Dedicated robotics team reduces pre-surgical preparation time

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ABSTRACT

Context: Robot-Assisted Laparoscopic Radical Prostatectomy (RALRP) requires significant preoperative setup time for the room, staff, and surgical platform. The utilization of a dedicated robotics operating room (OR) staff may facilitate efficiency and decrease costs.

Aims: We sought to determine the degree to which preoperative time decreased as experience was gained.

Materials and Methods: A total of 476 patients with a mean age of 60.2 years were evaluated (11/2006 to 1/2010). Data was assimilated through an institutional review board approved blinded, prospective database. Utilizing time from patient arrival in the OR to robot docking as preoperative preparation, our experience was evaluated. Age, body mass index (BMI), and American Society of Anesthesiologists risk scores (ASA) were compared.

Statistical Analysis Used: Analysis of variance; Two-sample t-test for unequal variances.

Results: The first and last 100 cases were found to have similar age (P=0.27), BMI (P=0.11), and ASA (P=0.09). The average preoperative times were 66.4 and 53.4 min, respectively (P<0.05). The second 100 patients treated were found to have a significantly shorter preoperative time when compared to the first 100 patients (P<0.05). When the first 100 cases were divided into cohorts of 10 cases the mean preoperative time for the first through fourth cohorts were 80.5, 69.3, 78.8, and 64.7 min, respectively. After treatment of our first 30 patients we found a significant drop in preoperative time. This persisted throughout the remainder of our experience.

Conclusions: From the time of patient arrival a number of tasks are accomplished by the non-physician operating room staff during RALRP. The use of a consistent staff can decrease preoperative setup times and, therefore, the overall length of surgery.

Key words: Cost-effectiveness, efficiency, preoperative preparation, robotic prostatectomy, staff

INTRODUCTION

The Robot-Assisted Laparoscopic Radical Prostatectomy (RALRP) was introduced in 2001 and has since been integrated into the mainstream of urologic surgical practice. A major challenge to its implementation, however, is the expense of beginning a robotic program.\textsuperscript{[1]} Apart from the cost of the robotic system, RALRP requires significant preoperative setup time for the room, staff, and surgical platform. From the time of patient arrival to incision, a number of tasks are accomplished including patient positioning and robot docking. The utilization of a robotics-specific operating room (OR) staff may facilitate efficiency.\textsuperscript{[2,3]} As a consequence, operative times may shorten and costs may decrease. We sought to determine the degree to which preoperative efficiency improved as experience was gained by a dedicated robotic-specific nurse circulator and scrub technician OR team.

MATERIALS AND METHODS

Data was assimilated through an IRB-approved blinded, prospective database created and maintained by a third party committee independent of the operating surgeons and
From November 2006 through January 2010 all patients undergoing RALRP were accrued.

From the time of patient arrival in the OR, preoperative setup consists of patient timeout protocol, anesthesia induction, patient positioning and testing of tolerance of steep Trendelenberg, patient prepping and draping, placement of trocars with establishment of pneumoperitoneum, and docking of the da Vinci® surgical system. Utilizing time from patient arrival in the OR to robot docking as a surrogate for pre-surgical preparation, our initial experience and our most recent were compared to determine if a significant change in efficiency had occurred. Age, BMI and ASA scores were compared in each group.

To assess a significant improvement in preoperative efficiency overall we compared the first and last 100 patients’ time from arrival in the OR to robot docking. After establishing that we had significantly improved our preoperative efficiency over time, we then compared our first and second 100 patients and found that after 100 patients we had significantly improved our preoperative efficiency. We then divided our first 100 patients into subsets of 10 patients to determine at what point we had achieved a significantly shorter preoperative setup time (patient arrival to robot docking).

All data was accrued and analyzed utilizing Microsoft Excel 2008 (© 1985-2008 Microsoft Corporation).

RESULTS

From November 2006 through January 2010, 476 patients with a mean age of 60.2 ± 0.3 years (range 43-77) underwent RALRP at our institution. Table 1 lists preoperative and intraoperative patient characteristics.

Our mean patient body mass index (BMI) was 27.9 (range 19-41). The mean preoperative prostate-specific antigen (PSA) and prostate volume were 5.7 (range 0.1-40) and 42.3 (range 14-175), respectively. Operative time, defined as time in room to skin closure, was 256.9 min (range 139-600).

Our first and last 100 patients were found to have similar age (P=0.27), BMI (P=0.11), and ASA (P=0.09). The first and last 100 patients’ mean preoperative setup time was 66.39 and 53.42 min, respectively. Using a two-sample t-test for unequal variances we found that their values were significantly different (P<0.00001). When we then evaluated the second 100 patients treated we found a mean preoperative setup time of 54.2 min. Comparing this value to that of the first 100 patients treated we found that we had achieved a significantly shorter setup time after 100 patients (P=0.00001).

After identifying that our preoperative setup time significantly decreased within the first 100 patients treated, we compared patients in subsets of 10. The mean preoperative setup time for the first, second, third, and fourth cohorts of 10 patients treated were 80.5, 69.3, 78.8, and 64.7 min, respectively. An initial analysis of variance (ANOVA) was performed on these 10 groups. We were able to reject the null hypothesis that the 10 groups were equal with an F-value of 3.632 (corresponding to a P-value of 0.0007). Once this was accomplished, a two-sample t-test was performed. This demonstrated a significant drop in preoperative setup time occurring after the treatment of our first 30 patients. When the first 10 patients were compared to the fourth 10 patients we found them to be significantly different (P=0.02). This persisted throughout the remainder of the patients treated [Figure 1].

DISCUSSION

Since its introduction, the RALRP has become commonplace amongst the nation’s academic and community hospitals. Effectively, the RALRP has since been integrated into the mainstream of urologic surgical practice.

Over the past decade a multitude of papers have evaluated the validity of robotic surgery against the historic standard of open surgery. RALRP, in particular, has been found to be comparable to open prostatectomy in the realm of surgical

| Table 1: Patient data |
|-----------------------|
| Mean demographic data (range) |
| Age | 60.2 (43-77) |
| BMI | 27.9 (19-41) |
| ASA score | 2.2 (1-6) |
| Oncologic data |
| Mean PSA | 5.7 (0.1-40) |
| Mean prostatic volume | 42.3 (14-175) |
| Preoperative gleason score |
| Mean | 6.4 (5-9) |
| 2-6 | 301 |
| 7-10 | 175 |
| Operative characteristics |
| Mean operative time (min) | 256.9 (139-600) |
Despite the advances that have propelled its success in urologic surgery, the integration of the surgical robot does harbor several disadvantages. The most striking disadvantage of this system is cost. The capital expenditure and running costs for robotic technology is a major obstacle for many centers. Lotan and colleagues compared the cost of robot-assisted prostatectomy to that of the open approach. After excluding the 1.2 million dollar initial price of the robot, the RALRP was more expensive by over $1,100 per case.\(^{13}\)

In addition to the added cost of the surgical equipment there have been multiple studies demonstrating a prolonged length of surgery of RALRP compared to open prostatectomy.\(^{14-17}\) Palmer and associates previously reported on the economic feasibility of RALRP.\(^{18}\) In this report OR utilization was found to account for nearly 35% of the cost per procedure.

Several authors have shown an added time necessary for preoperative setup in robotic cases as a specific factor leading to longer operative times.\(^{19,20}\) Given this information it seems obvious that any intervention that can decrease setup time may facilitate shorter OR times and, therefore, more cost-effective utilization of the surgical robot. A review of the literature demonstrates an array of papers evaluating the learning curve of the operating surgeon but little attention has been devoted towards the non-physician members of the surgical team who primarily participate in the preoperative process.

In our experience we have utilized a consistent robotic OR team throughout our experience with the RALRP. Using this devoted team we have documented a significantly decreased preoperative setup time after treating a total of 30 patients. Our preoperative times decreased from 80.5 min in our first 10 patients to 64.7 min (\(P=0.02\)) after our 30\(^{\text{th}}\) patient. As our experience has grown this time has continued to improve with an average preoperative time of 53.4 min in our most recent 100 patients.

Our data demonstrates that operative time can be significantly impacted through the implementation of a devoted surgical team. A consistent presence in the robot room allows the OR staff to become familiar with patient positioning and facile with the function and manipulation of the surgical robot.

Our data was collected prospectively throughout our experience and includes all patients undergoing RALRP at our institution. In addition we have attempted to eliminate selection bias through the institution of an independent third party for accumulation of data. Despite the fact that this research represents our initial experience with the surgical robot it is applicable to those initiating a new robotic program as well as those surgeons with an established program but no consistent OR staff.

**CONCLUSIONS**

From the time of patient arrival to incision a number of tasks are accomplished by the non-physician operating room staff. The use of a consistent staff can decrease preoperative setup times and the overall length of surgery.

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How to cite this article: Lasser MS, Patel CK, Elsamra SE, Renzulli JF, Haleblian GE, Pareek G. Dedicated robotics team reduces pre-surgical preparation time. Indian J Urol 2012;28:263-6.

Source of Support: Nil, Conflict of Interest: None declared.