General surgery 2.0: the emergence of acute care surgery in Canada

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Over the past 5 years, there has been a groundswell of support in Canada for the development of organized, focused and multidisciplinary approaches to caring for acutely ill general surgical patients. Newly forged acute care surgery (ACS) services are beginning to provide prompt, evidence-based and goal-directed care to acutely ill general surgical patients who often present with a diverse range of complex pathologies and little or no pre- or postoperative planning. Through a team-based structure with attention to processes of care and information sharing, ACS services are well positioned to improve outcomes, while finding and developing efficiencies and reducing costs of surgical and emergency health care delivery. The ACS model also offers enhanced opportunities for surgical education for students, residents and practicing surgeons, and it will provide avenues to strengthen clinical and academic bonds between the community and academic surgical centres. In the near future, cooperation of ACS services from community and academic hospitals across the country will lead to the formation of systems of acute surgical care whose development will be informed by rigorous data collection and research and evidence-based quality-improvement initiatives. In an era of increasing subspecialization, ACS is a strong unifying force in general surgery and a platform for collective advocacy for an important patient population.

General surgical emergencies represent a major challenge to the Canadian health care system. They account for a substantial proportion of general surgical operations, and almost every general surgeon, regardless of subspecialty interest or geography, cares for them. Patients with acute general surgical conditions often present with complex problems, may deteriorate quickly and are prone to complications. The spectrum of these illnesses, which range from acute appendicitis and cholecystitis to intestinal obstruction, mesenteric ischemia, ascending cholangitis, necrotizing pancreatitis, diverticulitis and other forms of abdominal sepsis, requires the prompt and comprehensive efforts of well-trained surgeons, engaged multidisciplinary teams and streamlined health care systems. Advancing the care of these patients is a universal priority and will require new strategies for data collection and information sharing, implementation of standards of care, design of systems of care, education and advocacy for the dedication of resources to this cause.

In the arena of acute care, there is increasing evidence that such efforts can improve patient outcomes. The "golden hour" concept of trauma care (i.e., the belief that rapid intervention to minimize the duration of shock can reduce morbidity and mortality) has led to the development of trauma teams and trauma systems with unprecedented power to bring high-quality care to severely injured patients, measure outcomes and improve performance.[1] In severe sepsis and septic shock, recent studies on early goal-directed resuscitation,[2] prompt administration of broad-spectrum antibiotics[3] and aggressive source control[4] have shown that early and systematic care saves lives. Furthermore, the critical care literature has shown that attention to detail and evidence-based practice throughout the trajectory of illness also saves lives.[4] These findings in patients with hypovolemic and septic shock provide a strong rationale for readily available, intense and sustained care in patients with acute general surgical conditions.

The tremendous potential of these observations has created a broad renewal of interest in the care of acute general surgical patients in Canada. In the past decade, clinical service teams dedicated to the comprehensive care of acutely ill general surgical patients have flourished across the country, quadrupling their number in the last 3 years alone. As of 2009, there were at least 13 acute general surgical services in Canada (Table 1) with many more services at academic and community hospitals in the planning stages. These services have brought focused attention to a sometimes ignored and fragmented patient population and have opened up exciting opportunities to address some of the most pressing issues in health care today, including access to acute care, evidence-based practice, quality improvement and patient safety, comparative effectiveness and surgical education.

The CAGS Acute Care Surgery Summit

On Sept. 9, 2009, the Acute Surgery and Critical Care Committee of the Canadian Association of General Surgeons (CAGS) invited service chiefs from all known acute general surgery services across Canada for a full-day summit. The objective of this meeting was to define this newly emerging model of acute care surgery (ACS) service delivery and to discuss national approaches to optimizing clinical care on these services, maximizing their educational opportunities and defining priorities for multicentre research. The group endorsed the term "acute care surgery" as the best descriptor of this initiative in Canada and outlined a proposal for a national agenda to develop clinical service delivery, education and research on these services, while recognizing that each service would evolve uniquely in response to local needs and priorities.

Clinical service delivery and patient safety

General surgeons have traditionally been required to simultaneously balance emergency general surgery on-call duties with the usual demands of scheduled surgery and outpatient clinics. This model of clinical service delivery often results in conflict between the prompt care of unpredictable surgical emergencies and scheduled clinical work. These conflicting demands in turn may lead to the provision of suboptimal care of emergency surgical patients or delays in the completion of scheduled work. Furthermore, the scattered distribution of admitted acute surgical patients across numerous subspecialty general surgery services, each with their own primary clinical and academic interests, may obscure unique opportunities for improving care and ensuring patient safety, and it may marginalize the acute surgery population even further. In addition to potentially compromising patient care, conventional general surgical call models may be associated with high workloads, double booking of surgeon time, stress and surgeon fatigue.

Table 1. Hospitals in Canada with an acute care surgery service

City	Hospital	Service name	Year of implementation
Vancouver	Vancouver General	ACS Gold/Blue	2007
Edmonton	University of Alberta	ACES	2007
Edmonton	Royal Alexandra	—	2007
Calgary	Foothills Medical Centre	ACCESS	2004
Calgary	Rockyview General	ACCESS	2009
Winnipeg	Grace	—	2009
Winnipeg	Winnipeg Health Sciences	Gold	1999
Winnipeg	St. Boniface	—	2008
Toronto	Sunnybrook	ACCESS	2008
Toronto	St. Michael's	ACS	2008
Ottawa	Ottawa General	ACS	2008
Montreal	Montreal General	TACS	ongoing
Halifax	Queen Elizabeth II	Surgery E	2001

Processes of care

The implementation of ACS services in Canada has begun to change the traditional paradigm of care and has renewed interest in the optimization of the processes and outcomes of care in acute general surgery. Surgeons are beginning to dedicate protected time to emergency on-call work and to emphasize prompt response and more focused care. Many residency programs have dedicated resident teams to the care of ACS patients. Early results of these changes have been promising. An 18-month pre- and postimplementation study in Vancouver highlighted the magnitude and consistency of acute surgical work taking place and demonstrated reduced time to consult and reduced hospital length of stay for ACS patients.[5] In Winnipeg, a new ACS service at St. Boniface Hospital achieved similar results.[6] Interestingly, both studies identified the lack of timely operating room access as an important issue and a priority for future process evaluation. A study at 2 tertiary referral centres in Kingston found that patients with symptomatic gallstone disease awaiting scheduled care had a significantly increased risk for development of acute symptoms requiring emergency operation.[7] Similar studies examining patients waiting for elective cholecystectomy demonstrated increased use of the emergency department, increased operative time and complications, prolonged hospital stays, higher conversion rates to open cholecystectomy[8,9] and increased morbidity.[10] The development of dedicated ACS services with access to protected operating time, rapid access clinics and fast-track referrals would accommodate such patients, thus avoiding greater morbidity at far greater costs to the health care system.

At Sunnybrook Hospital in Toronto, a new ACS service chose a comprehensive approach to measuring processes of care and found significant limitations in existing administra-

tive data sources. Once strategies for rigorous measurement were implemented, Sunnybrook found that a dedicated ACS team and a modified triage and consult process shortened diagnostic time, consult time and time to definitive operative care for patients with pain in the right lower quadrant (Dr. Frederick Brenneman, 2009, personal communication).

Patient safety

Improvements in process, however, are just the beginning. Reducing morbidity and mortality for ACS patients is an even more fundamental priority. Although health care effectiveness has steadily improved as a whole over time, added complexity has also rendered systems more prone to errors. Acute care surgery patients often have complex comorbidities, but in contrast to scheduled surgical patients, they may not have the opportunity to benefit from ideal preoperative physiologic or medical optimization and thoughtful antecedent plans for postoperative rehabilitation. Their care may be further compromised by the triage of patients with equally high operative priorities and high turnover of busy nursing and surgical staff. These factors may make ACS patients uniquely vulnerable to medical error.

These risks were initially suggested by Brennan and colleagues,[10] who documented an adverse event rate of 3.7% in more than 30 000 randomly selected patients. Even more concerning was the fact that 27.6% of these events were caused by overt negligence. The 1999 Institute of Medicine report *To Err Is Human*[12] confirmed that medical mistakes are a leading cause of death. Surgical care was found to be responsible for 66% of all adverse events, with 54% of these deemed to have been preventable.[13] One source of preventable error lies in the realm of patient care handover between surgeons.[14] Unlike traditional surgical care models where handover was unnecessary because the patient's own surgeon was almost always available, today most systems of acute care service delivery, including ACS, rely on regular handovers and transfers of care to maintain sustained focus and perpetual action in rapidly evolving and complex clinical situations.

Enhancing patient safety in this context is a major opportunity and the main priority of the new ACS services. Three strategies have been outlined to measure and improve ACS processes and outcomes, and more are being developed. First, ACS services are designed and organized to improve access to high-quality surgical intervention for patients with time-dependent illnesses such as severe sepsis and septic shock. Acute care surgery services have the potential to advocate for universal standards for processes of care and patient safety, including surgeon response time, daytime access to emergency operating theatres and rigorous postoperative care through the establishment of multidisciplinary teams that may incorporate nurse practitioners or physician assistants. These services will promote standardization of care through the development, implementation and refinement of evidence-based clinical practice guidelines. Second, by consolidating the care of patients, ACS services are in a unique position to systematically define and address complications and opportunities to promote safe surgical care. There are 2 ongoing national research projects examining patient safety issues: a national audit of complications in ACS that will inform the development of patient safety indicators or audit filters and a national survey of patient handover practices that will outline current communication gaps and inform the development of services that promote collective responsibility in an increasingly diverse and complex therapeutic effort.[15] Until these studies are complete, many Canadian ACS services are independently examining ways to streamline communication, and many are using established methods of performance improvement such as ACS morbidity and mortality rounds and mortality reviews. Third, the ACS service chiefs also agreed to establish a national ACS registry, and a prototype is in the developmental stage. Once audit filters are established, this electronic database will provide the means to create and monitor ACS benchmarks of performance across Canada on an ongoing basis.

New opportunities for collaboration and growth

The recent development of organized, team-based approaches for the care of acutely ill surgical patients represents an important opportunity to embrace a common agenda and to create deep and productive links between community and academic general surgeons in Canada. Acute care surgery services will be able to provide support or referral services for regional centres and smaller communities. They can also serve as a template for the development of new ACS services in these centres, particularly those that have implemented distributed surgical education programs. In this way, the ACS concept could act as a lightning rod for community engagement with surgical trainees and, in doing so, improve quality of life for the general surgeons who currently work tirelessly in those communities.

SURGICAL EDUCATION

Acute care surgery has had important implications for the education of medical students, residents, fellows, staff surgeons and other members of the surgical team. Goals and objectives for junior and senior residents on ACS rotations and a comprehensive ACS curriculum were developed after an exhaustive review of the ACS literature and North American ACS service websites and a survey of ACS faculty. A series of podcasts on key ACS topics is also being developed to accompany the ACS curriculum. The ACS goals and objectives, curriculum and podcasts have been or will be submitted to and disseminated by the Residency

Education Committee of the Canadian Association of General Surgeons and will serve as the basis for new assessments of knowledge and decision making in ACS.

The curriculum and new ACS rotation have received favourable reviews, such as "This service is a wonderful opportunity to focus on acute general surgery in an environment where learning is as important as service."[16] Interestingly, ACS implementation had a favourable effect on subspecialty general surgical rotations as well, with a substantial increase in the ability of residents to attend clinics, scheduled surgical procedures and academic half days because of a reduction of call volumes on these services.[16]

So far, evaluations of surgical education on Canadian ACS services have relied on self-reported assessments of educational experience and some objective measures of participation.[15] A national study is now in the works to assess knowledge and decision-making skills in ACS. This study will establish a baseline for the future development of ACS. The creation of ACS services also allows us to track case mix and case logs in acute general surgery more effectively, which all participating sites are now doing.

Canadian ACS services are currently developing a national curriculum for an ACS fellowship. Although the details of the fellowship are still emerging, they are currently being developed in 3 Canadian centres, with the intention of preparing surgeons who are focused on clinical and academic excellence and leadership in ACS. The emergence of ACS as an area of specialized knowledge at the heart of general surgery also creates numerous opportunities for continuing medical education. Surgeons from across all general surgical subspecialties can use ACS as a platform to disseminate new and ACS-relevant findings throughout general surgery, and they can learn useful techniques and strategies in ACS from their colleagues. The response of Canadian general surgeons to the first Acute Care Surgery Symposium at the 2009 Canadian Surgical Forum highlighted the enthusiasm and need for sustained and rigorous continuing medical education opportunities in ACS. Moving forward, ACS will continue to provide links to evidence and connections between surgeons, and it will keep a diverse surgical workforce well equipped to handle the often complex and challenging problems of ACS.

Research

Canadian ACS services are in a strong position to begin to collect data about this newly unified patient population and to share it across boundaries as needed, drive evidence-based changes in surgical practice and generate hypotheses that will advance the field. Brenneman and colleagues at Sunnybrook Hospital and Segedi and colleagues[5] at Vancouver General Hospital have noted gaps and inaccuracies in the available administrative data sources (from the initial patient encounter to long-term follow-up) and have highlighted the need for new ACS services to collect their own data with relevance to ACS-specific issues.

To begin this process, Canadian ACS services have agreed to create a minimal data set and standard data definitions with the ultimate goal of establishing national benchmarks for processes and outcomes of care, similar to those defined for trauma surgery. The services also recognize the potential of information technology applications to integrate data collection into clinical workflow. Consultation reports, operative summaries, discharge summaries and clinic notes linked to an underlying database will ultimately allow real-time data collection and real-time monitoring of quality of care.

We hope that standardization and streamlining of data definitions and data collection processes will set the foundations for effective multicentre collaboration on clinical trials in the near future.

The future of general surgery

The Canadian ACS service chiefs who attended the ACS summit were in strong agreement about many issues, but perhaps none so strongly as the identification of ACS as a unifying factor in general surgery. It is anticipated that patients with acute surgical problems will benefit equally from the contributions of general and subspecialty surgeons, from both community and academic practices. Many also believe that finding a common voice to advocate for a previously fragmented patient population will increase access, improve care, promote work sustainability and reorganize existing patterns of service delivery and resource allocation for greater efficiency. Acute care surgery may provide a framework for general surgeons to work together to bring advances in techniques and strategy from all general surgical subspecialties back to our roots and to advance the care of a large proportion of our patients in the context of a unified national agenda.

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