THE JOURNAL of UROLOGY®
www.auajournals.org/journal/juro

JU Insight

Same-Day Discharge vs Inpatient Robotic-Assisted Radical Prostatectomy: Complications, Time-Driven Activity-Based Costing, and Patient Satisfaction

Emily Cheng, Sofia Gereta, Tenny R. Zhang, et al.

Correspondence: Jim C. Hu (email: jch9011@med.cornell.edu).

Full-length article available at https://doi.org/10.1097/JU.0000000000003678.

Study Need and Importance: More than 50,000 patients undergo robotic-assisted radical prostatectomy (RARP) annually in the United States. RARP is traditionally followed by inpatient admission, but the hospital bed shortage caused by the COVID-19 pandemic prompted a transition to same-day discharge after surgery. We compared complications, total health care costs, and patient satisfaction for same-day discharge vs inpatient RARP.

What We Found: Of 392 RARPs performed at 2 academic medical centers from February 2020-November 2022, 206 patients were discharged on the same day and 186 were admitted as inpatients. Inpatient RARP patients were more likely to be older, self-reported Black race or Hispanic ethnicity, and have higher American Society of Anesthesiologists classification. Using propensity-score analysis, complications were similar for same-day discharge vs inpatient RARP (OR 0.87, 95% CI 0.35-2.21, $P = .8$). A validated patient satisfaction questionnaire administered within 30 days after RARP showed no significant differences in pain or satisfaction. Time-driven activity-based costing analysis demonstrated that same-day discharge RARP saved $2106 in costs compared to inpatient stay (see Figure).

Limitations: The 2 academic centers in this study used different criteria for same-day discharge, served different populations, and involved surgeons of varying experience. However, despite these variations, which strengthen the study design, we demonstrate similar outcomes. Additionally, time-driven activity-based costing analysis did not capture the indirect savings of same-day discharge RARP freeing up hospital beds for other diagnosis and conditions.

Interpretation for Patient Care: Our study is the first to show same-day discharge after RARP lowered health care costs by 19% without affecting 30-day complications or patient satisfaction. Same-day discharge after RARP demonstrates improved value-based (outcomes/costs) care delivery and should be preferred in appropriately selected patients.

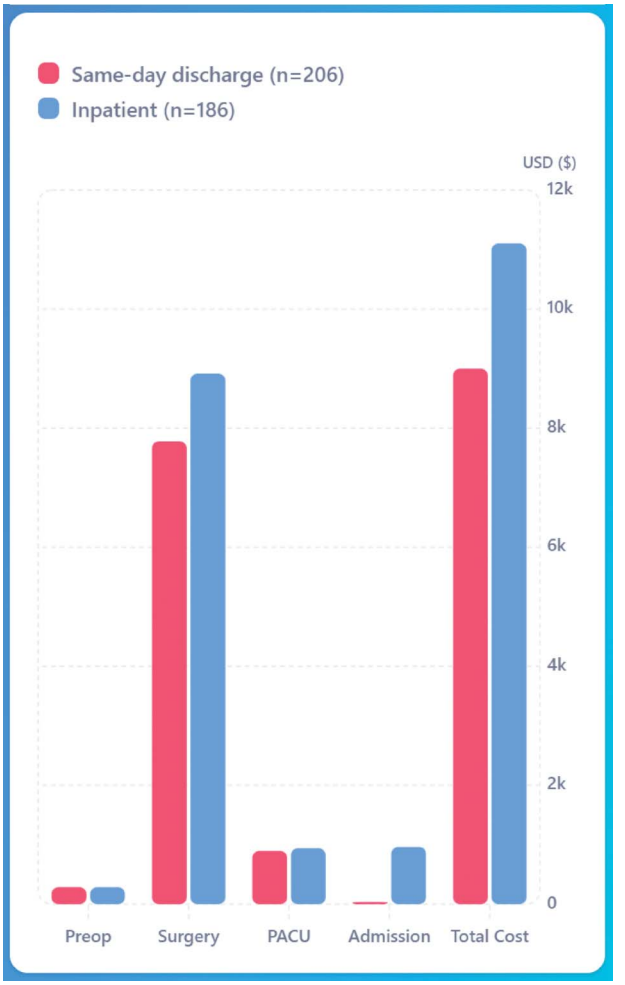

Figure. Cost breakdown of same-day discharge vs inpatient surgery. PACU indicates postanesthesia care unit; Preop, preoperative; USD, US dollars.

THE JOURNAL OF UROLOGY®

https://doi.org/10.1097/JU.0000000000003678
Vol. 210, 856-864, December 2023
Printed in U.S.A.

THE JOURNAL of UROLOGY®
www.auajournals.org/journal/juro

Same-Day Discharge vs Inpatient Robotic-Assisted Radical Prostatectomy: Complications, Time-Driven Activity-Based Costing, and Patient Satisfaction

Emily Cheng,[1] Sofia Gereta,[2] Tenny R. Zhang,[1] Alec Zhu,[1] Spyridon P. Basourakos,[1] Chunmei McKernan,[1] Siwen Xie,[1] Andrew J. Vickers,[3] Aaron A. Laviana,[2] and Jim C. Hu[1]*

[1]Department of Urology, New York Presbyterian Hospital, Weill Cornell Medicine, New York, New York
[2]Department of Surgery and Perioperative Care, University of Texas at Austin Dell Medical School, Austin, Texas
[3]Department of Epidemiology and Biostatistics, Memorial Sloan Kettering Cancer Center, New York, New York

Purpose: Historically, robotic-assisted radical prostatectomy is accompanied by an inpatient hospital admission. The COVID-19 pandemic necessitated a transition to same-day discharge robotic-assisted radical prostatectomy in some centers to free up critically needed inpatient beds. This study aims to compare complications, total health care costs, and patient satisfaction for same-day discharge vs inpatient robotic-assisted radical prostatectomy.

Materials and Methods: We compared 392 consecutive robotic-assisted radical prostatectomies performed as same-day discharge (n = 206) vs inpatient (n = 186) from February 2020 to November 2022 at 2 academic medical centers. We utilized propensity score analysis to assess the impact of same-day discharge vs inpatient robotic-assisted radical prostatectomy on 30-day complications (primary outcome). Time-driven activity-based costing analysis was applied to compare total costs of robotic-assisted radical prostatectomy care, and we administered a validated Patient Satisfaction Outcome Questionnaire to compare satisfaction scores.

Results: Inpatient robotic-assisted radical prostatectomy patients were more likely to be older, self-reported Black race or Hispanic ethnicity, and have higher American Society of Anesthesiologists classification. Complication rates were nonsignificantly lower for same-day discharge vs inpatient robotic-assisted radical prostatectomy (OR 0.87, 95% CI 0.35 to 2.21; $P = .8$). Same-day discharge vs inpatient robotic-assisted radical prostatectomy demonstrated a $2106 (19%) overall cost reduction. Median satisfaction survey scores were similar, and a clinically significant difference can be excluded.

Conclusions: Same-day discharge robotic-assisted radical prostatectomy is cost-effective and should be the preferred approach in appropriately selected patients.

Key Words: prostatic neoplasms, ambulatory care, prostatectomy, costs and cost analysis

Submitted January 23, 2023; accepted August 10, 2023; published August 28, 2023.

Support: JCH receives research support from the Frederick J. and Theresa Dow Wallace Fund of the New York Community Trust. JCH also receives salary support from NIH R01 CA241758, R01 CA259173, R01 CA273031, PCORI CER-2019C1-15682, and CER-2019C2-17372, and a Prostate Cancer Foundation Challenge Award. AJV is supported in part by the National Institutes of Health/National Cancer Institute with a Cancer Center Support Grant to Memorial Sloan Kettering Cancer Center (P30-CA008748), a SPORE grant in Prostate Cancer (P50-CA92629).

Conflict of Interest Disclosures: JCH: Intuitive Surgical: Consultant, Pfizer: Consultant. All other authors have nothing to disclose.

Ethics Statement: This study received Institutional Review Board approval (IRB No. 1403014960).

Data Availability: The data sets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

*Correspondence: Department of Urology, New York Presbyterian Hospital-Weill Cornell Medicine, 525 E 68th St, Starr 900, New York, NY 10065 (telephone: 646-962-9600 email: jch9011@med.cornell.edu).

Editor's Note: This article is the second of 5 published in this issue for which Category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 932 and 933.

Approximately 60,000 men—one-third of those with localized prostate cancer—undergo radical prostatectomy annually.[1,2] Robotic-assisted radical prostatectomy (RARP) currently comprises 85%-90% of all radical prostatectomies.[3,4] While RARP traditionally requires an inpatient admission, the feasibility of same-day discharge (SDD) RARP without overnight stay was first reported in 2010,[5] and a few studies demonstrate similar outcomes.[5,6]

The COVID-19 pandemic caused critical hospital bed shortages. As a

https://doi.org/10.1097/JU.0000000000003678
Vol. 210, 856-864, December 2023
Printed in U.S.A.

result, we switched to SDD RARP and continue to offer it, creating an opportunity for comparison. As such, we sought to be the first to compare SDD vs inpatient RARP complications (primary outcome), health care costs, and patient satisfaction (secondary outcomes). We used time-driven activity-based costing (TDABC) to determine the actual cost of care delivery by modeling the costs of all involved personnel, equipment, facility, and support resources per unit time.[7] We hypothesized that SDD would not increase 30-day complications, readmissions, or patient satisfaction, while significantly reducing health care costs.

MATERIALS AND METHODS

We performed a retrospective study of a cohort of 392 consecutive RARPs (206 SDD, 186 inpatient) performed by JCH (New York-Presbyterian/Weill Cornell Medical Center [NYP]) and AAL (Dell Seton Medical Center [Dell] at University of Texas Austin) from February 2020 through November 2022. The study was approved by our Institutional Review Board (Protocol No. 1403014960).

During the COVID-19 pandemic from March to September 2020, all RARPs at NYP were performed SDD. Hospital policy eventually allowed elective inpatient procedures, and patients chose between overnight stay vs SDD. Patient choice at NYP was captured prospectively beginning in January 2022. At Dell, patients were allowed to choose SDD if they had a caretaker at home; those who lived alone underwent inpatient RARP.

Race and ethnicity were self-reported. We report these characteristics due to variation in populations served by our centers and to discern whether there were disparities in postoperative care. Comorbidities were captured using American Society of Anesthesiologists (ASA) classification, and complications were stratified using Clavien-Dindo classification.[8] In patients with more than 1 complication, multiple algorithms were used to conduct analyses based on mutual exclusivity or highest Clavien-Dindo score. RARP was performed as previously described.[9] There were no comorbidity or ASA class criteria that mandated the inpatient approach, and there were no exclusion criteria for this study.

The postoperative analgesic protocol included IV ketorolac in the postanesthesia care unit (PACU) and for inpatient stays. Additionally, oral acetaminophen, ibuprofen, and/or cyclobenzaprine were prescribed for both SDDs and inpatients alike. Dell patients also received a transversus abdominus plane block in the operating room with 20 mL 0.25% bupivacaine.

Regarding our key question, an association between RARP postoperative care and complications would most plausibly be explained by either a causal effect of the approach or by differences in case mix. Given the small number of events relative to the number of covariates, propensity score methods were utilized for the odds of 30-day complications. We used a logistic regression model to calculate the propensity of undergoing SDD vs inpatient based on age, BMI, race/ethnicity, and comorbidities, then weighted each patient's data based on the inverse propensity of being in one of the 2 treatment groups. Covariate balance was checked after adjustment. Covariates were also separately analyzed on univariate models to determine association with complications. Statistical analysis was performed using SAS version 9.4.

We modified a Patient Satisfaction Outcome Questionnaire previously validated for orthopedic surgery and administered it starting in February 2021 within 30 days postoperatively (n = 62 SDD, n = 49 inpatient) to compare satisfaction and pain.[10] Survey modifications included changes to the specific surgical procedure performed (see Supplementary Appendix, https://www.jurology.com). For instance, "robotic radical prostatectomy" replaced "anterior cruciate ligament reconstruction," and "catheter care" replaced "physical rehabilitation." Items focused on patient perceptions of the effectiveness of pain control, medication side effects, and overall satisfaction with the surgery and recovery process. Responses on the Patient Satisfaction Outcome Questionnaire were scored on a scale ranging from 0 to 100. Higher scores represent better outcomes for items concerning drug effectiveness; lower scores represent better outcomes for items concerning side effect severity. We performed a Wilcoxon rank-sum test, with the 95% CI for difference in medians calculated using the Hodges-Lehman estimator.

To derive the costs for RARP, we implemented the TDABC method as previously described by Kaplan.[11] We assembled stakeholders to develop process maps of steps in delivering care for RARP.[12] Next, we traced the RARP care timepoints from time of hospital arrival, time in preop, time in the operating room, beginning and end of anesthesia, beginning and end of case, time in the PACU, and time on the inpatient floor/observation unit before discharge. We then calculated the average time spent in each phase. The capacity cost rate was determined for every resource involved in the process maps.[12] Finally, the summation of the cost of each process in the pathway was calculated, resulting in the total average cost of care for SDD and inpatient RARP. For SDD patients who were unexpectedly admitted overnight, we utilized an intention-to-treat analysis and calculated the admission cost by multiplying the probability of an added overnight admission (6/206, 3%) by the cost of inpatient admission.

RESULTS

Baseline patient characteristics for the multicenter pooled sample are shown in Table 1. There were some significant differences in race/ethnicity and comorbidities, largely driven by diabetes and hypertension, but these were moderate in size: 35% vs 48% were ASA 3-4 and 51% vs 46% self-identified as White race for same-day vs inpatient, respectively. Eighty-seven percent of men at NYP and 47% men at Dell opted for SDD when offered the choice.

Procedural time and complications are shown in Table 2. Procedure times were longer at Dell, but PACU time at Dell was shorter. Dell does not have a phase III PACU, necessitating a significantly shorter PACU stay.[13] Inpatients experienced statistically

Table 1. *Baseline Patient Demographics and Characteristics*

	NYP n = 258	Dell n = 134	*P* value	Inpatient n = 186	Same-day discharge n = 206	*P* value
Age, median (IQR), y	66 (60-71)	63 (59-67)	.002	65 (59-71)	65 (59-70)	.4
BMI, median (IQR), kg/m^2	26.5 (24.3-28.8)	27.3 (24.5-30.6)	.039	26.8 (24.5-30.1)	26.6 (24.3-28.6)	.14
ASA 3-4, No. (%)	84 (33)	78 (58)	< .001	90 (48)	72 (35)	.008
Race, No. (%)			< .001			< .001
White	113 (44)	78 (58)		86 (46)	105 (51)	
Black	28 (11)	23 (17)		33 (18)	18 (8.7)	
Asian	67 (26)	3 (2.2)		17 (9.1)	53 (26)	
Hispanic	4 (2)	20 (15)		17 (9.1)	7 (3.4)	
Other[a]	46 (18)	10 (7.5)		33 (18)	23 (11)	
Comorbidities, No. (%)						
Coronary artery disease	49 (19)	11 (8.2)	.005	26 (14)	34 (17)	.6
Hypertension	134 (52)	84 (63)	.054	114 (61)	104 (50)	.033
Diabetes mellitus	35 (14)	23 (17)	.4	35 (19)	23 (11)	.045
Chronic kidney disease	11 (4.3)	1 (0.7)	.066	6 (3.2)	6 (2.9)	1

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; IQR, interquartile range; NYP, New York-Presbyterian/Weill Cornell Medical Center.
Continuous variables were compared using nonparametric Wilcoxon rank-sum test. Categorical variables were compared using the Fisher exact test.
[a] "Other" includes patients who self-reported "other" as race and those who declined to self-report.

significant longer operative times and shorter PACU times, possibly due to a relatively larger influence of inpatients at Dell. Complication rates were low and similar in each arm. Clavien-Dindo grade II events included urinary tract infection and other infections requiring antibiotics. Grade III complications included a symptomatic lymphocele requiring hospital admission and interventional radiology drainage in an inpatient RARP, and 1 SDD RARP developing a port-site strangulated hernia requiring laparoscopic repair. There were 3 (1.6%) readmissions following inpatient RARP and 4 (1.9%) readmissions following SDD RARP.

There were no statistically significant differences between groups for the covariates after adjusting for propensity score (all P values $> .8$). Moreover, both inpatient and SDD were represented across the distribution of potential confounders with only 1 patient having a propensity score of >90% or less than 10% (92%). In the main analysis, after adjusting for propensity score, there were slightly, though nonsignificantly, fewer complications in the SDD vs inpatient RARP in the propensity score analysis (OR 0.87, 95% CI 0.35, 2.21; $P = .8$). Table 3 shows that there are not strong associations between complications and any of the variables that differed between groups. The only statistically significant predictor of complications was BMI, which was similar between groups.

Patients responded overwhelmingly positively to survey items about pain control in the hospital, pain control at home, severity of side effects from pain medications during treatment, and overall satisfaction with the treatment. The median scores for these questions were 97-100 (out of a maximum of 100) for both groups. Patients assigned low scores to the question about stress due to uncontrolled pain after surgery, for a median of 10 for both groups. There was no difference in survey scores ($P > .05$) for any item (Table 4), and for 3 of the 5 questions, a clinically relevant difference could be excluded. Analysis was repeated with patient satisfaction being dichotomized and the findings were unchanged.

In terms of TDABC (Table 5), preoperative visit costs ($287) were similar. The most substantial differences were in RARP and overnight admission

Table 2. *Procedural Time and Complications*

	NYP (n = 258)	Dell (n = 134)	*P* value	Inpatient (n = 186)	Same-day discharge (n = 206)	*P* value
Procedure time, median (IQR), min	173 (152-202)	242 (223-268)	< .001	222 (180-251)	184 (153-218)	< .001
PACU time, median (IQR), min	314 (258-391)	74 (60-103)	< .001	141 (68-271)	300 (221-357)	< .001
Total length of stay (PACU+admission), median (IQR), min	388 (299-1015)	1259 (154-1441)	< .001	1266 (824-1516)	322 (271-388)	< .001
Readmissions, No. (%)	4 (1.6)	3 (2.2)	.7	3 (1.6)	4 (1.9)	1
CD complication rate, No. (%)						
Take the higher score if multiple, mutually exclusive:						
Grade 2	13 (5.0)	4 (3.0)		8 (4.3)	9 (4.4)	
Grade 3	2 (0.8)	5 (3.7)		4 (2.2)	3 (1.5)	
Not mutually exclusive:						
Any CD=2	13 (5.0)	5 (3.7)		9 (4.8)	9 (4.4)	
Any CD=3	2 (0.8)	5 (3.7)		4 (2.2)	3 (1.5)	

Abbreviations: CD, Clavien-Dindo; IQR, interquartile range; NYP, New York-Presbyterian/Weill Cornell Medical Center; PACU, postanesthesia care unit.
Wilcoxon rank-sum test and Fisher exact test were performed.

Table 3. *Association Between Potential Confounders and 30-Day Complications*

	OR	95% CI	*P* value
30-Day complications			
Chronic kidney disease (referent No)	1.39	0.17, 11.25	.8
Coronary artery disease (referent No)	0.49	0.11, 2.13	.3
Diabetes (referent No)	1.99	0.76, 5.26	.2
Hypertension (referent No)	0.93	0.41, 2.13	.9
Variant			
NYP (referent Dell)	0.88	0.37, 2.06	.8
Race (referent White)			
Asian	0.93	0.20, 4.36	.9
Black	1.40	0.33, 5.90	.6
Hispanic	0.72	0.08, 6.75	.8
Other	1.11	0.34, 3.55	.9
BMI	1.13	1.03, 1.23	.012
Age	1.05	0.99, 1.11	.12
SDD, inpatient, unadjusted	0.9	0.39, 2.05	.8
SDD, inpatient, propensity-score weighted	1.08	0.47, 2.49	.9
Readmission			
SDD, inpatient, unadjusted	2.29	0.44, 11.94	.3
SDD, inpatient, propensity-score weighted	3.65	0.6, 22.33	.2

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio; NYP, New York-Presbyterian/Weill Cornell Medical Center; SDD, same-day discharge. Univariate logistic regression and Wald χ^2 test were performed.

costs. The average cost of the RARP procedure was \$7777 for SDD and \$8915 for inpatients. The average cost of overnight admission for an inpatient was \$963. There was a small cost (\$39) of inpatient admission for SDD to account for those who had an unplanned overnight stay. The net difference was \$2106 in favor of SDD for a cost savings approximating 19% (Table 5).

DISCUSSION

We found that SDD after RARP lowered health care costs without a clinically relevant increase in complications or decrease in patient satisfaction. The upper bound of the 95% CI for complications was an odds ratio of 2.21. While residual confounding cannot be excluded, overall low complications indicate that any increase in the absolute risk of complications caused by SDD will be small.

These findings confirm studies highlighting comparable safety and outcomes of SDD RARP,[14-16] but our study is the first to also compare patient satisfaction using a validated instrument as well as health care costs, using the most accurate methodology. In a small 2016 study of 30 men undergoing RARP, 26 discharged same-day were comparable to 4 patients who stayed overnight in terms of narcotic usage days, days to return to work, and continence at 2 months.[6] A more recent and much larger study of 258 SDD and 1290 inpatient RARPs compared the risk of early postoperative mortality, morbidity, reoperation, and readmission and found no significant difference.[17] Overall morbidity was 3.1% vs 4.7%, RR 0.65, 95% CI 0.32-1.35, reoperation rate was 2.3% vs 0.6%, RR 1.82, 95% CI 0.63-5.28, and readmission rate was 2.6% vs 3.9%, RR 0.5, 95% CI 0.30-1.55 in this study.[17] A French multi-institutional assessment of SDD for RARP also found a low readmission rate (2.8%), further supporting the safety and feasibility of SDD RARP.[15]

Another study of SDD RARP from 2006 to 2016 found that over 70% of the SDDs were done after 2012, which demonstrates its increasing popularity over time.[17] An additional study found a 65% preference for SDD RARP.[16] Compared to these studies, our NYP patients preferred SDD at a higher rate. We surmise that during the COVID-19 pandemic, patients may have become more wary of the risk of nosocomial infections, resulting in a preference to recover at home rather than in the hospital if reasonable. Additionally, as SDD RARP has become more common and normalized, more patients might be willing to choose this option. These numbers for SDD were lower at Dell largely due to differences in the patient population: one-third are uninsured/underinsured with many traveling several hours to the hospital, contributing to additional social factors that make SDD challenging. Furthermore, the lack of a phase III PACU meant patients had at most 2-3 hours before needing to be admitted or discharged. Whereas previous studies showed a higher likelihood of SDD for patients undergoing RARP earlier in the day,[16] all planned SDD patients were discharged on the same day in our study, regardless of case order, and up to 3 RARPs were performed daily. This difference may be a consequence of our patients selecting SDD surgery in a pre-planned fashion, as opposed to the aforementioned study which offered it to patients both before and after surgery.

One potential reason for consistently high patient-reported outcomes on pain is our standardized

Table 4. *Median Patient-Reported Satisfaction Scores and Pain Scores*

Patient satisfaction items, selected for relevance	Inpatient n = 49	Same-day discharge n = 62	Difference in median (95% CI)[a]	*P* value
Overall satisfaction with entire course of treatment (to 2 wk postoperatively), median (IQR)	100 (100-100)	100 (100-100)	0 (0, 0)	.2
Overall pain control in the hospital, median (IQR)	100 (100-100)	100 (95-100)	0 (0, 0)	.7
Overall pain control at home, median (IQR)	100 (75-100)	97 (80-100)	2 (−6, 10)	.9
Stress due to uncontrolled pain after surgery, median (IQR)	10 (0-50)	10 (0-35)	0 (−16, 16)	.9
Severity of side effects from pain medications during entire course of treatment, median (IQR)	100 (0-100)	100 (0-100)	0 (−33, 33)	.9

Abbreviations: CI, confidence interval; IQR, interquartile range.
Scores ranged from 0-100. Wilcoxon rank-sum test was performed.
[a] 95% CI by Hodges-Lehman estimator.

Table 5. *Mean Time-Driven Activity-Based Costing Breakdown Between Inpatient and Same-Day Discharge Robotic-Assisted Radical Prostatectomy*

Breakdown of costs (US dollars)	Same-day discharge (n = 206)	Inpatient (n = 186)
Preoperative	287	287
RARP	7777	8915
PACU	895	939
Admission	39	963
Total cost	8999	11,104
Cost difference (net)	−2106	
Cost difference (% decrease)	−19	

Abbreviations: PACU, postanesthesia care unit; RARP, robotic-assisted radical prostatectomy; US, United States.

postoperative pain regimen. A multimodal, non-opioid pain regimen which includes nonsteroidal anti-inflammatory drugs, acetaminophen, and local anesthetics is recommended by the AUA to reduce opioid usage.[18] A recent large national cohort study identified IV ketorolac as the strongest predictor of opioid-sparing radical prostatectomy.[18] Postoperative pain control for all of our RARPs was opioid-sparing—patients received 2 doses of IV ketorolac: one at the time of incision and another in the PACU. We found no significant differences in postoperative pain and patient satisfaction scores between SDD and inpatient RARPs.

This is the first study to demonstrate that SDD is 19% (or approximately $2,000 per patient) less expensive than inpatient RARP without affecting 30-day complications, readmissions, or patient satisfaction. Although it may be self-evident that SDD vs inpatient RARP significantly reduces health care costs, the mapping and quantification of phases of care generates targets for additional cost reduction. For example, after reviewing various interims throughout the process, we reduced patient PACU times by administering the first dose of ketorolac at the start of the procedure to minimize the duration until second ketorolac dose in the PACU prior to discharge. Moreover, health systems pivoting toward value-based care must factor in an SDD approach to RARP when using TDABC to compare radical prostatectomy to alternatives such as active surveillance, radiation therapy, or partial gland ablation.[12,19] Our multicenter study provides contemporary and more generalizable SDD RARP TDABC analyses for this purpose.

The annual number of RARP cases in the United States is estimated to range from 48,600 to 55,400, yielding a cost savings of approximately $102 to $116 million per year if calculations are scaled nationally when converting RARP to SDD.[20] Moreover, on an individual surgeon level, some health systems incentivize surgeons for efficiency. In such scenarios, SDD savings may be offered as surgeon bonuses to further incentivize physician buy-in.[21] Finally, there is an indirect revenue benefit from SDD beyond our TDABC-derived cost savings that results from freeing the use of the inpatient personnel, beds, labs, and personnel for other medical conditions.

With respect to causal attribution, we can leave aside the question of costs, for which the causal pathway is obvious. This leaves the question of whether SDD may in fact lead to an increased risk of 30-day complications, but this was not observed due to confounding. We find this scenario unlikely as there were not large between-group differences for measured covariates, no strong associations between those covariates and outcome, and our main analysis was adjusted.

TDABC analysis at large academic centers in major metropolitan areas may not necessarily generalize to health systems located in other regions. Although we estimate the lower costs of SDD RARP, we do not quantify the benefit of an additional bed capacity that enables other surgeries or medical therapy for other conditions. In addition, the 2 institutions handled the decision of SDD vs inpatient differently—SDD surgery was only an option at Dell if patients had caregivers at home. Alternatively, a strength of our study is that these 2 academic centers serve patients from different sociodemographic groups. Whereas NYP treats a large percentage of Medicare and commercially insured patients, Dell is a hybrid of a county/insured hospital mixed with private/government payers. Another strength of our study is that it encompasses 2 different populations of patients who underwent surgery with surgeons of varying experience—1 with 18 years of RARP experience and 1 who recently finished fellowship at the start of the study.

CONCLUSIONS

Our multi-institutional evaluation of SDD vs inpatient RARP showed cost savings associated with SDD while maintaining similar satisfaction levels and no difference in complications, even across institutions and differing surgeon experience. The majority of patients preferred an SDD approach when given the choice. These data provide evidence that SDD RARP improves value-based care with comparable outcomes at significantly lower health care costs. It should be the preferred approach for appropriately selected patients. Future investigation should explore linking TDABC calculations to patient experience and postsurgical outcomes.

ACKNOWLEDGMENTS

We thank Leonardo Borregales, MD, for his assistance in editing this manuscript. We also thank our statistician, Xiangmei Gu, for her assistance and support in this manuscript.

REFERENCES

1. Halpern JA, Shoag JE, Artis AS. National trends in prostate biopsy and radical prostatectomy volumes following the US Preventive Services Task Force guidelines against prostate-specific antigen screening. *JAMA Surg.* 2017;152(2):192-198.
2. Martini A, Marqueen KE, Falagario UG. Estimated costs associated with radiation therapy for positive surgical margins during radical prostatectomy. *JAMA Netw Open.* 2020;3(3):e201913.
3. Crew B. Worth the cost? A closer look at the da Vinci robot's impact on prostate cancer surgery. *Nature.* 2020;580(7804):S5-S7.
4. Oberlin DT, Flum AS, Lai JD, Meeks JJ. The effect of minimally invasive prostatectomy on practice patterns of American urologists. *Urol Oncol.* 2016;34(6):255.e1-255.e5.
5. Banapour P, Elliott P, Jabaji R. Safety and feasibility of outpatient robot-assisted radical prostatectomy. *J Robot Surg.* 2019;13(2):261-265.
6. Berger AK, Chopra S, Desai MM, Aron M, Gill IS. Outpatient robotic radical prostatectomy: matched-pair comparison with inpatient surgery. *J Endourol.* 2016;30(S1):S52-S56.
7. Porter ME. A strategy for health care reform—toward a value-based system. *N Engl J Med.* 2009;361(2):109-112.
8. Clavien PA, Barkun J, De Oliveira ML. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg.* 2009;250(2):187-196.
9. Arenas-Gallo C, Shoag JE, Hu JC. Optimizing surgical techniques in robot-assisted radical prostatectomy. *Urol Clin North Am.* 2021;48(1):1-9.
10. Krywulak SA, Mohtadi NGH, Russell ML, Sasyniuk TM. Patient satisfaction with inpatient versus outpatient reconstruction of the anterior cruciate ligament: a randomized clinical trial. *Can J Surg.* 2005;48(3):201-206.
11. Kaplan RS. Improving value with TDABC. *Healthc Financ Manage.* 2014;68(6):76-83.
12. Laviana AA, Ilg AM, Veruttipong D. Utilizing time-driven activity-based costing to understand the short- and long-term costs of treating localized, low-risk prostate cancer. *Cancer.* 2016;122(3):447-455.
13. Godden B. Determining the appropriate location and level of care for a postanesthesia and/or postsedation patient. *J Perianesth Nurs.* 2015;30(1):54-57.
14. Ploussard G, Grabia A, Barret E. Same-day-discharge robot-assisted radical prostatectomy: an annual countrywide analysis. *Eur Urol Open Sci.* 2022;36:23-25.
15. Ploussard G, Dumonceau O, Thomas L, et al. Multi-institutional assessment of routine same day discharge surgery for robot-assisted radical prostatectomy. *J Urol.* 2020;204(5):956-961.
16. Abaza R, Martinez O, Ferroni MC, Bsatee A, Gerhard RS. Same day discharge after robotic radical prostatectomy. *J Urol.* 2019;202(5):959-963.
17. Khalil MI, Bhandari NR, Payakachat N, Davis R, Raheem OA, Kamel MH. Perioperative mortality and morbidity of outpatient versus inpatient robot-assisted radical prostatectomy: a propensity matched analysis. *Urol Oncol.* 2020;38(1):3.e1-3.e6.
18. Brant A, Lewicki P, Johnson JP. Predictors and trends of opioid-sparing radical prostatectomy from a large national cohort. *Urology.* 2022;168:104-109.
19. Hu JC, Laviana AA, Sedrakyan A. High-intensity focused ultrasound for prostate cancer. *Interv Urol.* 2016;10065:139-151.
20. McClintock TR, Wang Y, Cole AP. Contemporary trends in the utilisation of radical prostatectomy. *BJU Int.* 2018;122(5):726-728.
21. Anoushiravani AA, Nunley RM. Gainsharing strategies, physician champions, getting physician buy in. *J Arthroplasty.* 2017;32(6):1723-1727.

EDITORIAL COMMENTS

Robotic-assisted radical prostatectomy (RARP) has significantly reduced hospital stays and postoperative complications.[1] But is same-day discharge a step too far or the next logical progression? In this paper, the authors show the difference in postoperative complications between same-day discharge and inpatient RARP is negligible, suggesting that for select patients, going home the same day is safe.[2] This is a testament to the advancements in surgical techniques and postoperative care.[3] However, the real eye-opener is the time-driven activity-based cost analysis. By allowing patients to recover in the comfort of their homes, health care systems can achieve substantial cost savings without compromising patient outcomes. In an era where health care costs are skyrocketing, such findings are invaluable. Finally, patients who went home the same day reported equal satisfaction levels compared to those who stayed overnight.

Data requested from Intuitive Surgical reveal that currently less than 1% of prostatectomies are performed at ambulatory surgery centers (ASCs).[4] This statistic underscores the vast potential for growth and the need to reevaluate our current health care paradigms. There are several reasons why more robotic surgeries are not performed at ASCs, including restrictions on reimbursement from Medicare and a lack of robotic consoles at many ASCs. As a surgeon who personally performs RARP at an ASC, there is no doubt in my mind we will see a steady increase in the number of prostatectomies performed on an outpatient basis. I was pleased to see the authors make a compelling case for same-day discharge, emphasizing that when technology, cost efficiency, and patient satisfaction align, it's time to rethink and reshape the future of prostate cancer surgery.

Daniel Oberlin[1]
[1]*Urologic Oncology*
Golden Gate Urology
Berkeley, California

REFERENCES

1. Kim H. Safety of same-day discharge in robotic surgery. *J Mod Surg Tech.* 2021;6(2):75-85.
2. Cheng E, Gereta S, Zhang TR, et al. Same-day discharge vs inpatient robotic-assisted radical prostatectomy: complications, time-driven activity-based costing, and patient satisfaction. *J Urol.* 2023;210(6):856-864.
3. Rodriguez M. Minimally invasive approaches to prostate cancer. *Urology Today.* 2023;20(1):10-20.
4. Intuitive Surgical. *Annual Review of Surgical Procedures 2022.* 2023. https://isrg.intuitive.com/static-files/0cb4f097-4e55-47b2-bfb8-dd4f9d45182b

We congratulate the authors on evaluating the outcomes of same-day discharge (SDD) vs inpatient robotic-assisted radical prostatectomy.[1] The economic findings of their analysis are of particular interest, as hospitals can achieve 19% cost savings while maintaining excellent outcomes and patient satisfaction with SDD. This raises the question of why SDD, described as early as 2016 by Abaza et al,[2] has not been broadly disseminated. It took a global pandemic to accelerate the adoption of SDD across the country.[1,3]

The issue may lie in the misalignment of economic incentives. While hospitals stand to make significant cost savings, these benefits do not trickle down to the medical teams. In a quaternary care institution like ours, the cost savings could exceed $1 million. If hospitals were to financially incentivize physicians or allocate a share of the savings to the department, it could facilitate alignment among all parties involved in care delivery. Such incentives could foster a stronger collaboration between administration and medical staff, enhancing the efficiency and quality of care.[4]

Yet, this strategy is not without its challenges. Introducing financial rewards risks shifting the focus from patient-centered care to monetary gains. Striking a balance between financial incentives and ethical obligations is critical to ensure that patient safety and satisfaction are not compromised.

In conclusion, this study by Cheng et al offers valuable data on reducing the cost burden on the health care system with SDD robotic-assisted radical prostatectomy without compromising on quality.[1] Incentivizing this practice among physicians and administrators could be beneficial, but the primary focus must remain on patient well-being in any such financial arrangements.

Dejan K. Filipas,[1,2] Edoardo Beatrici,[1,3] and Quoc-Dien Trinh[1]

[1]Division of Urological Surgery and Center for Surgery and Public Health
Brigham and Women's Hospital
Boston, Massachusetts

[2]Department of Urology
University Medical Center Hamburg-Eppendorf
Hamburg, Germany

[3]Department of Urology
Humanitas Research Hospital-IRCCS, Rozzano
Milan, Italy

REFERENCES

1. Cheng E, Gereta S, Zhang TR, et al. Same-day discharge vs inpatient robotic-assisted radical prostatectomy: complications, time-driven activity-based costing, and patient satisfaction. *J Urol.* 2023;210(6):856-864.
2. Abaza R, Martinez O, Ferroni MC, Bsatee A, Gerhard RS. Same day discharge after robotic radical prostatectomy. *J Urol.* 2019;202(5):959-963.
3. Labban M, Frego N, Qian ZJ, et al. Institutional trends and safety profile of same-day discharge for robot-assisted laparoscopic radical prostatectomy: a retrospective analysis. *Urol Oncol.* 2023;41(8):354.e19-354.e26.
4. Gaughan J, Gutacker N, Grašič K, Kreif N, Siciliani L, Street A. Paying for efficiency: incentivising same-day discharges in the English NHS. *J Health Econ.* 2019;68:102226.

REPLY BY AUTHORS

We thank the reviewers for their supportive and insightful comments. Robotic-assisted radical prostatectomy has been a truly disruptive innovation, given that patients were hospitalized after radical prostatectomy for 8 days in 1991.[1] We add to early evidence that same-day discharge (SDD) radical prostatectomy is preferred by patients, has safe outcomes, has high satisfaction, and nets significant health care savings.[2]

The review by Reitblat et al discusses some of the evidence for value-based health care in urology and describes the need to measure some of the effects of health care changes,[3] and we agree wholeheartedly. By measuring outcomes and costs and tying this to patient satisfaction, this is one of the first steps toward implementing value-based care.

We also agree that patient safety should be prioritized and should never be compromised when

identifying areas of potential cost reduction. Future steps should be to closely examine process control measures to identify inefficiencies and to identify economic incentives for medical teams and surgery centers to promote SDD—perhaps through bundled payments or other alternative reimbursement methods rather than traditional fee-for-service utilized by many contemporary urologic practices.[4] Beyond potential financial incentives for high quality but efficient health care delivery, SDD is also patient centered, as over 70% of our subjects across 2 centers opted for home recovery compared to the option of an overnight stay.[2]

REFERENCES

1. Hu JC, Gold KF, Pashos CL, Mehta SS, Litwin MS. Temporal trends in radical prostatectomy complications from 1991 to 1998. *J Urol.* 2003;169(4):1443-1448.
2. Cheng E, Gereta S, Zhang TR, et al. Same-day discharge vs inpatient robotic-assisted radical prostatectomy: complications, time-driven activity-based costing, and patient satisfaction. *J Urol*. 2023;210(6):856-864.
3. Reitblat C, Bain PA, Porter ME, et al. Value-based healthcare in urology: a collaborative review. *Eur Urol.* 2021;79(5):571-585.
4. Golla V, Scales CD Jr, Johnson D, et al. Value based payment shift for independent urology practices: roadmap and barriers. *Urology.* 2023;171:1-5.