Predictors of failed same-day discharge in patients undergoing robot-assisted radical prostatectomy in a Canadian universal healthcare system

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ABSTRACT

INTRODUCTION: Same-day discharge (SDD) after robot-assisted radical prostatectomy (RARP) has been shown to be feasible and safe. In order to improve uptake of this ambulatory model in Canada, we aimed to update our experience of SDD after RARP and identify reasons for SDD pathway non-initiation and failure in a universal healthcare system.

METHODS: A review of our prospectively collected database of patients undergoing RARP at a Canadian tertiary academic center from May 2021 to May 2023 was conducted. Binary logistic regression analysis determined predictors SDD pathway non-initiation and failure.

RESULTS: We identified 387 patients, of which 198 were initiated on the SDD pathway. Of those initiated, 104 (52.5%) were successfully discharged home on the same day. Patients who travelled distances greater than 100 km, or who had non-CPAP (continuous positive airway pressure)-compliant obstructive sleep apnea were significantly less likely to be initiated on the SDD pathway (both $p<0.05$). Patients who were scheduled to be the second case or later had an estimated blood loss ≥300 mL, or had a postoperative abdominal drain, were predictive of failing SDD after initiation (all $p<0.05$). There were similar rates of readmissions, unscheduled office visits, and emergency department presentations, when compared to the traditional inpatient model (all $p>0.05$).

CONCLUSIONS: SDD after RARP in a Canadian healthcare system remains feasible and safe for selected patients. Predictors of failed SDD identified in this study inform the development of future ambulatory protocols and highlight areas of need in infrastructure to increase uptake of these outpatient pathways.

INTRODUCTION

Robot-assisted radical prostatectomy (RARP) remains a gold standard for the surgical treatment of localized prostate cancer. Advances in enhanced recovery after surgery (ERAS) pathways have improved the perioperative recovery for patients, and the concept of same-day discharge (SDD) has been popularized in recent years.[1,2] Although we reported our initial early experience of this ambulatory pathway,[3] data on SDD after RARP in Canada remains sparse. There has been one other report of SDD after RARP in the Canadian system with good outcomes, but the final analysis is limited by the small sample size.[4] The innate differences of a universal healthcare system when compared to a private model, along with limited access to robotic surgery, make SDD after RARP in Canada a unique but challenging model.

We aimed to update our experience with SDD after RARP for patients with localized prostate cancer to improve uptake.

METHODS

Data extraction

Following approval from our institutional local research ethics board, clinical data was reviewed from a prospectively collected database of patients who underwent RARP with pelvic lymph node dissection (PLND) from a single surgeon at our tertiary academic center from May 2021 to May 2023. Patients were included if they had a history

KEY MESSAGES

- Same-day discharge (SDD) after robot-assisted radical prostatectomy (RARP) seems to be feasible and safe in a Canadian healthcare system.
- Patients who live further from the hospital and those with poorly controlled sleep apnea tend not to be offered this ambulatory pathway, while patients who are scheduled later in the day or have a more difficult intraoperative course tend to fail SDD attempt.

of localized prostate cancer, underwent RARP with PLND, and had adequate followup data of a minimum of 90 days from initial surgery.

Patients were categorized between those who underwent SDD versus those who remained as inpatients on postoperative day (POD) 0 due to SDD ineligibility as described in our protocol, or per patient preference. SDD was defined as patients who successfully met SDD requirements and were discharged on POD 0. Data extracted included: baseline demographics such as age, body mass index (BMI) (kg/m^2), American Society of Anesthesiology (ASA) score, distance traveled (km), prostate-specific antigen (PSA) (ug/L), and prostate volume (cc); perioperative data, such as operative time (minutes), length of stay (LOS) (hours), estimated blood loss (EBL) (cc), immediate postoperative complications as measured by the Clavien-Dindo score; and followup data, including 90-day readmission rate, 90-day unscheduled clinic visit, and 90-day emergency department (ED) visit.

SDD protocol

All RARPs were conducted via a transperitoneal approach, using the Intuitive Surgical DaVinci® Si and Xi Surgical Systems. Given the rarity of surgery for low-risk disease, we perform a complete PLND on all patients undergoing RARP in our center, with boundaries including the external iliac artery laterally, bifurcation of common iliac artery proximally, external iliac vein posteriorly, and node of Cloqet distally. Preoperatively, patients were counselled in clinic on the SDD pathway and the typical postoperative course. A prescription for Ketorolac 10 mg PO fifteen tablets was filled by the patient prior to surgery. SDD was offered to patients who had no history of non-compliant continuous positive airway pressure (CPAP) obstructive sleep apnea (OSA), had access to local living accommodations on POD 0, had access to a caregiver or family member, and had no intraoperative complications.

Immediate postoperative instructions included early ambulation (within three hours), an oral diet (within 2–4 hours), scheduled non-narcotic analgesics (acetaminophen 650 mg q4h and Ketorolac 10 mg IV q6h), and intravenous fluids (1 L Ringers lactate bolus over two hours starting in the first postoperative hour). Patients were provided routine written postoperative instructions, as well as a custom print out based on common questions. Final clearance for discharge necessitated patients to ambulate without assistance, have good pain control, tolerate oral intake, and have vital signs within 20% of their preoperative values.

Data analysis

Baseline demographics was compared between surgical cohorts. Student's t tests (two-tailed, paired) were used to compare means between groups, and Chi-squared tests to compare proportions. Binary logistic regression analysis determined predictors for failure of SDD. The α-level was set at 0.05 for statistical significance. Analysis was performed using commercially available software, SPSS® version 25.0 (IBM, Armonk, NY, U.S.).

RESULTS

Demographics and predictors of SDD

A total of 387 patients underwent RARP with PLND at our center between May 2021 and May 2023. SDD was not offered to 189 patients (48.8%). Reasons for non-initiation of SDD pathway included: planned postoperative monitoring (57/189, 30.1%), distance from hospital with no local area to stay (55/189, 29.1%), intraoperative decision by operating surgeon (35/189, 18.5%), or patient preference during preoperative clinic assessment (42/189, 22.2%).

The remaining 198 patients were offered SDD, and of these patients, 104 (52.5%) were successfully discharged home the same day. Specific reasons for failure of SDD included the patient preferring to stay overnight postoperatively (82/93, 88.2%), or the patient had an immediate postoperative complication (11/93, 11.8%). Postoperative issues included incisional leaking (2/11), coffee ground emesis (1/11), postural hypotension (1/11), postoperative fever (2/11), postoperative nausea (3/11), low oxygen saturation (1/11), and supraventricular tachycardia (1/11).

Ultimately, 104 patients were discharged home same day and formed our SDD-RARP cohort. When compared to the inpatient (IP) RARP group, patients were similar in age, BMI, ASA score, prostate volume, PSA, and Gleason grade group (all p>0.05) (Table 1). Patients in the IP-RARP group were more likely to live further from the hospital and have higher rates of OSA (p=0.011 and p=0.007, respectively), and were the only predictors of non-initiation of SDD (Table 2). Patients that were scheduled to be the second case or later, had an EBL ≥300 mL, or had a postoperative abdominal drain were predictive of failing SDD after initiation (Table 2).

Operative variables

A higher proportion of patients of the SDD-RARP group were the first case of the day (64.4% vs. 44.2%, p=0.001) (Supplementary Table 1; available at *cuaj.ca*). Longer operative time, higher EBL, longer LOS, and use of a drain was more prevalent in the IP-RARP group (all p<0.05). No differences were found in pathologic outcomes, such as final pathologic staging, positive margins, lymph node count, bladder neck invasion, extra-prostatic extension, and seminal vesical invasion (all p>0.05) (Supplementary Table 2; available at *cuaj.ca*).

Complications and readmissions

The total complication rate of the IP-RARP group was 9.5% (27/283) with a major complication (≥ Clavien-Dindo grade 3) rate of 1.4% (4/283) (Table 3). Major complications included an epigastric injury needing embolization (IIIa), urinoma formation needing drainage (IIIa), intra-operative rectal injury needing primary repair by general surgery (IIIb), and postoperative bleeding needing open exploration (IV). No admission complications occurred in the SDD-RARP group, as eligibility for SDD was the absence of complications prior to discharge.

There were no differences in unscheduled 90-day office visits, readmission rates, or ED visits between both groups (p=1.000, p=0.079, and p=0.278, respectively). A subgroup analysis including only patients who were initially offered SDD was conducted and similarly found no differences in 90-day office visits, readmission rates, or ED visits between patients who failed vs. succeeded in SDD (p=1.000, p=0.152, and p=1.000, respectively). Two patients from the SDD group were readmitted, the first for postoperative pain management, and the other for an incisional wound infection needing intravenous antibiotics.

Table 1. Baseline demographics

	SDD RARP n=104	IP RARP n=283	p
Age, years, mean (± SD)	63.9 (6.9)	64.4 (5.7)	0.483
BMI, kg/m², mean (± SD)	28.9 (3.6)	29.6 (4.7)	0.165
ASA score, mean (± SD)	2.8 (0.5)	2.9 (0.5)	0.327
Distance from hospital, km, mean (± SD)	**46.3 (43.7)**	**157.2 (439.7)**	**0.011**
OSA (%)	**12 (11.7)**	**69 (24.4)**	**0.007**
Prostate volume, cc, mean (± SD)	43.5 (27.2)	45.2 (22.5)	0.554
PSA, ug/L, mean (± SD)	10.8 (7.3)	11.2 (10.0)	0.711
Biopsy Gleason grade group, mean (± SD)	2.5 (1.0)	2.4 (0.9)	0.509

Means were compared via a 2-tailed t test for two independent samples, equal variances assumed; proportions were compared via Chi-squared tests. ASA: American Society of Anesthesia; BMI: body mass index; IP: in-patient; OSA: obstructive sleep apnea; PSA: prostate-specific antigen; RARP: robot-assisted radical prostatectomy; SDD: same-day discharge; SD: standard deviation.

DISCUSSION

We found that select patients who undergo RARP can safely be discharged on the same operative day with similar rates of readmissions, unscheduled office visits, and ED presentations, when compared to the traditional inpatient model. Predictors of failed SDD identified in this study inform the development of future ambulatory protocols that can be modeled by other Canadian institutions.

This study builds upon our initial experience of SDD for RARP and maintains similar success rates of discharge (52.8%), while observing no increase in unscheduled 90-day office visits, readmission rates, or ED presentations.[3] Our rates of successful discharge are similar to other established high-volume centers in the U.S. and France (49–51.9%).[5,6] These success rates are likely attributed to a well-developed SDD protocol that involves cross-collaboration from a multidisciplinary surgical and anesthetic team, and has been modelled from a thorough review of published ambulatory models.[1,2]

Key factors in our ambulatory pathway include an in-depth preoperative counselling session on the safety and process of SDD, clear communication with anesthesiology of SDD intent, and adherence to ERAS principles, which includes early mobilization, immediate oral diet, and minimal opioid administration.[7,8] The natural next steps in improving SDD success rates include the introduction of a prehabilitation program prior to surgery, in which patients attend a multidisciplinary prehabilition clinic to optimize various perioperative fac-

tors, such as continence with pelvic floor physiotherapy workshops and nutrition optimization with a dietician.[9]

Of those patients that failed attempted SDD, the presence of a postoperative drain, or elevated EBL (odds ratio [OR] 2.13, 95% confidence interval [CI] 1.10–4.16 and 3.86, 95% CI 1.28–11.65, respectively) were predictive of failure. This is likely a reflection of a more technically difficult case, which in turn decreases rates of postoperative recovery due prolonged anesthesia, longer states of pneumoperitoneum, higher volumes of fluid resuscitation, and discomfort from the presence of a drain. Moreover, patients scheduled the second case or later were also predictive of failed SDD (OR 3.03, 95% CI 1.61–5.72). These patients had less time to recover throughout the day and reassessment for discharge tend to occur after-hours when the surgical team is typically not as readily available to reassess for discharge. These challenges seem to be universal among centers performing SDD.[10-12]

Although our success rates are similar to other institutions, initiation of SDD seems to be more restricted compared to our international counterparts.[13] Half of the patients in our study were not initiated on the SDD pathway, with many patients (51.3%) preferring to stay overnight due to their own preference or not having a local area to stay. This phenomenon may reflect innate differences of a Canadian universal healthcare system.

First, access to robotic surgery is limited to urban centers and a proportion of our patients traveling to our center have minimal options to stay locally. Second, infrastructure for accommodations after ambulatory surgery, such as hospital-affiliated hotels with accessible transportation, are not readily available. Finally, our universal healthcare model removes a financial aspect in decision-making for patients deciding on SDD. In other words, patients do not need to take into consideration insurance premiums or potential in-network coverage when staying the night. Overall, though SDD after RARP can be successfully performed, a proportion of Canadian patients may not be motivated to attempt the pathway.

The potential benefits of an ambulatory model for RARP in a Canadian healthcare system cannot be understated. First, it has previously been shown that early mobilization and return to work are major priorities for patients undergoing RARP.[14] Ambulatory models after RARP capitalize on ERAS principles that allow for patients to attain these goals earlier. Second, admission avoidance decreases the strain of our already scarce healthcare resources. Opening hospital beds improves strained nursing-patient ratios, provides space for patients with more acute conditions, and ensures other surgeries that rely on planned admission can continue.[15] Finally, decreased healthcare spending is another attractive feature of this ambulatory model. The average cost of an admission at our local health network is estimated to be $6311,[16] although this figure likely includes several costs not applicable to our

Table 2. Predictors of non-initiation and failure of SDD

	Predictors of non-initiation of SDD		Predictors of failed SDD	
	OR (95% CI)	p	OR (95% CI)	p
Preoperative variables				
Age ≥65, years	1.28 (0.8–1.96)	0.261	0.79 (0.42–1.50)	0.476
BMI ≥30, kg/m²	1.23 (0.60–2.51)	0.573	1.04 (0.34–3.23)	0.943
ASA ≥3	0.89 (0.52–1.52)	0.668	1.12 (0.52–2.42)	0.774
OSA	**2.55 (1.46–4.45)**	**0.001**	1.74 (0.69–4.36)	0.241
Distance ≥100 km	**5.33 (2.63–10.79)**	**<0.001**	0.65 (0.16–2.59)	0.543
Second case or later	1.18 (0.76–1.81)	0.462	**3.03 (1.61–5.72)**	**0.001**
Intraoperative variables				
Operative time ≥150, min	–	–	1.63 (0.52–5.10)	0.403
Postoperative drain	–	–	2.13 (1.10–4.16)	0.027
EBL ≥300, mL	–	–	**3.86 (1.28–11.65)**	**0.017**

BMI: body mass index; CI: confidence interval; EBL: estimated blood loss; OR: odds ratio; OSA: obstructive sleep apnea; SDD: same-day discharge.

Table 3. Complications and readmissions

	SDD RARP n=104	IP RARP n=283	p
Admission complications	0	27 (9.5)	0.000
I		17	
II		6	
IIIa		2	
IIIb		1	
V		1	
90-day readmission (%)	2 (1.9)	20 (7.1)	0.079
Unscheduled 90-day office visits	1 (1.0)	3 (1.1)	1.000
90-day ED visit not needing admission	13 (12.5%)	49 (17.3%)	0.278

Proportions were compared via Chi-squared tests. ED: emergency department; IP: in-patient; RARP: robot-assisted radical prostatectomy; SDD: same-day discharge.

SDD pathway, such as diagnostic imaging and ED costs. Nevertheless, even a fraction of this figure over the course of several years among multiple surgeons can add up to a significant sum.

Strengths and limitations

The strengths of our study lie in our sample size, which is one of the larger cohorts reported on the topic, increasing our power in identifying reasons for SDD pathway non-initiation and SDD failure. A pertinent factor identified includes a lack of infrastructure for non-hospital accommodations. Carrying forward, institutions pivoting towards an SDD model can improve infrastructure and motivation for ambulatory surgery by establishing affiliations with local hotels with hospital transportation. Further, our data represents high success rates in a Canadian system despite barriers in patient motivation and infrastructure compared to our international colleagues.

A limitation of our study includes the inherent selection bias in our SDD cohort. Patients are always given a choice to stay postoperatively despite being offered SDD. The cohort of patients that choose to stay tends to have higher rates of postoperative pain and nausea, which would ultimately affect readmission rates if mandated SDD. In addition, per our protocol, the presence of an intraoperative complication was a contraindication to SDD. These include any deviation in the normal operative course, such as excessive blood loss needing transfusion or the need to repeat the anastomotic suture due to an intraoperative detected urine leak. As such, preventing SDD for these patients selects out those who are at high risk for re-presenting to the hospital.

Another limitation includes the counter-argument that freeing up beds would inadvertently provide opportunities to increase the number of inpatient surgeries completed, thus driving up total healthcare expenditure; however, increasing surgical load and decreasing surgical wait times may have monetary benefit in the long term by preventing potential admissions.

CONCLUSIONS

SDD after RARP in a Canadian healthcare system remains feasible and safe for selected patients. We found that living greater distances from the hospital or having a medical history of OSA are predictive of not being initiated on an SDD pathway; and of those initiated, those who have postoperative abdominal drains or increased intraoperative blood loss, or who are the second/third case of the day, are more likely to fail SDD. These predictors identified inform the development of future ambulatory protocols for other Canadian institutions, and highlight areas of need in infrastructure to increase uptake of these outpatient pathways.

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