The impact of introducing laparoscopic radical prostatectomy on surgical wait times for prostate cancer

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Wait times for radical prostatectomy are increasing in Canada. However, the impact of adopting a new surgical technique, such as laparoscopic radical prostatectomy (LRP), is not known. We outline the determinants of surgical wait time, the potential impact of adopting LRP and ways to minimize the impact. Surgical wait time is determined by surgical demand (number of people wanting surgery) relative to supply (number of surgeries a centre is able to offer). The introduction of any new technique will at first prolong operative times, but the degree to which it does is dependent on the learning curve of the surgeon and perioperative team. The influence of this learning curve on wait times depends on surgeon-level factors including case selection, triaging and scheduling tendencies, as well as hospital-level factors such as the amount and flexibility of operating room and hospital resources. The impact of adopting new technology may be minimized by the following: one surgeon per group initially learns the new procedure; the group and learning surgeon continue to offer the conventional procedure; early procedural experiences with the new technique are made as homogenous as possible; and a constant, dedicated team is created. Thus, the potential benefits of new techniques like LRP may be realized when adopted in a way that minimizes a negative impact on surgical wait times.

Key Words: surgical innovation, technology, wait times

Introduction

"Technology... is a queer thing. It brings you great gifts with one hand, and it stabs you in the back with the other." (C.P. Snow, 1971)[1]

Innovation in surgery has brought us far in the battle against disease. From hand washing to lasers, each step has translated into improved quality and quantity of patients' lives. Yet, innovation has costs. Every new technique must be honed; a process which tends to prolong operative times. In an environment of fixed resources, this prolongation can lead to reduced surgical "supply" or the number of surgeries a centre is able to offer, and ultimately prolonged surgical wait times.

When dealing with a prevalent disease such as prostate cancer, minor changes in surgical supply can have a profound effect on national surgical wait times. Currently the wait time for radical prostatectomy (RP) in Canada ranges from 42[2] to 83[3] days and has increased over the past two decades.[4] With over 20,000 new cases of prostate cancer diagnosed each year in Canada and 20% of

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these choosing radical prostatectomy as a primary treatment, it is estimated that over 4000 procedures are performed each year.[4,5] This demand is unlikely to abate given that a recent randomized control trial demonstrated a survival advantage for patients with clinically localized prostate cancer undergoing radical prostatectomy.[6]

In this article we address the impact of innovation on surgical wait times with particular reference to prostate cancer and the advent of laparoscopic radical prostatectomy (LRP). We explore surgeon-level and system-level factors that influence the balance between surgical supply and demand, and offer strategies to reduce the impact on wait times.

Factors affecting wait times

The effect of surgical innovation on wait times is not known. A careful literature search revealed that no studies have directly addressed this issue. Intuitively, the introduction of new surgical techniques would prolong operative times and thus lengthen wait times. But this simplistic view does not take into account the number of factors at work.

Wait time definitions vary. As regards surgical innovation, the period of interest is from when the patient decides to have surgery to when the surgery actually happens. Determinants of this latency can be classified as surgeon-level and system-level factors, Figure 1. With an equal, and fixed surgical demand (number of people wanting surgery) and surgical supply (number of surgeries a centre or region can offer) the wait time will reach equilibrium. The degree to which introduction of surgical innovation disrupts this equilibrium and translates into increased wait time depends on other physician and system-level factors.

Learning curves: how a new technique affects operative times?

The introduction of any new technique will at first require longer operative times. As the surgeon improves, and operating room staff becomes familiar with the procedure, the surgical times diminish. The effect on wait times is dependent on the rate at which the surgeon improves and the ultimate time-difference between the standard procedure and the newly honed technique after the learning curve is achieved. The

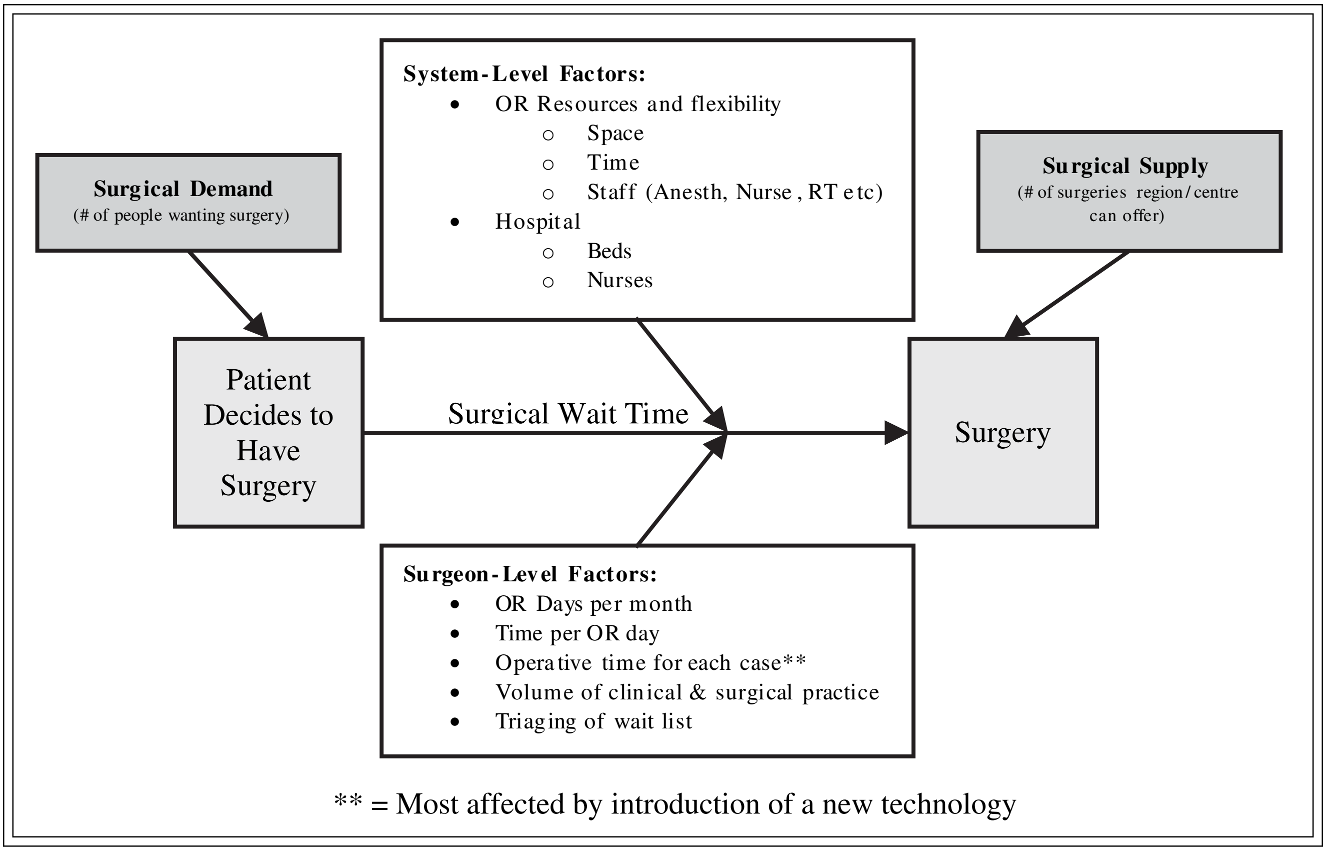

Figure 1. The surgical wait times equilibrium.

learning curve for LRP has been well described. Table 1 summarizes the published studies from the major North American and European Centres. Variability in case-mix, whether the procedure included lymph node dissection, and definitions of "operative time" preclude comparisons between series. However, the trend towards reduction in operative time with increasing experience is apparent. Two series indicate a similar reduction in operative time with experience for robotic assisted prostatectomy.[7,8] This relationship has also been observed in other surgical specialties.[9]

It is generally felt that the learning curve for LRP plateaus after 40-60 cases.[10-12] However, this will vary depending on the surgeon's previous laparoscopic experience. Furthermore, whether termination of the learning curve is defined by surgeon ability to independently complete a procedure or rather the quality of oncologic and functional outcomes will also impact on the number of cases required to plateau.[13] Once mastered though, LRP operative times range from "equivalent" to 90 minutes longer than conventional open radical prostatectomy.[8,14] Thus while major disruption of the wait time equilibrium is transient, minor prolongation of operative times may persist. The degree to which this change affects wait times depends on other factors.

TABLE 1. **Operative times at major North American and European sites during the learning curve for laparoscopic radical prostatectomy**

Series	Mean operative time (minutes)
Ferguson et al (n = 50)[20]	
Second 10	269
Fourth 10	205
Guillonneau and Vallencien (n = 120)[11]	
First 40	282
Second 40	247
Last 40	230
Rehman et al (n = 38)[21]	
First 10	591
Second 10	427
Third 18	305
Rassweiler et al (n = 438)[14]	
Early 219	288
Late 219	218
Turk et al (n = 54)[22]	
First 10	352
Next 45	200
Bhandari et al (n = 400 robotic assisted)[7]	
First 200	160
Second 200	146
UHN (n = 75) – Unpublished data	
First 25	210
Second 25	180
Third 25	165

As noted in Figure 1, at the surgeon level, factors such as case selection, triaging, scheduling tendencies and the case-composition of the practice determine the ultimate impact on wait times. Careful selection of ideal patients with small to average sized prostates and favorable habitus eases the learning curve. Similarly, if introduction of a new technique changes the scheduling from a normal operative day that included two conventional radical prostatectomies and one minor procedure such as a transurethral resection of prostate (TURP) to a day with two LRPs only, the volume of cancer care will not be affected. Finally, if a surgeon's practice is laden with incident or newly diagnosed prostate cancers, then the introduction of a novel surgical technique will quickly result in a back-log of cases.

At the system level, the amount and flexibility of operating room resources, hospital resources (in-patient beds and ward staffing), and the availability of the procedure in a region influences the degree of disturbances of the wait time equilibrium. The ability of a hospital to be flexible in allowing the appropriate space for new technology, assigning properly trained staff, and permitting room shuffling to maximize these parameters is of great importance. Flexible scheduling that permits some rooms to run late and allocating more OR days per month to accommodate for learning curves will also minimize the impact on surgical wait times. Finally, if the conventional procedure is offered at many other centres in the vicinity, then the regional impact of having one surgeon at one centre learning a new technique will be minimized.

Can the effect of surgical innovation on wait times be minimized?

A study of operative times during the learning phase of a new minimally invasive cardiac surgery technique at several institutions described the organizational factors that determined the rate at which adopting programs improved.[9] Incorporating their qualitative findings, it appears that appropriate changes in surgeon-level and system level factors could minimize the impact on wait times.

At the surgeon level, they found that the number of surgeons in the group learning the new procedure did not significantly affect the learning time. However, the study was underpowered with only one centre having multiple surgeons learning the new technique. In the absence of quality evidence to the contrary, we feel it is best if one surgeon in a group learns the new procedure at one time. If remaining group members perform the conventional procedure, coupled with the learning surgeon continuing to perform some conventional procedures, the prolonged operative times will be diluted over a group and thus minimized. The study also concluded that faster learning times were observed in centres where the surgeon made efforts to keep the procedure and the type of patient as constant as possible early in the learning curve. These two issues are interrelated. Choosing patients with not only similar, but favorable body habitus and prostate specific parameters will standardize the early operative experiences. By repetition of similar and straight forward cases, not only the surgeon, but also the operating room team will learn faster and this will minimize increases in operative times.

The way a surgeon learns the new technique also influences the slope of the learning curve. Debate continues regarding this topic. Mentored,[15,16] modular course,[12] and mini sabbatical/fellowship[17] approaches have been described with reference to LRP. No head to head study has proven one method to result in a faster learning curve, however, what is clear is that intensive training programs decrease complications.[18] One study emphasized that regardless of the type of training, it is important to minimize the lag time between completion of training and starting independent cases.[9]

At the system level, elevating case triaging to the group or region level can also help distribute the potential decrease in surgical supply. Such integration allows real-time monitoring of wait times and is in line with the "4-M Toolbox" of strategies recommended by the Wait Time Alliance.[19] High risk cases, such as those outlined in the Consensus document of this supplement could be identified and fast-tracked to surgeons in the group with the appropriate wait time. Furthermore, the study by Pisano et al emphasized the importance of a dedicated team of nurses and other perioperative support staff.[9] Hospitals lacking stability in team membership (e.g. constantly varying nursing assignments) tended to have slower learning curves. Finally, they also emphasized the importance of cross-departmental communications. Anesthesia, nursing, respiratory therapy and other support staff should be involved early in the adoption of new techniques and their input should be encouraged. Such an approach engenders a team mentality with all members having a vested interest in success. This translates into faster learning curves and minimized prolongation of surgical wait times.

Conclusion

The effect of implementing innovative surgical techniques on wait times has not been formally studied. Laparoscopic or robot-assisted laparoscopic radical prostatectomy is a relatively new procedure that continues to be more commonly performed in North America and Europe. Although a randomized control trial comparing LRP to conventional RP has not been conducted, LRP is a viable alternative with distinct advantages. Widespread adoption of LRP would disrupt the surgical supply-demand equilibrium. Although this may be warranted if LRP is shown to have at least equivalent outcomes and reduced morbidity, currently, adoption in the Canadian health care system requires a different approach. Thus, as the role of LRP continues to be defined, it is most appropriate to adjust surgeon and system-level factors in such a way that facilitates technique dispersion with minimal detriment to surgical wait times. □

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