	
RCRI			
0	35 (92.1%)	9 (75.0%)	0.28
1	3 (7.9%)	3 (25.0%)	
Anesthesia			
General	38 (100%)	12 (100%)	NA
Anticoagulated			
No	34 (89.5%)	9 (75.0%)	0.44
Antiplatelet	3 (7.9%)	2 (16.7%)	
Anticoagulated	1 (2.6%)	1 (8.3%)	
Stone laterality			
Bilateral	1 (2.6%)	0 (0%)	0.85
Left	22 (57.9%)	7 (58.3%)	
Right	15 (39.5%)	5 (41.7%)	
Stone load (type)			
Calcified JJ	0 (0%)	1 (8.3%)	0.080
Staghorn	36 (94.7%)	9 (75.0%)	
Multiple	2 (5.3%)	2 (16.7%)	
Stone load (diameter in cm)			

Median [min, max]	2.20 [0.500, 6.00]	2.60 [1.40, 7.00]	0.24
Missing	0 (0%)	1 (8.3%)	
Duration of Surgery (hours)			
Mean (SD)	1.88 (0.627)	2.11 (0.652)	0.31
Missing	4 (10.5%)	0 (0%)	
Timing			
AM	24 (63.2%)	8 (66.7%)	0.49
PM	10 (26.3%)	4 (33.3%)	
Missing	4 (10.5%)	0 (0%)	
Postoperative drainage			
Stent	33 (86.8%)	12 (100%)	0.416
Nephrostomy	1 (2.6%)	0 (0%)	
Missing	4 (10.5%)	0 (0%)	
Stone-free rate			
No	27 (71.1%)	7 (58.3%)	0.6
Yes	5 (13.2%)	3 (25.0%)	
No documented postoperative scan	6 (15.8%)	2 (16.7%)	
Residual stone load (diameter in mm)			
Mean (SD)	8.46 (4.37)	6.21 (3.09)	0.15
Timing of postoperative scan (weeks)			
<1	7 (18.4%)	5 (41.7%)	0.23
1	3 (7.9%)	0 (0%)	
2	7 (18.4%)	4 (33.3%)	
4	5 (13.2%)	0 (0%)	
>4	10 (26.3%)	1 (8.3%)	
No documented postoperative scan	6 (15.8%)	2 (16.7%)	
Distance from hospital (km)			
Mean (SD)	31.5 (39.1)	54.3 (59.7)	0.24
Missing	2 (5.3%)	0 (0%)	
Perioperative complications			

No	35 (92.1%)	12 (100%)	0.76
Yes	3 (7.9%)	0 (0%)	

ASA: American Society of Anesthesiologist; BMI: body mass index; LEP: laser enucleation of the prostate; LUTS: low urinary tract symptoms; RCRI: revised cardiac risk index; UTI: urinary tract infection; SD: standard deviation.

Table 2A. Overall same-day discharge rate, postoperative complications, ≤30-day emergency visits and ≤30-day re-admission rate for LEP

	Planned same-day (n=104)	**Planned inpatient (n=65)**	**95% CI**	**p**
Postop patient orientation				
Discharged	81 (77.9%)	0 (0%)	[0.69, 0.86]	<0.001
Hospitalized	23 (22.1%)	65 (100%)		
Duration of hospitalization				
Median [min, max]	1.00 [1.00, 5.00]	1.00 [1.00, 15.0]	[-1.37, 0.15]	0.12
≤30-day emergency visit				
No	100 (96.2%)	59 (90.8%)	[-0.038, 0.15]	0.27
Yes	4 (3.8%)	6 (9.2%)		
≤30-day re-admission rate				
No	103 (99.0%)	62 (95.4%)	[-0.030 0.10]	0.32
Yes	1 (1.0%)	3 (4.6%)		
Duration of re-admission				
Median [min, max]	2.00 [2.00, 2.00]	8.00 [3.00, 33.0]	NA	NA
Postoperative complications				
No	95 (91.3%)	50 (76.9%)	[0.016, 0.27]	0.017
Yes	9 (8.7%)	15 (23.1%)		

Clavien-Dindo classification				
1	6 (66.7%)	8 (53.3%)	NA	0.73
2	3 (33.3%)	4 (26.7%)		
3a	0 (0%)	1 (6.7%)		
4a	0 (0%)	1 (6.7%)		
4b	0 (0%)	1 (6.7%)		

CI: confidence interval; LEP: laser enucleation of the prostate; SD: standard deviation.

Table 2B. Overall same-day discharge rate, postoperative complications, ≤30-day emergency visits and ≤30-day re-admission rate for RARP

	Planned same-day (n=46)	**Planned inpatient (n=148)**	**95% CI**	**p**
Postop patient orientation				
Discharged	34 (73.9%)	0 (0%)	[0.60, 0.88]	<0.001
Hospitalized	12 (26.1%)	148 (100%)		
Duration of hospitalization				
Mean (SD)	1.17 (0.389)	1.21 (0.702)	[-0.31, 0.22]	0.74
Median [min, max]	1.00 [1.00, 2.00]	1.00 [1.00, 7.00]		
≤30-day emergency visit				
No	38 (82.6%)	142 (95.9%)	[-0.26, 0.0051]	<0.001
Yes	8 (17.4%)	6 (4.1%)		
≤30-day re-admission rate				
No	44 (95.7%)	146 (98.6%)	[0.11, 0.046]	0.51
Yes	2 (4.3%)	2 (1.4%)		
Duration of hospitalization				
Median [min, max]	5.50 [1.00, 10.0]	3.00 [2.00, 4.00]	NA	NA
Postoperative complications				

Table 2B. Overall same-day discharge rate, postoperative complications, ≤30-day emergency visits and ≤30-day re-admission rate for RARP				
	Planned same-day (n=46)	**Planned inpatient (n=148)**	**95% CI**	**p**
No	39 (84.8%)	139 (93.9%)	[-0.22, 0.034]	0.097
Yes	7 (15.2%)	9 (6.1%)		
Clavien-Dindo classification				
1	6 (85.7%)	7 (77.8%)	NA	0.24
2	0 (0%)	2 (22.2%)		
3a	1 (14.3%)	0 (0%)		

CI: confidence interval; RARP: robotic-assisted radical prostatectomy; SD: standard deviation.

Table 2C. Overall same-day discharge rate, postoperative complications, ≤30-day emergency visits and ≤30-day re-admission rate for PCNL				
	Planned same-day (n=38)	**Planned inpatient (n=12)**	**95% CI**	**p**
Postop patient orientation				
Discharged	27 (71.1%)	0 (0%)	[0.51, 0.91]	<0.001
Hospitalized	11 (28.9%)	12 (100%)		
Duration of hospitalization				
Mean (SD)	1.64 (1.03)	1.50 (0.798)	[-0.67, 0.94]	0.73
Median [min, max]	1.00 [1.00, 4.00]	1.00 [1.00, 3.00]		
≤30-day emergency visit				
No	35 (92.1%)	11 (91.7%)	[-0.18, 0.19]	1
Yes	3 (7.9%)	1 (8.3%)		
≤30-day re-admission rate				
No	37 (97.4%)	11 (91.7%)	[-0.16, 0.28]	0.97
Yes	1 (2.6%)	1 (8.3%)		

Duration of readmission				
Mean (SD)	6.00 (NA)	1.00 (NA)	NA	NA
Median [min, max]	6.00 [6.00, 6.00]	1.00 [1.00, 1.00]		
Postoperative complications				
No	30 (78.9%)	10 (83.3%)	[-0.34, 0.25]	1
Yes	8 (21.1%)	2 (16.7%)		
Clavien-Dindo classification				
1	5 (62.5%)	2 (100%)	NA	0.59
2	2 (25.0%)	0 (0%)		
3a	1 (12.5%)	0 (0%)		

CI: confidence interval; PCNL: percutaneous nephrolithotomy; SD: standard deviation.

Table 3A. Reasons for hospitalization, ≤30-day emergency visit and re-admission for LEP

	Planned same-day (n=23)	**Planned inpatient (n=65)**	**p**
Reason for hospitalization			
Hematuria	4 (17.4%)	6 (9.2%)	0.72
Infection	2 (8.7%)	2 (3.1%)	
Normal	17 (73.9%)	53 (81.5%)	
Delirium	0 (0%)	1 (1.5%)	
Heart failure	0 (0%)	1 (1.5%)	
NSTEMI	0 (0%)	1 (1.5%)	
Thrombophlebitis	0 (0%)	1 (1.5%)	
Reason for ≤30-day emergency visit			
Hematuria	1 (25.0%)	3 (50.0%)	0.25
LUTS	1 (25.0%)	0 (0%)	
Retention	2 (50.0%)	1 (16.7%)	
Infection	0 (0%)	2 (33.3%)	

Table 3A. Reasons for hospitalization, ≤30-day emergency visit and re-admission for LEP			
	Planned same-day (n=23)	**Planned inpatient (n=65)**	**p**
Reason for ≤30-day readmission			
Hematuria	1 (100%)	1 (33.3%)	1.0
Infection	0 (0%)	2 (66.7%)	

LEP: laser enucleation of the prostate; LUTS: lower urinary tact symptoms; NSTEMI: non-ST-elevation myocardial infarction.

Table 3b. Reasons for hospitalization, ≤30-day emergency visit and re-admission for RARP			
	Planned came-day (n=12)	**Planned inpatient (n=148)**	**p**
Reason for hospitalization			
Normal	11 (91.7%)	142 (95.9%)	0.025
Urinary leak	1 (8.3%)	0 (0%)	
Acute kidney injury	0 (0%)	1 (0.7%)	
Hematoma	0 (0%)	3 (2.0%)	
Hematuria	0 (0%)	1 (0.7%)	
Ileus	0 (0%)	1 (0.7%)	
Reason for ≤30-day emergency visit			
Abdominal pain	2 (25.0%)	0 (0%)	0.22
Abscess	1 (12.5%)	0 (0%)	
Catheter blockage	1 (12.5%)	0 (0%)	
Hematuria	1 (12.5%)	1 (16.7%)	
Urinary retention	3 (37.5%)	0 (0%)	
Hematoma	0 (0%)	1 (16.7%)	
Opiate intolerance	0 (0%)	1 (16.7%)	
Subcutaneous emphysema	0 (0%)	1 (16.7%)	
Urinary leak	0 (0%)	1 (16.7%)	
Wound seroma	0 (0%)	1 (16.7%)	
Reason for ≤30-day re-admission			
Abscess	1 (50.0%)	0 (0%)	0.26
Urinary retention	1 (50.0%)	0 (0%)	
Hematoma	0 (0%)	1 (50.0%)	
Urinary leak	0 (0%)	1 (50.0%)	

RARP: robotic-assisted radical prostatectomy.

Table 3C. Reasons for hospitalization, ≤30-day emergency visit and re-admission for PCNL			
	Planned same-day (n=11)	**Planned inpatient (n=12)**	**p**
Reason for hospitalization			
Hematoma	1 (9.1%)	1 (8.3%)	0.37
Hematuria	2 (18.2%)	0 (0%)	
Infection	2 (18.2%)	1 (8.3%)	
Infundibulum tear	1 (9.1%)	0 (0%)	
Normal	4 (36.4%)	8 (66.7%)	
Renal colic	1 (9.1%)	0 (0%)	
Antibioprophylaxis	0 (0%)	1 (8.3%)	
Thrombophylaxis	0 (0%)	1 (8.3%)	
Reason for ≤30-day emergency visit			
Infection	1 (33.3%)	0 (0%)	N/A
Renal colic	2 (66.7%)	1 (100%)	
Reason for ≤30-day re-admission			
Infection	1 (100%)	0 (0%)	N/A
Renal colic	0 (0%)	1 (100%)	

PCNL: percutaneous nephrolithotomy