

1
2
3 TITLE: Emergency general surgery in Ontario: inter-hospital variability in structures, processes,
4 and models of care.
5
6
7

8 AUTHORS:

9
10 Graham Skelhorne-Gross MD PhD¹

11 Rahima Nenshi MD MSc²

12 Angela Jerath MD MSc^{3,5}

13 David Gomez MD PhD^{1,4*}

14
15
16
17 *corresponding author
18
19

20
21 Please send all correspondence to Dr. David Gomez (gomezda@smh.ca)

22 St. Michael's Hospital

23 30 Bond Street

24 3-071 Donnelly Wing

25 Toronto, ON M5B 1W8 Canada

26 T: 416.864.6060 x 7143 F: 416.864.5965

27
28 Corresponding Authors Email Addresses: David Gomez (david.gomez@unityhealth.to)

29
30
31 Affiliations:

32 1. Department of Surgery, Division of General Surgery, University of Toronto, ON, Canada

33 2. Department of Surgery, Division of General Surgery, McMaster University, Hamilton, ON,
34 Canada

35 3. Department of Anesthesia and Pain Medicine, University of Toronto, ON, Canada

36 4. Li Ka Shing Knowledge Institute, St Michael's Hospital, Toronto, ON, Canada

37 5. ICES, 2075 Bayview Avenue, Toronto, Ontario M4N 3M5
38
39
40
41
42
43
44
45
46

47 Word Count: 2500 (max 2500)

48
49 Key Words: Emergency General Surgery, Health Care Models, Appendicitis, Biliary tract
50 disease
51
52
53
54
55
56
57

ABSTRACT

Background: Emergency general surgery (EGS) patients experience high rates of morbidity and mortality and require timely surgical evaluation and care. However, there is no consensus regarding the optimal model of care. Our aim was to characterize the structures and processes for the delivery of EGS. In addition, we evaluated whether the presence of EGS models of care is associated with the increased availability of EGS structures and processes, independent of hospital size.

Methods: 114 adult acute care hospitals in Ontario, Canada were provided with a survey designed to characterize EGS models of care and associated structures and processes. Responses were collected between August 2019 and July 2020.

Results: Response rate was 96% (n=109/114). A third (n=37, 34%) of hospitals have EGS models care. Thirty-four of these hospitals with EGS models are large (>100 bed) institutions which would be predicted to have increased resources. However, even when comparing between similarly-sized hospitals, those with EGS models had increased staffing [clinical associates (16% vs. 3%, p=0.03), nurse practitioners/physician assistants (32% vs 4%, p<0.01)], diagnostic/interventional equipment [24/7 CT access (89% vs 64%, p=.05), IR (84% vs 39%, p<0.01), endoscopy (95% vs 64%, p=0.02) and ERCP (74% vs 39%, p=0.02)], and dedicated operating room (OR) time (59% vs 0%).

Interpretation: The structures and processes relevant to the care of EGS patients are highly variable between hospitals. Even when controlling for hospital size and academic status, hospitals with EGS models of care are more likely to have these key resources.

INTRODUCTION

Emergency General Surgery (EGS) patients present with a variety of infectious, hemorrhagic, and obstructive diseases of the gastrointestinal tract and one in four needs urgent surgical, image-guided, and/or endoscopic procedures to obtain infection/hemorrhage control, and/or resolution of obstruction¹. EGS conditions are very common, the incidence exceeds that of newly diagnosed cancer and new-onset diabetes, and these conditions are responsible for 7.1% of hospital admissions. EGS patients experience high rates of morbidity and mortality, accounting for only 11% of general surgery operations but 28% of complications - including wound infections, pneumonia, and ileus - and 47% of deaths²⁻⁶.

There are multiple factors responsible for these poor outcomes. EGS patients tend to be medically complex, with one-third having greater than three chronic health problems⁷. Many patients with EGS diseases also present with acute physiological derangement (i.e., sepsis, dehydration) that may be inadequately optimized prior to infection/hemorrhage control, and/or resolution of obstruction given the time constraints to treat the underlying condition. High levels of chronic morbidity in the presence of acute illness can be life-threatening, and many patients require close monitoring and advanced therapies provided in intensive care units (ICU)⁷. Best practice pathways and dedicated multidisciplinary teams exist for other acute complex surgical patients such as trauma patients. However, care for EGS patients has not been standardized and often falls under the purview of the on-call general surgeon, who will have varied experience and access to hospital resources (i.e. operating room, ICU) based on location⁸.

EGS models of care were formally defined in the Canadian context by the Canadian Association of General Surgeons (CAGS) in 2009¹. The original aim was to provide “prompt, evidence-based and goal-directed care to acutely ill general surgical patients” by optimizing hospital structures

1
2
3 and processes of care and allowing for urgent general surgery evaluation/treatment¹. These
4 structures and processes may include staffing of EGS services, accessing aligned diagnostic and
5 interventional services (e.g., endoscopy, radiology), dedicated operating room time, access to
6 ICU for patients with severe physiologic derangements, and inter-hospital agreements to transfer
7 high risk patients.
8
9

10
11
12 In 2009, there were 13 Canadian hospitals with EGS models of care^{5,9}. In the decade since,
13 evidence has suggested that EGS models improve patient outcomes by decreasing post-operative
14 complications and mortality^{3,10-12}. EGS models of care have also been shown to decrease the
15 time to surgical review^{10,13}, increase the proportion of cases performed during daylight hours,
16 and decrease length of hospital stay^{14,15-20}. Collectively, this significantly decreases the cost of
17 managing EGS diseases²¹.
18
19

20
21
22 Despite these benefits, the structures and processes that comprise these models for the delivery
23 of EGS care are highly variable between institutions and have never been formally assessed in
24 Canada. In this study we characterize the structures and processes for the delivery of EGS care
25 across all hospitals that provide urgent surgical care in Ontario. In addition, we evaluate whether
26 the presence of EGS models of care is associated with the increased availability of EGS
27 structures and processes, independent of hospital size.
28
29

30 31 32 **METHODS**

33 34 35 *Study design*

36
37
38 Cross-sectional survey of leaders/directors of general surgery across all hospitals that provide
39 urgent surgical care in Ontario.
40
41

42 43 44 *Hospital and Survey Recipient Selection*

1
2
3 A complete list of Ontario's Hospitals was accessed from the Ministry of Health and Long-Term
4 Care (MOHLTC) website²² which classifies 151 hospitals in categories based on the type of care
5 provided as per Regulation 964. A (large >100 bed, academic hospitals), B (large >100 bed, non-
6 academic hospitals), and C (small <100 bed, non-academic hospitals) type hospitals were
7 considered for inclusion. Hospitals are further classified in categories D through V; however,
8 these facilities (psychiatric, rehabilitation, chronic and continuing care, etc....) do not provide
9 acute treatment to EGS patients.

10
11 We used official hospital websites and phone calls to administrative personnel to determine
12 whether each hospital offered urgent general surgery services (e.g. capacity to diagnose and
13 provide surgical management of acute appendicitis or cholecystitis). All Ontario hospitals that
14 offered urgent/emergent adult general surgery were included in the study.

15
16 We targeted individual recipients who possessed intimate knowledge of the structures and
17 processes of that hospital's surgical service. In order of highest to lowest preference we
18 contacted the chief of emergency general surgery, chief of general surgery, a general surgeon
19 who participated in the EGS call, chief of surgery, chief of staff, and finally, the director of
20 perioperative services.

21 22 *Questionnaire design*

23
24 The survey was designed to address five core components of EGS models of care based on a
25 review of the relevant literature^{19,21,26,31-35}: i) organizational structure and staffing; ii) operating
26 room availability; iii) interventional radiology and interventional endoscopy availability; iv) ICU
27 availability and staffing; and v) regional participation. Questions were multiple-choice, with the
28 option of free text answers, to provide context if required. A draft survey was pilot-tested on two
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 EGS surgeons, who were not potential respondents, prior to implementation. The survey was
4
5 modified based on feedback.
6
7

8 *Survey implementation*

9

10
11 A hybrid approach was utilized with the survey sent out in 4 rounds. All participants were
12
13 initially contacted via email for the first round of the survey. A cover letter outlining the
14
15 objectives of the survey, time commitment, and an opportunity to opt out accompanied the first-
16
17 round email. Reminder emails were sent out after three and seven weeks as per the Dillman total
18
19 design survey methodology³². Given that the aim was to have a near 100% response rate, the
20
21 fourth and last round consisted of phone interviews.
22
23

24 *Statistical Analysis*

25

26
27 Survey answers were compiled on a survey response platform. Some questions were left blank
28
29 by some respondents. To ensure common denominators for accurate comparisons between
30
31 subgroups, these blank questions were counted as “No” responses. All respondents were
32
33 analyzed together, and then, hospitals were stratified by academic status, presence of EGS
34
35 models of care, and bed size. Categorical variables are described using frequency (proportion)
36
37 and analyzed using Chi-squared test. Continuous variables are summarized using median and
38
39 inter-quartile range and analyzed with student’s t-test. Survey data was compiled and analyzed
40
41 using GraphPad Prism 8.3.0 software. A p-value < 0.05 was considered statistically significant.
42
43
44
45
46

47 *Ethics Approval*

48

49
50 The study was reviewed and approved by the research ethics board at St Michaels Hospital.
51
52

53 **RESULTS**

54
55
56
57

Hospitals Surveyed

Each of the 151 Ontario hospitals identified by the MOHLTC as types A, B, and C was contacted. We excluded 37 hospitals as 33 provided no adult urgent/emergency general surgery services, 1 hospital provided pediatric only services, and 3 hospitals had amalgamated and no longer existed as stand-alone institutions. The remaining 114 hospitals received the survey and 109 (96%) responded after 4 rounds (Figure 1).

Organizational Structure and Staffing

One third (n=37, 34%) of hospitals have EGS models of care. EGS models of care are most common among large (>100 bed) academic hospitals (n=15/18, 83%) followed by large non-academic hospitals (n=19/47, 40%) and are uncommon in small (<100 bed) non-academic hospitals (n=3/44, 7%). Two hospitals adopted EGS models of care in the 1980s, but all other institutions that reported the date that their hospital adopted an EGS model of care commenced after 2007 with 12/37 (38%) programs initiated within the last 5-years (Figure 2).

All general surgeons participate in the on-call schedule at only 38% (n=41) of Ontario's hospitals. Academic institutions are equally likely to have all surgeons take part in the on-call as non-academic hospitals (n=6, 33% vs. n=35, 38%, p=0.68). Sixty-two percent (n=25) of hospitals with EGS models of care have all surgeons participating in the on-call schedule versus 25% (n=18) of hospitals that do not have EGS models (p< 0.01). Among hospitals with EGS models, 85% (n=29) report that more than 75% of surgeons participate in the on-call schedule. In hospitals without EGS models, only 38% (n=27) have more than 75% of surgeons participating in the on-call schedule, p<0.01. There was no difference between hospitals with and without EGS models in the likelihood of staff surgeons having additional clinical responsibilities while

1
2
3 on-call, such as clinic or performing elective surgical or endoscopic procedures (32% vs 28%,
4
5 p=0.61).
6

7
8 Hospitals with EGS models of care are more likely to have clinical associates (16% vs. 3%,
9
10 p=0.03), residents/fellows (70% vs 14%, p<0.01), and nurse practitioners (NPs)/physician
11
12 assistants (PAs) (32% vs 4%, p<0.01). Among large academic hospitals, clinical associates,
13
14 residents, fellows, NP/PAs are exclusively seen at hospitals with EGS models of care. 38% of
15
16 hospitals with EGS models have dedicated outpatient EGS clinics, compared to 1.4% of
17
18 hospitals without this care model (p<0.01), (Table 1).
19
20
21

22 23 *Operating Room Availability*

24
25
26 Access to the operating room (OR) at any time of day is available at 72% (n=79) of hospitals and
27
28 is more common in hospitals with EGS models of care (92% n=34 vs. 61% n=44, p<0.01). Only
29
30 21% (n=22) of hospitals provide dedicated OR time for EGS patients, all of which have adopted
31
32 EGS models of care. Academic institutions (n=9, 50%) are more likely than non-academic
33
34 hospitals (n=13, 15%, p < 0.01) to grant this dedicated time. 35% (n=22) of large hospitals have
35
36 dedicated OR time while none of the small hospitals do (p < 0.01). 18 respondents (8 academic,
37
38 10 non-academic) provided the exact number of OR hours allotted to EGS each week. There was
39
40 a trend towards increased time at academic hospitals (median 19.25h, IQR 9.8-28.7h) compared
41
42 to non-academic hospitals (median 13.5h, IQR 9.5-17.5h p=0.07) (Figure 3).
43
44
45

46 47 *Interventional radiology and interventional endoscopy availability*

48
49
50 As expected, hospital size and academic status correlates with access to CT scanners,
51
52 interventional radiology (IR), endoscopy, and endoscopic retrograde cholangiopancreatography
53
54 (ERCP) (Table 1). However, hospitals with EGS models of care have more access to these
55
56
57

1
2
3 resources, even when comparing between hospitals with similar size and academic status.
4
5 Among large academic and large non-academic hospitals, those with EGS models have more
6
7 access to CT scanners, IR, endoscopy, and ERCP; however, there was no difference among small
8
9 non-academic hospitals between those with and without EGS models of care (Table 1).
10
11

12 13 *ICU availability and staffing*

14
15
16 As expected, large hospitals have greater critical care resources such as ICUs, step down units,
17
18 and critical care outreach teams compared to small hospitals. ICU resources did not differ
19
20 between hospitals with and without EGS models of care at large academic and non-academic
21
22 hospitals. Among small, non-academic hospitals, those with EGS models of care (n=2, 67% vs
23
24 n=7 (17%), p=0.04) were more likely to have ICU step-down units, but the presence of outreach
25
26 teams did not vary (Table 1).
27
28

29 30 *Regional participation*

31
32
33 Over 50% of Ontario hospitals have formal agreements allowing them to transfer patients to
34
35 higher levels of care (54%) and accept transfers of EGS patients (52%). As expected, smaller
36
37 hospitals (75%) are more likely to have transfer agreements for EGS patients than large hospitals
38
39 (37%, p<0.01). Among hospitals with EGS models of care, 30% (n=11) have formal agreements
40
41 to transfer EGS patients out compared to 65% (n=47) of hospitals without this model (p<0.01).
42
43 Similarly, 86% (n=32) of hospitals with EGS models have formal agreements to accept transfer
44
45 of care for EGS patients while only 42% (n=30) hospitals without EGS models have these
46
47 agreements in place (p<0.01) (Table 1).
48
49
50

51 52 **INTERPRETATION**

1
2
3 Our study is the first to characterize the structures and processes available to care for patients
4 with EGS conditions across Ontario. A third of hospitals have adopted EGS models of care, with
5 nearly half being established within the last five years. The benefits of EGS models of care to
6 patients is emerging in the literature. Several studies have demonstrated significant reduction in
7 morbidity and mortality^{3,10-13,23} as well as improvements in wait-times, hospital length of stay,
8 and cost^{10,14-16,24}. Given the complexity of EGS patients and presentations, ideal management
9 involves a multidisciplinary approach, led by the surgeon, with inclusion of emergency
10 physicians, anesthesiologists, intensivists, radiologists, gastroenterologists, nurses,
11 occupational/physical therapists, and social workers, as indicated. Further, specific hospital
12 structures and processes of care are needed to ensure expedient access to the operating room and
13 endoscopy/IR suite. As expected, EGS models of care are more common among large academic
14 institutions which have significantly more access to dedicated personnel (clinical associates,
15 nurse practitioners/physician assistants, residents), dedicated operating room time, diagnostic and
16 therapeutic adjuncts (CT, IR, endoscopy, ERCP), as well as critical care resources (ICUs and
17 outreach teams). However, when comparing among large academic or non-academic hospitals,
18 those with EGS models of care were more likely to have implemented key structures and
19 processes.

20
21
22 The trauma patient population, another high-risk group requiring timely care and a
23 multidisciplinary approach, is a natural comparator for EGS patients. Trauma care has undergone
24 decades of rigorous research, protocol standardization, and regionalization at the pre-hospital and
25 hospital levels²⁵⁻²⁷. In contrast, the delivery of EGS care has been mostly ad hoc. Where an EGS
26 patient receives care is based on geographic proximity to a hospital, and not on patient or disease
27 factors, or the closest hospital's capabilities. There is no province-wide EGS system or

1
2
3 standardized triage or transfer guidelines. Our study indicates that Ontario hospitals that provide
4 care to EGS patients do so in very different ways, as is the case in other geographic
5 locations^{8,21,28-30}. High variability in access to key hospital structures and processes required for
6 the care of EGS patients may lead to variability in morbidity and mortality outcomes.
7
8
9

10
11
12
13 This ad hoc system of EGS care in Ontario is concerning given that, as in other surgical
14 disciplines, there is a volume-outcome relationship in EGS care^{31,32}. Risk-adjusted mortality
15 decreases as volume increases for each of the ten most common surgical procedures performed
16 on EGS patients³⁴. It has been postulated that there is an institutional minimum annual volume of
17 EGS cases below which mortality increases³⁵. These discrepancies in outcomes may be
18 especially pronounced among elderly EGS patients who face an 86% higher risk of death when
19 treated by low-volume surgeons³⁶. Given the lack of availability of key structures and processes
20 of care across a subset of hospitals, as well as the described volume-outcome relationships, some
21 hospitals may best serve a subset of EGS patients that exceed their local capabilities with robust
22 transfer agreements. A regional approach will enable these complex EGS patients to receive
23 timely access to resources at designated regional institutions. Given the parallels between trauma
24 care and the care of EGS patients, a similar health system transformation has the potential to
25 have a major impact on patient outcomes.
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

44 *Limitations*

45
46
47 We designed our survey to investigate the critical aspects of EGS care that others have identified
48 and, in our experience, affect the care of EGS patients. There are likely other important
49 differences between EGS services that play a role in EGS patient outcomes. Further, this study
50 relies on information gathered from single individuals at each institution. We made a substantial
51
52
53
54
55
56
57
58
59
60

effort to identify these people based on their knowledge of their hospital's EGS program, but it is possible that some respondents were not certain of all answers. The survey took place over nearly one year and some hospitals may have adjusted their EGS care models in that time.

Conclusions

The structures and processes relevant to the care of EGS patients are highly variable between hospitals. After controlling for hospital size and academic status, hospitals with EGS models of care are more likely to have access to many important EGS resources, such as personnel, dedicated OR time, and diagnostic and therapeutic adjuncts.

REFERENCES

1. Hameed, S. et. al. General surgery 2.0: the emergence of acute care surgery in Canada. *Can J Surg.* 2010;53(2):79-83.
2. Havens, J. The excess morbidity and mortality of emergency general surgery. *J Trauma Acute Care Surg.* 2015;78:306-311.
3. To, K. et al. Acute Care Surgery Model and Outcomes in Emergency General Surgery. *J Am Coll Surg.* 2019;228(1):21-28.
4. Polk, H., et. al. A proposal for enhancing the general surgical workforce and access to surgical care. *Ann Surg.* 2012;55:611e617.
5. Ball, C. et. Al. Acute care surgery: a new strategy for the general surgery patients left behind. *Can J Surg.* 2010;3:84-5.
6. Becher, R. et. al. A critical assessment of outcomes in emergency versus nonemergency general surgery using the American College of Surgeons National Surgical Quality Improvement Program Database. *Am Surg.* 2011;7(7): 951-9.
7. DeGirolamo, K. et. al. A day in the life of emergency general surgery in Canada: a multicentre observational study. *Can J Surg.* 2018;61(4);237-243.
8. Santry, H. et. al. Variations in the implementation of acute care surgery: Results of a national survey of university-affiliated hospitals. *J Trauma Acute Care Surg.* 2014;78(7).60–69.
9. Shafi, S. el. al. Emergency general surgery: definition and estimated burden of disease. *J Trauma Acute Care Surg.* 2013;74(4):1092-1097.
10. Cubas, R. et. al. Outcomes in the management of appendicitis and cholecystitis in the setting of a new acute care surgery service model: impact on timing and cost. *J Am Coll Surg.* 2012;215:715–721.
11. Gandy, R. et. al. Outcomes of appendectomy in an acute care surgery model. *Med J Aust.* 2010;193:281–284.

12. Lau, B. and DiFronzo, L. An acute care surgery model improves timeliness of care and reduces hospital stay for patients with acute cholecystitis. *Am Surg.* 2011;77:1318–1321.
13. Lehane, C., et. al. Does an acute care surgical model improve the management and outcome of acute cholecystitis? *ANZ J Surg.* 2010;80:438–442.
14. Pepingco, L., et. al. The acute surgical unit as a novel model of care for patients presenting with acute cholecystitis. *Med J Aust.* 2012;196:509–510.
15. Ogola, G. et. al. Hospitals with higher volumes of emergency general surgery patients achieve lower mortality rates: a case for establishing designated centers for emergency general surgery. *J Trauma Acute Care Surg.* 2017;82(3):497-504.
16. Sorelli, P. et. al. The dedicated emergency surgeon: towards consultant-based acute surgical admissions. *Ann R Coll Surg Eng.* 2008;90:104–108.
17. Suen, K. et. al. Effect of the introduction of an emergency general surgery service on outcomes from appendectomy. *Br J Surg.* 2014;10:141–146.
18. Anantha, R. et. al. Implementation of an acute care emergency surgical service: a cost analysis from the surgeons' perspective. *Can J Surg.* 2014;57:9–14.
19. Britt, R. et. al. Initial implementation of an acute care surgery model: implications for timeliness of care. *J Am Coll Surg.* 2009;209(4):421Y424.
20. Khalil, M. et. al. Certified acute care surgery programs improve outcomes in patients undergoing emergency surgery: A nationwide analysis. *J Trauma Acute Care Surg.* 2015;79:1,60–64.
21. Schuster, K., et. al. Can acute care surgeons perform emergency colorectal procedures with good outcomes? *J Trauma.* 2011;71:94–101.
22. Ontario Ministry of Health and Long-Term Care. Hospital Locations and Classifications. <website accessed: August 2019>.
23. Diaz, J. et. al. Triaging to a regional acute care surgery center: distance is critical. *J Trauma.* 2011;70:116–119.
24. Ogola, G. et. al. The financial burden of emergency general surgery: national estimates 2010 to 2060. *J Trauma Acute Care Surg.* 2015;79:444–448.
25. Nathens, A, et. al. The effect of organized systems of trauma care on motor vehicle crash mortality. *JAMA.* 2000;283(15):1990-1994.
26. Utter, G, et. al. Inclusive trauma systems: do they improve triage or outcomes of the severely injured? *J Trauma.* 2006;60(3):529-35.
27. Gomez, D. Temporal trends and differences in mortality at trauma centres across Ontario from 2005 to 2011: a retrospective cohort study. *CMAJ Open.* 2014;2(3):E176-82.
28. Committee to Develop the Reorganized Specialty of Trauma, Surgical Critical Care, and Emergency Surgery. Acute care surgery: trauma, critical care, and emergency surgery. *J Trauma.* 2005;58(3):614-616.
29. Daniel, V. Variation in the delivery of emergency general surgery care in the era of acute care surgery. *The Joint Commission Journal on Quality and Patient Safety.* 2019;45: 14-23.
30. Pottenger, B. et. al. The modern acute care surgeon: characterization of an evolving surgical niche. *J Trauma Acute Care Surgery.* 2015;78:120-125.
31. Chana, et. al. A systematic review of the impact of dedicated emergency surgical services on patient outcomes. *Annals of Surgery.* 2016;263 (1) 20-27.
32. Hoddinott, S., and Bass, M. The dillman total design survey method. *Can Fam Physician.* Nov1986;32:2366-8.

- 1
2
3 33. Begg, C. et. al. Impact of hospital volume on operative mortality for major cancer
4 surgery. JAMA. 1998;280(20):1747–1751
5
6 34. Becher, R. et. al. Hospital Volume and Operative Mortality for General Surgery
7 Operations Performed Emergently in Adults. Ann Surg. 2020;272(2):288-303.
8
9 35. Ogola GO, Haider A, Shafi S. Hospitals with higher volumes of emergency general
10 surgery patients achieve lower mortality rates: A case for establishing designated centers
11 for emergency general surgery. J Trauma Acute Care Surg. 2017;82(3):497-504.
12
13 36. Mehta, A. et. al. Emergency general surgery in geriatric patients: A statewide analysis of
14 surgeon and hospital volume with outcomes. J Trauma Acute Care Surg. 2018;84(6):864-
15 875.
16
17
18
19

20 FIGURE LEGENDS

21
22 Figure 1. Study enrollment. 151 Ontario hospitals were identified from the MOHLTC website
23 and all were contacted. 33 hospitals do not offer urgent/emergent general surgery and were
24 excluded. One hospital was a children’s hospital and three hospitals had amalgamed with others.
25 These four hospitals were also excluded. Thus, there are 114 Ontario hospitals that offer
26 urgent/emergent adult general surgery. These hospitals were provided with the survey and
27 responses were received from 109 hospitals.
28
29
30
31
32
33
34

35
36 Figure 2. Date of EGS Establishment. Newly established EGS programs (black) are counted and
37 plotted as bars based on time period. The cumulative total (white) number of Ontario hospitals
38 with EGS programs is also shown for each time-period.
39
40
41

42
43 Table 1. Comparison of EGS (n=37) and non-EGS (n=72) hospitals divided into A (large
44 academic), B (large non-academic) and C (small non-academic) categories. Study results for
45 organizational structure/staffing, operating room, hospital resources, intensive care unit and
46 transfers. Statistical analysis is presented, $p < 0.05$ is considered significant.
47
48
49
50

51
52 Figure 3. Dedicated EGS OR time. Academic hospitals provide an average of 22.4 hours/week
53 while non-academic hospitals provide an average of 15.6 hours/week.
54
55
56
57

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Confidential

APPENDIX 1.

EMERGENCY GENERAL SURGERY IN ONTARIO

Thank you for your participation in our study "Emergency General Surgery in Ontario" conducted by principal investigator Dr. David Gomez.

Contact: Dr. David Gomez (gomezda@smh.ca)

REB: 19-087

This survey should take 5 minutes to complete.

Completion of this survey will have no impact on you personally or professionally. You make skip questions that you are unable, or wish not, to answer. Your information will not be collected unless you submit your survey. However, information submitted cannot be withdrawn to ensure the integrity of the study. Please feel free to keep the cover letter for your records. There will be no compensation for completion of this study.

The results of the study will be published upon study completion.

By completing this survey you are agreeing to the following: As Survey Monkey's servers are located in the United States, they are subject to the conditions of the PATRIOT ACT. As such, we cannot guarantee that these files will not be accessed by others. However, no information that personally identifies you will be collected in this survey. Consent to the study is implied by completion and submission of the survey.

1. Unique Institution Number:

Organizational Structure and Staffing

2. Do you have an established emergency general surgery (EGS) model of care or equivalent?

An EGS model of care is defined as an organizational structure that provides protected time for surgeons to focus on the care of patients with surgical emergencies as well specific structures and processes designed to improve the care of patients with general surgical emergencies.

3. If yes, in what year did you establish your EGS service?
4. Do all general surgeons in your institutions participate in the EGS service?

- 1
- 2
- 3 5. If no, what proportion of surgeons participate in the EGS service? (<25%, 25-50%, 50-
- 4 75%, >75%)
- 5
- 6
- 7 6. Do EGS surgeons typically have other clinical responsibilities (clinic, elective ORs,
- 8 teaching, etc.) during the time that they are on call for EGS?
- 9
- 10
- 11 7. Does the EGS surgeon on call also cover trauma?
- 12
- 13 8. Do you have an EGS clinical associate or fellow?
- 14
- 15
- 16 9. Do residents or other surgical trainees participate in the care of EGS patients?
- 17
- 18 10. Do you have dedicated nurse practitioners or physician assistants assigned specifically to
- 19 your EGS service?
- 20
- 21
- 22 11. Do you have an EGS specific outpatient clinic?
- 23
- 24
- 25

Operating Room Availability

- 26
- 27 12. Is the operating room available 24 hours/day at your institution?
- 28
- 29
- 30 13. Do you have dedicated operating room time which is exclusive for your EGS patients?
- 31
- 32 14. If so, please provide details on number of dedicated OR hours per day and total dedicated
- 33 OR hours per week.
- 34
- 35
- 36 15. If so, what year was the dedicated OR time established?
- 37
- 38
- 39 16. Does your institution have the capability to provide emergency general surgical care to
- 40 patients with an ASA score equal or greater than 3?
- 41
- 42

Resources

- 43
- 44
- 45 17. Does your institution have an emergency department that is open 24/7?
- 46
- 47 18. If no, what are the emergency department hours?
- 48
- 49
- 50 19. Does your institution have access to a CT scanner 24/7?
- 51
- 52 20. If no, when do you have access?
- 53
- 54
- 55 21. Does your institution have emergent/urgent interventional radiology capabilities?
- 56
- 57

1
2
3
4 22. If yes, what days/hours do you have access?
5

6
7 23. Does your institution have emergent/urgent interventional endoscopy capabilities?
8

9 Interventional endoscopy is defined as upper or lower endoscopy performed to control upper or
10 lower gastrointestinal bleeding and/or relieve gastrointestinal obstruction.
11

12 24. If yes, during what days/hours do you have this access?
13

14 25. Does your institution have Endoscopic Retrograde Cholangio-Pancreatography (ERCP)
15 capabilities?
16

17
18 26. If yes, during what days/hours do you have access?
19
20

21
22 Intensive Care Unit
23

24 27. Does your hospital have an intensive care unit (ICU)?
25

26 28. Does your hospital have a step-down unit?
27

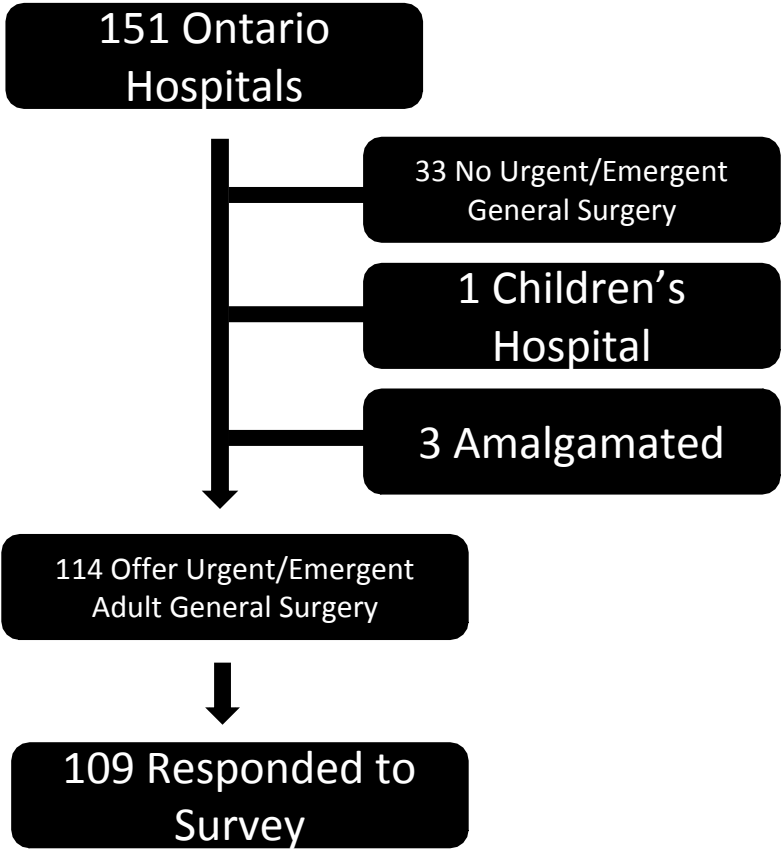
28
29 29. Does the ICU have an outreach team to assist with management of ward emergencies?
30
31

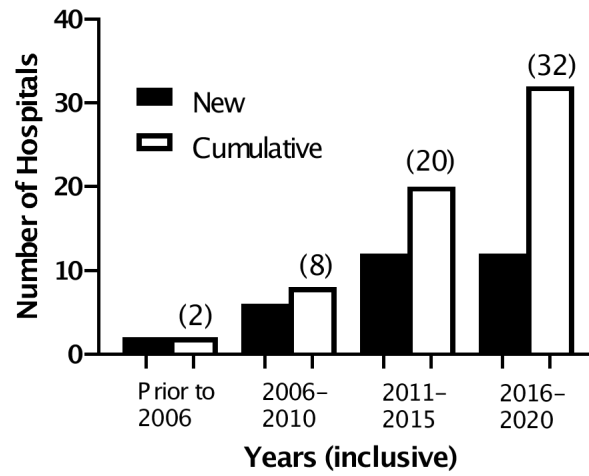
32
33 Interfacility Transfer Agreements
34

35 30. Does your institution have an agreement to transfer EGS patients to other hospitals?
36

37 31. Does your institution accept EGS transfers from other hospitals?
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41





1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41

	Large Academic (n=18)			Large Non-Academic (n=47)			Small Non-Academic (n=44)		
	EGS (n=15)	Non-EGS (n=3)	p-value	EGS (n=19)	Non-EGS (n=28)	p-value	EGS (n=3)	Non-EGS (n=41)	p-value
Organizational Structure/Staffing									
All Surgeons in On-Call Schedule	6 (40%)	0 (0%)	.18	14 (74%)	11 (39%)	.02	3 (100%)	7 (17%)	< 0.01
Other Clinical Responsibilities	5 (33%)	0 (0%)	.24	5 (26%)	11 (39%)	.36	2 (67%)	9 (22%)	.08
Clinical Associate	4 (27%)	0 (0%)	.31	2 (11%)	2 (7%)	.68	0 (0%)	0 (0%)	NA
Residents/Fellows	15 (100%)	0 (0%)	< 0.01	11 (58%)	9 (32%)	.08	0 (0%)	1 (2%)	.78
NP/PA	8 (53%)	0 (0%)	.09	4 (21%)	3 (11%)	.32	0 (0%)	0 (0%)	NA
Outpatient Clinic	8 (53%)	0 (0%)	.09	6 (32%)	0 (0%)	< 0.01	0 (0%)	1 (2%)	.78
Operating Room									
OR 24/7	14 (93%)	2 (67%)	.18	18 (95%)	22 (79%)	.12	2 (67%)	20 (49%)	.55
Dedicated OR Time	9 (60%)	0 (0%)	.06	13 (68%)	0 (0%)	< 0.01	0 (0%)	0 (0%)	NA
ASA≥3	15 (100%)	2 (67%)	.02	17 (89%)	22 (79%)	.32	2 (67%)	12 (29%)	.18
Hospital Resources									
ED 24/7	15 (100%)	3 (100%)	NA	18 (95%)	25 (89%)	.51	3 (100%)	34 (83%)	.44
CT 24/7	15 (100%)	2 (67%)	.02	17 (89%)	18 (64%)	.05	2 (67%)	11 (27%)	.14
Interventional Radiology	15 (100%)	1 (33%)	< 0.01	16 (84%)	11 (39%)	< 0.01	0 (0%)	5 (12%)	.52
Endoscopy	15 (100%)	2 (67%)	.02	18 (95%)	18 (64%)	0.02	2 (67%)	17 (41%)	.39
ERCP	15 (100%)	0 (0%)	< 0.01	14 (74%)	11 (39%)	0.02	1 (33%)	3 (7%)	.13
Intensive Care Unit									
ICU	15 (100%)	3 (100%)	NA	17 (89%)	22 (79%)	.32	1 (33%)	17 (41%)	.78
ICU Step-Down	9 (60%)	2 (67%)	.82	8 (42%)	8 (29%)	.34	2 (67%)	7 (17%)	.04
ICU Outreach Team	15 (100%)	3 (100%)	NA	16 (84%)	19 (68%)	.21	1 (33%)	11 (27%)	.81
Transfer Agreements									
Transfers to Receiving Hospital	2 (13%)	1 (33%)	.40	7 (37%)	15 (54%)	.26	2 (67%)	32 (78%)	.65
Accept Transfers	15 (100%)	1 (33%)	< 0.01	16 (84%)	17 (61%)	.08	1 (33%)	12 (29%)	.88

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41

