

Implementing and evaluating the efficacy of an acute care urology model of care in a large community hospital

Abirami Kirubakaran, MD; Roger Buckley, MD; Shawn Khan, MD; Rebecca Richard, MD; Veselina Stefanova, MD; Nicole Golda, MD

University of Toronto, Toronto, ON, Canada

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Abstract

Introduction: We implemented an acute care urology (ACU) model at a large Canadian community hospital to determine the impacts on safe and timely care of patients with renal colic. The model includes a dedicated ACU surgeon, a clinic for emergency department (ED) referrals, and additional daytime operating room (OR) blocks for urgent cases.

Methods: We conducted a chart review of 579 patients presenting to the ED with renal colic. Data was collected before (pre-intervention, September to November 2015) and after (post-intervention, September to November 2016) implementation of the ACU model. Secondary methods of evaluation included surveying patients and 20 ED physicians to capture subjective feedback.

Results: Of the 579 patients presenting with renal colic, 194 were diagnosed with an obstructing kidney stone and were referred to urology for outpatient care. The ED-to-clinic time was significantly lower for those in the ACU model ($p < 0.001$). Furthermore, the ACU clinic resulted in significantly more patients being referred for outpatient care ($p = 0.0004$). There was also higher likelihood that patients would successfully obtain an appointment post-referral ($p = 0.0242$). The number of after-hours and weekend surgeries decreased significantly after dedicated ACU daytime OR blocks were added in September 2015 ($p < 0.0001$). All surveyed patients rated the care as either “excellent” or “very good,” and all physicians believed the ACU model has improved patient care.

Conclusions: The ACU model has shown benefit in ensuring timely followup for ED patients, reducing use of after-hour OR time, and improving patient and physician satisfaction.

Introduction

The acute care surgery (ACS) model has gained popularity in general surgery and is quickly becoming the standard model for delivering emergency general surgery care across Canada.¹ The ACS model involves the urgent assessment and treatment of surgical emergencies through rapid referral clinics and protected operating block times. Results from general surgery literature have shown this practice model to be effective in reducing emergency department (ED) wait times, time to consultation, and wait times for procedures.²⁻⁴ Furthermore, as the ACS model allows for predictable scheduling, the majority of general surgeons reported an improved balance when scheduling emergency vs. elective procedures.⁵ This model of care has gained favor in general surgery, but has yet to be widely adopted in other surgical specialties. To our knowledge, there are no urology divisions in other Canadian hospitals that have implemented this model of care.

We implemented an acute care urology (ACU) model in Toronto, Canada to address gaps in current emergency care in urology. At the community-based hospital where we conducted our study, many ED physicians had been concerned that urology patients were lost to followup, considering that average wait times ranged several months for an initial urology consultation. Furthermore, urology surgeons struggled to balance emergency referrals with previously scheduled elective surgery times. Urgent referrals would be seen by the on-call urologist, who would often have to perform urgent surgical cases after-hours. Alternatively, elective cases would be cancelled or delayed to accommodate completion of more urgent cases. The standard model of practice could both compromise care for patients with emergency needs and promote patient dissatisfaction, as well as increase the risk of physician fatigue.

Purpose and hypothesis

The purpose of our study was to implement and evaluate an ACU model of care at a large community-based hospi-

tal. Our hypothesis was that the implementation of an ACU model would have positive outcomes on important patient flow metrics, namely ED length of stay, time from urology referral to consultation, and number of after-hours surgeries for patients presenting to the ED with renal colic and confirmed to have an obstructing stone. We also hypothesized that ED physicians, urologists, and patients would be more satisfied with the quality of patient care.

Methods

Details of the ACU model

We implemented an ACU model in a stepwise approach. This included the enhanced use of dedicated ACU daytime operating room (OR) blocks every Tuesday and Thursday, which began in September 2014. We then included the addition of a dedicated ACU surgeon and creation of a rapid referral clinic for ED patient referrals in July 2016.

In this revised model of urology care, the ACU surgeon saw all urgent urology outpatient referrals received from the ED (e.g., renal colic, hematuria, and urinary retention). The ACU surgeon was stationed at an outpatient care clinic, allowing him to see urgent referrals, as well as perform minor procedures that could be accomplished under local anesthesia. Patients seen in referral who required operative care were prepared for the ACS-urology operating room (OR) dedicated block on Tuesday (0730–1200) and Thursday (0730–1530). Clinic time was available on weekdays (Monday 0800–1200, Tuesday 1500–1600, Wednesday 1300–1600, Thursday 1500–1600, Friday 0800–1200). A standard call arrangement remained for daytime (Monday to Friday) and evening and weekend calls, in which a single on-call surgeon would complete urgent consultations and emergent operative cases as required. There are a total of six urologists practicing in our group.

Research methods

We conducted a manual chart review of 579 patients presenting to the ED with a complaint of renal colic. Patients were considered eligible for analysis if they had a diagnosis of an obstructing stone (i.e., a stone within the ureter) and were referred to urology for outpatient assessment. Patients were excluded if they lacked satisfactory imaging, had a non-urological diagnosis, were admitted to hospital care, or if they passed the stone while in the ED (Figs. 1, 2). Patient data was collected in two separate time periods to analyze impact on patient care before (pre-intervention: September to November 2015) and after (post-intervention: September to November 2016) implementation of the ACU model. Patient data was obtained from ICD codes from the ED and coded using anonymized numbers to maintain privacy.

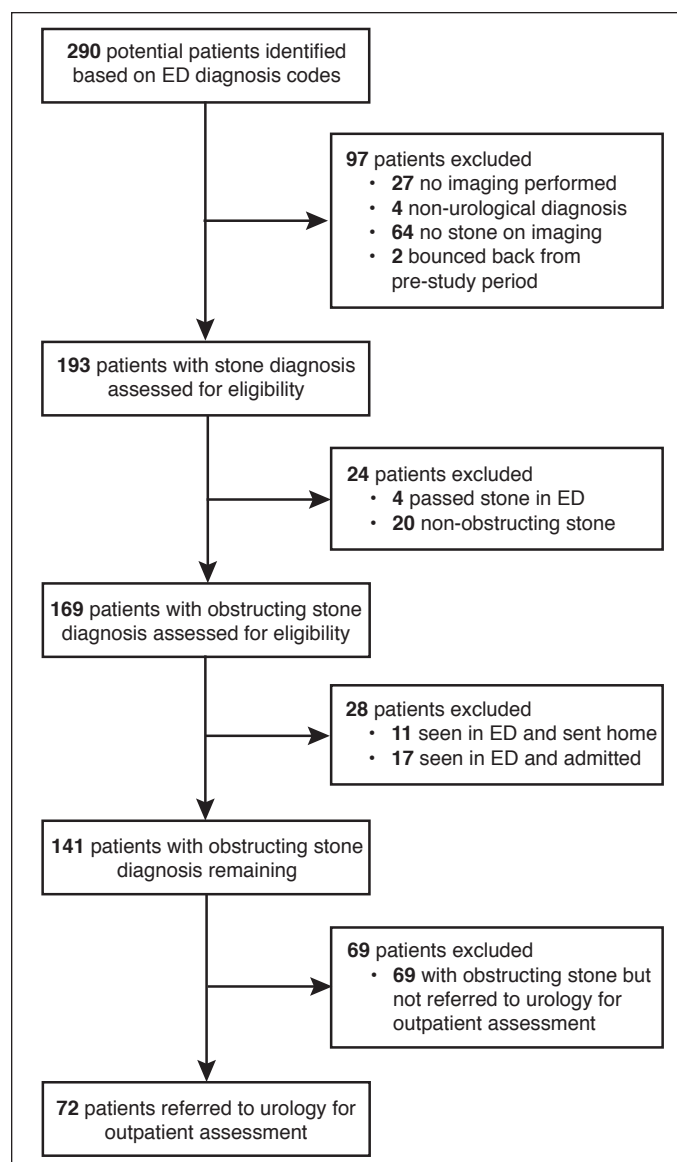


Fig. 1. Flowchart of patients assessed for eligibility pre-intervention. ED: emergency department.

Secondary methods of evaluation included a survey of ED physicians and urologists to capture subjective feedback of the ACU model through Likert scale data, adapted from a recent study by Wilgenbusch et al.⁶ Questions were asked via an online survey in order to gauge perception related to patient flow metrics and quality of care. All responses were anonymized. Patients also had the opportunity to provide feedback from July 2017 to September 2017, which was collected and analyzed using descriptive statistics. The combination of open-ended and closed-ended questions were developed after a literature search, adaptation from previous surveys, and consultation with stakeholders on the healthcare team.

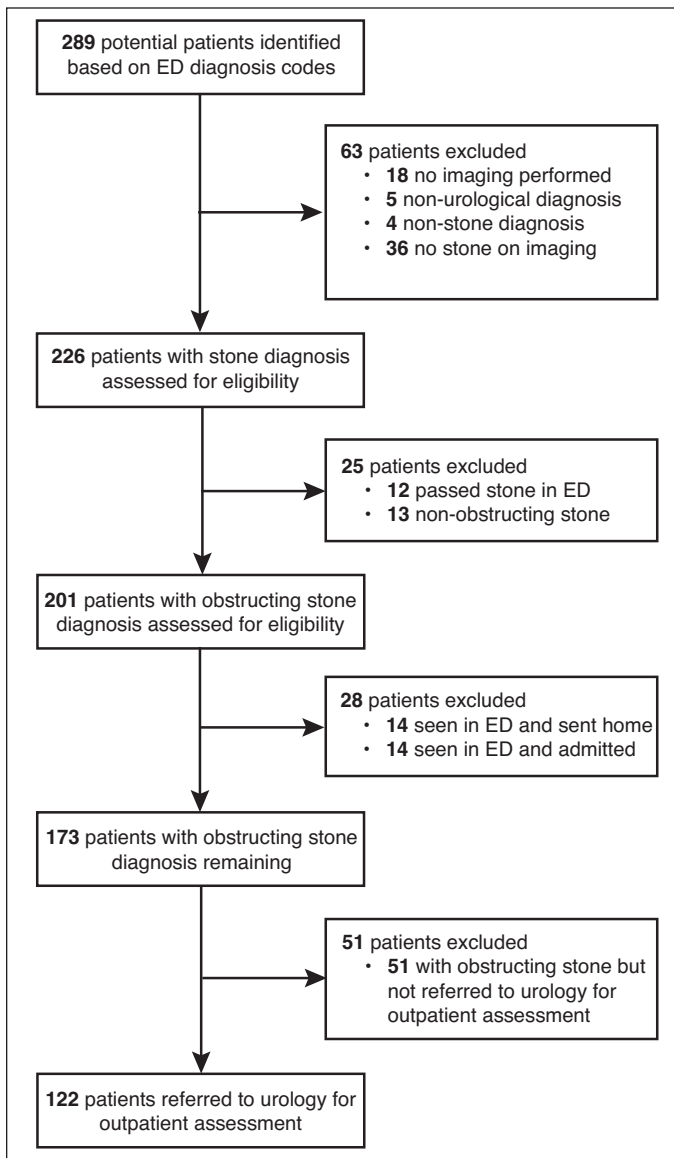


Fig. 2. Flowchart of patients assessed for eligibility post-intervention. ED: emergency department.

Table 1. Patient demographics

Variable	Pre-intervention n (%)	Post-intervention n (%)	p
Patients presenting to the ED with a renal colic complaint	290	289	
Sex distribution			
Male	187 (64.5)	186 (64.4)	0.98
Female	103 (35.5)	103 (35.6)	0.98
Age in years, mean (SD)	48.61 (14.55)	48.87 (15.14)	
Male	48.94 (14.25)	49.55 (14.74)	0.83
Female	48.01 (15.13)	47.64 (15.83)	0.83

ED: emergency department; SD: standard deviation.

Statistical analysis

Statistical analysis was prepared using “N - 1” χ^2 test for comparison of proportions, as well as unpaired two-sided t-tests. A statistical significance of $p < 0.05$ was considered significant. Survey data was analyzed through descriptive statistics.

Results

Chart review

Out of the 579 patients analyzed, 370 patients (169 pre-intervention and 201 post-intervention) were diagnosed with an obstructing kidney stone; 194 patients (72 pre-intervention and 122 post-intervention) were referred for outpatient urological assessment following the diagnosis of an obstructing kidney stone. There was no significant difference in age or sex distribution in the pre- and post-intervention groups (Table 1).

The ED-to-clinic time was significantly lower for those in the ACU model ($p < 0.0001$). The mean time to clinic was 15.76 days (standard deviation [SD] 15.47, range 1–93) pre-intervention vs. 4.17 days (SD 2.33, range 1–12) post-intervention (Table 2). However, we did not observe a signifi-

Table 2. Comparison of wait times spent by the referral group

Wait time	Pre-intervention group			Post-intervention group			p
	Patients, n	Mean (SD)	Median (IQR)	Patients, n	Mean (SD)	Median	
Time spent in ED	72	3 hrs 39min (2 hrs 17 min)	3 hrs 23 min	122	3hr 29 min (2 hrs 12 min)	3 hrs13 min	0.6151
From ED to urological assessment (days)	51	15.76 (15.47)	13 (1–93)	103	4.17 (2.33)	4.0 (1–12)	<0.0001
From ED to urological procedure	15	24.1 (34.1)	11 (4–141)	28	14.1 (15.1)	9 (2–69)	0.1889
From urological assessment to procedure (days)	15	14.2 (30.8)	3 (1–120)	28	10.9 (14.6)	6.0 (1–64)	0.6347

ED: emergency department; IQR: interquartile range; SD: standard deviation.

Table 3. Wait times

Wait time	Pre-intervention group			Post-intervention group			p
	Patients, n	Mean (SD)	Median (IQR)	Patients, n	Mean (SD)	Median (IQR)	
Patients with renal colic in the ED (minutes)	290	208.26 (156.94)	177 (104.00–264.25)	238*	221.30 (165.01)	193.00 (114.50–288.50)	0.3537

*Data not available for 51 patients. ED: emergency department.

cant difference in ED wait-times before physician assessment (Table 3). The changes in time from assessment to procedure were also not statistically significant.

Furthermore, the ACU clinic resulted in significantly more patients successfully receiving outpatient care. Specifically, 51.1% (72/141) of patients diagnosed with an obstructing stone were referred in the pre-intervention cohort in comparison to 70.5% (122/173) referred in the post-intervention cohort ($p=0.0004$) (Table 4). There was also a higher likelihood that patients would successfully obtain an appointment following referral ($p=0.0242$). Fewer patients were lost to followup following the implementation of the ACU model. Prior to the establishment of the ACU clinic, 21/72 (29%) of referred patients were never seen by a urologist, in comparison to 15/122 (12.7%) after all referrals were streamlined to the ACU clinic ($p=0.006$). Furthermore, these 15 patients were all contacted within 48 hours of receiving the referral and declined the appointment.

Balancing indicators were also considered in order to determine whether an ACU model may hasten unnecessary investigations or surgeries. There was no difference in the proportion of patients who underwent a computed tomography CT scan and/or ultrasound, with 90.69% (263/290) pre-intervention and 93.77% (271/289) post-intervention undergoing imaging ($p=0.1667$) (Table 5). The number of patients assessed who proceeded to undergo surgical intervention (ureteroscopy, laser lithotripsy ± ureteric stent insertion) was similar, with 15/51 (29.41%) pre-intervention and 28/103 (27.18%) post-intervention ($p=0.77$). Furthermore, based on preoperative imaging, there was no statistically significant difference between the size of stone operated upon, with the average size being 6.7 cm and 7.7 cm in the pre- and post-intervention groups, respectively. In the post-intervention group, this aver-

age stone size of 7.7 cm compares to 4.3 cm in the group of patients who were managed conservatively and ultimately passed the obstructing stone spontaneously.

The number of after-hours and weekend surgeries decreased significantly after dedicated ACU daytime OR blocks were added in September 2014. Only 1/43 cases occurred after-hours (start time after 1600) or on weekends of the combined pre- and post-intervention six-month periods analyzed (September to November 2015 and 2016). However, to highlight the impact of adding the dedicated ACU daytime OR blocks on after-hours cases, comparable time periods were analyzed before and after September 2014. Retrospectively analyzing all stone procedures, 15.4% (19/123) of cases were performed after-hours or on weekends from April to Jun 2016, in contrast to 51% (51/100) from April to June 2014 ($p<0.0001$).

Feedback of providers and patients

Results of the qualitative surveys were overwhelmingly positive. All 20 surveyed ED physicians were more confident that outpatients would be seen in a timely manner (85% strongly agree, 15% agree) (Table 6). Qualitative feedback included the belief that followup is more accessible and that ED physicians are less likely to page the on-call urologist, allowing them to discharge patients sooner. Overall satisfaction with the ACU model was 95% satisfied, and all believe there has been a positive impact on patient care.

The urology group at the community hospital unanimously agreed that acute urology patient outcomes have improved since implementation of ACU and that since ACU implementation, patient consults are performed in a more timely fashion. All (100%) urologists were “completely satis-

Table 4. Comparison of referrals in the pre- and post-intervention periods

	Pre-intervention, n (%)	Post-intervention, n (%)	p
Patients diagnosed with obstructive kidney stone	141	173	
Proportion of diagnosed patients referred to outpatient urology	72/141 (51.1%)	122/173 (70.5%)	0.0004*
Sex distribution of referrals			
Male	54 (75%)	77 (63.11%)	0.0884
Female	18 (25%)	45 (36.89%)	0.0884
Age in years, mean (SD)	48 (14)	49 (16.11)	0.6619
Proportion of patients assessed by urologists as outpatient % patients seen	51/72 (70.83%)	103/122 (84.42%)	0.0242*
Proportion of referrals who underwent a surgical procedure	15/51 (29.41%)	28/103 (27.18%)	0.77

*Statistical significance. SD: standard deviation.

Table 5. Comparison of number of imaging tests performed

	Pre-intervention, n (%)	Post-intervention, n (%)	p
Proportion of patients with renal colic in the ED who underwent imaging	263/290 (90.69%)	271/289 (93.77%)	0.1667
Number of CTs	178 (66.17)	190 (67.37)	0.76
Number of USs	91(33.83)	92 (32.62)	0.76

CT: computed tomography; ED: emergency department; US: ultrasound.

fied" with the addition of the ACU clinic, with qualitative feedback that the ACU clinic promotes collegiality among staff and improves the work environment (Table 7).

Eleven patients provided voluntary feedback from July to September 2017, with 100% of patients noting satisfaction with the clinic. All (100%) patients believed that wait time from ED to clinic was timely and that they were given very clear information about their care options (Table 8).

Discussion

Ultimately, there were several key benefits of the ACU model in this study. The urologists at our hospital had unanimously agreed in our survey that after-hours surgeries contribute to burnout and dissatisfaction, which has been confirmed by previous literature as well. The significant decrease of after-hours surgeries has benefits for both provider satisfaction, as well as increased patient safety.⁷ In addition, in the Ontario health system, after-hours surgeries are more costly for the hospitals due to payments of overtime for staffing, as well as constraints on OR space. The ACU model significantly decreased the number of after-hours surgeries, without incurring any delays in patients receiving their necessary proce-

dures. Future research could investigate specific cost-benefit savings and the final dollar value saved for each acute care urological case.

In addition, the ACU model resulted in more timely and reliable access of clinical care for patients. Providers could have greater trust that patients would be seen in a timely manner, while patients appreciated the additional support in their time of need. Loss of followup has been noted as a large issue for many patients, and the ACU model provides a potential solution to better organize care between the ED and specialists. There is a more direct and streamlined pathway for patients and providers following the diagnosis of their urgent urological condition. In addition, it is important to note that the addition of an ACU surgeon and the ACU clinic did not lead to patients prematurely undergoing a surgical procedure, as the stone size was not significantly different in patients who were operated on through the ACU model.

Another potential added benefit is the opportunity for increasing urologist employment in Canada through the creation of these specialized roles. The recent research by Hosier et al suggests a relative paucity in Canadian urologist jobs, despite more than doubling the number of trainees per year.⁸ ACU programs at hospitals could create meaningful job opportunities for urologists that offer a mix of both medical and surgical experience, with hospitals incentivized to hire due to the cost-savings realized from reduced after-hours surgeries. At our hospital specifically, we were able to create a full-time job for a new urologist to join the group and focus on acute care as a career practice. However, further research is required to characterize how the ACU model may affect hiring trends, particularly regarding part-time employment and itinerant practice.

Contrary to our hypothesis, the ACU model did not result in significantly different wait times based on the time periods

Table 6. Results of emergency physician survey (n=20)

Statements regarding physician satisfaction	Mean score
Patient flow and system improvement	
1. Since the introduction of the Acute Care urology clinic, I feel more confident patients will be seen by urology in a timely manner as an outpatient	4.84
2. I feel follow up is easy to arrange and accessible	4.84
3. I am able to discharge patients sooner from ED (decrease length of stay)	3.95
4. I am less likely to page urology on call	4.58
5. I feel the clinic has made a positive impact on patient care	4.84
6. I predict there has been a decrease in patient return or repeat visits for urological complaints (i.e., renal colic, hematuria, catheter problems)	3.90

Scoring system: 1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree; ED: emergency department.

Table 7. Results of urologist satisfaction survey (n=5)

Statements regarding surgeon satisfaction	Mean score
1. I believe that after-hours surgeries contribute to surgeon burnout and dissatisfaction (after-hours surgeries are defined as surgeries scheduled in the evenings and weekends)	4.5
2. I believe that since ACU implementation, patient consults are performed in a more timely fashion	5
3. I believe that since ACU implementation, patient consults are performed in a more timely fashion	5
4. I believe that acute urology patients are operated on in a more timely fashion since implementation of ACU	5
5. I believe that acute urology patient outcomes have improved since implementation of ACU	5
6. I prefer to perform acute care urology surgeries during the daytime (in comparison to after-hours)	5

Scoring system: 1 - strongly disagree; 2 - disagree; 3 - neutral; 4 - agree; 5 - strongly agree; ED: emergency department.

Table 8. Results of patient feedback survey (n=11)

	Always	Sometimes	Never	N/A
1. The staff at the front desk were polite and courteous	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)
2. I felt my privacy was respected	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)
3. Tests, test results and procedures were explained to me clearly so I could understand	90.9% (10/11)	0% (0/11)	0% (0/11)	9.1% (1/11)
4. I was told what symptoms to watch for after I left the clinic	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)
5. I was told what symptoms to watch for after I left the clinic	81.8% (9/11)	9.1% (1/11)	0% (0/11)	9.1% (1/11)
6. My scheduled test/procedures were done in a timely manner	90.9% (10/11)	9.1% (1/11)	0% (0/11)	0% (0/11)
7. My wait time from the time I was seen in the emergency room to my appointment to see the urologist in the Baruch Weisz Clinic was timely	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)
8. I was given information about what would happen next regarding my care	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)
9. I had an overall good experience	100% (11/11)	0% (0/11)	0% (0/11)	0% (0/11)

Responses at the urology clinic from July 4, 2017 to September 6, 2017

selected. However, ED wait times have risen nationally due to systemic factors according to the Canadian Institute for Health Information. As such, it is difficult to extrapolate the differences in hospital wait times due to other variables in the system's landscape. In addition, as the ACU model did not run weekend hours, there were often lags in assessment between Friday and Monday. Future models could expand to offering weekend clinics.

Another limitation of our analysis involves the restricted focus of renal colic when evaluating the ACU model. While the ACU clinic sees a wide array of urgent urological concerns, ranging from hematuria to urinary retention, renal colic was the most common presentation to the ACU clinic. Evaluating a single patient diagnosis allowed for better comparability of results and patient demographics. Moreover, we were unable to evaluate repeat visits to the ED or "bounce backs" from the ACU model, as there are many hospitals and EDs available in our catchment area. We were unable to access patient data from other hospitals to determine repeat admissions. Future research could involve collaboration between multiple hospitals to determine this information. In addition, patient feedback was very limited and may be skewed towards positive information, as only a select few patients decided to provide feedback following their experience at the ACU clinic. Finally, we were only able to complete questionnaires post-intervention and not pre-intervention. Future research could more systematically survey patients to obtain more thorough results.

Conclusions

The ACU model involves the creation of a rapid referral clinic dedicated to ED patient referrals, the addition of an ACU surgeon, and enhanced use of daytime OR blocks. The ACU model appears to be beneficial for both patients and

providers through reducing ED-to-clinic time for renal colic, ensuring proper followup after diagnosis, and reducing the number of after-hours surgeries.

Competing interests: The authors report no competing personal or financial interests related to this work.

This paper has been peer-reviewed

References

1. Hameed SM, Brennen FD, Ball CG, et al. General surgery 2.0: The emergence of acute care surgery in Canada. *Can J Surg* 2010;53:79-83.
2. Faryniuk AM, Hochman DJ. Effect of an acute care surgical service on the timeliness of care. *Can J Surg* 2013;56:187-91. <https://doi.org/10.1503/cjs.022911>
3. Ball CG, MacLean AR, Dixon E, et al. Acute care surgery: The impact of an acute care surgery service on assessment, flow, and disposition in the emergency department. *Am J Surg* 2012;203:578-83. <https://doi.org/10.1016/j.amjsurg.2011.12.006>
4. Qureshi A, Smith A, Wright F, et al. The impact of an acute care emergency surgical service on timely surgical decision-making and emergency department overcrowding. *J Am Coll Surg* 2011;213:284-93. <https://doi.org/10.1016/j.jamcollsurg.2011.04.020>
5. Helewa RM, Kholdebarin R, Hochman DJ. Attending surgeon burnout and satisfaction with the establishment of a regional acute care surgical service. *Can J Surg* 2012;55:312-6. <https://doi.org/10.1503/cjs.000611>
6. Wilgenbusch CS, Dust PW, Sunderland IR. Development of an acute care plastic surgery service in the saskatoon health region: Effects on flexor tendon management. *Plast Surg* 2015;23:195-8. <https://doi.org/10.1177/229255031502300305>
7. Helewa RM, Kholdebarin R, Hochman DJ. Attending surgeon burnout and satisfaction with the establishment of a regional acute care surgical service. *Can J Surg* 2012;55:312-6. <https://doi.org/10.1503/cjs.000611>
8. Hosier GW, Touma NJ. Attitudes of graduating Canadian urology residents on the job market: Is it getting better or are we just spinning our wheels? *Can Urol Assoc J* 2018;12:104. <https://doi.org/10.5489/cuaj.4765>

Correspondence: Dr. Abirami Kirubarajan, University of Toronto, Toronto, ON, Canada; abi.kirubarajan@mail.utoronto.ca