Published in final edited form as:

J Surg Res. 2015 August ; 197(2): 354–362. doi:10.1016/j.jss.2015.03.046.

Innovation or rebranding, acute care surgery diffusion will continue

Courtney E. Collins, MD^a, Patricia L. Pringle, MD^b, and Heena P. Santry, MD, MS, FACS^{a,*}

Courtney E. Collins: Courtney.Collins@umassmemorial.org; Patricia L. Pringle: patricia.pringle@umassmed.edu; Heena P. Santry: Heena.Santry@umassmemorial.org

^aDepartment of Surgery, University of Massachusetts Medical School, 55 Lake Avenue North, Worcester, MA 01655, USA

^bDepartment of Medicine, Massachusetts General Hospital, 55 Fruit Street, Boston, MA 02114, USA

Abstract

Background—Patterns of adoption of acute care surgery (ACS) as a strategy for emergency general surgery (EGS) care are unknown.

Methods—We conducted a qualitative study comprising face-to-face interviews with senior surgeons responsible for ACS at 18 teaching hospitals chosen to ensure diversity of opinions and practice environment (three practice types [community, public/charity, university] in each of six geographic regions [Mid-Atlantic, Midwest, New England, Northeast, South, West]). Interviews were recorded, transcribed, and analyzed using NVivo (QSR International, Melbourne, Australia). We applied the methods of investigator triangulation using an inductive approach to develop a final taxonomy of codes organized by themes related to respondents' views on the future of ACS as a strategy for EGS. We applied our findings to a conceptual model on diffusion of innovation.

Results—We found a paradox between ACS viewed as a healthcare delivery innovation *versus* a rebranding of comprehensive general surgery. Optimism for the future of ACS due to increased desirability for trauma/critical care careers and improved outcomes for EGS was tempered by fear over lack of continuity, poor institutional resources and uncertainty regarding financial viability. Our analysis suggests that the implementation of ACS, whether a true healthcare delivery innovation or an innovative rebranding, fits into the Rogers' Diffusion of Innovation Theory.

© 2015 Published by Elsevier Inc.

*Corresponding author: Department of Surgery, Room S3-731, 55 Lake Avenue North, Worcester, MA 01655, USA. Tel.: +1 508 856 1168; fax: +1 508 856 4224. Heena.Santry@umassmemorial.org (H. Santry).

note: Dr. Pringle's contributions to this research were made while she was a medical student at the University of Massachusetts

Author contributions

Study conception and design: Santry; acquisition of data: Santry; analysis and interpretation of data: Collins, Pringle, Santry; statistical analysis: Collins, Pringle, Santry; drafting of manuscript: Collins; critical revision: Pringle, Santry.

Disclosure

Heena P. Santry receives partial salary support from a grant from the National Institute of Health (UL1RR031982, 1KL2RR031981-01 (02), 8KL2TR000160-03).

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Conclusions—Despite concerns over resource allocation and the definition of the specialty, from the perspective of senior surgeons deeply entrenched in executing this care-delivery model, ACS represents the new face of general surgery that will likely continue to diffuse from these early adopters.

Keywords

Surgery; resource allocation; acute care surgery; healthcare delivery; healthcare innovation; diffusion of innovation

1. Introduction

In 2003, the Institute of Medicine stated that the nation's hospitals were at breaking point due to emergency department (ED) over-crowding and lack of specialists, surgeons included, for emergency care [1]. Acute care surgery (ACS) was envisioned soon after, to bring together the resources of modern trauma centers with the most qualified surgeons to care for patients with injuries and nontrauma surgical emergencies (NTSEs). Reorganization of the specialty of trauma/critical care into ACS was intended to increase access to care for patients with NTSEs while increasing the attractiveness of careers in trauma and general surgery, which had seen dramatic drops in resident interest [2–6]. Since the first white paper endorsing ACS appeared in 2005 [7], many hospitals have adopted it. Reports from these hospitals suggest that ~70% of patients with NTSEs require an operation, often during the night [8,9]. Nearly one-third of these patients have complex diseases/physiology requiring critical care [9–11]. Centers that have implemented ACS have reported improved outcomes (e.g. shorter lengths of stay and time to the operating room) [11–16]. Despite these promising reports, ~30% of hospitals still report difficulty providing 24/7 emergency general surgery (EGS) coverage, with 7% reporting no EGS coverage [17,18].

As with all new specialties, the role and sustainability of ACS in the landscape of surgery is uncertain. We undertook this qualitative study to better understand the benefits and drawbacks of ACS and to determine what senior surgeons see for the future of this new specialty. We apply our findings to a conceptual model on the Rogers' Diffusion of Innovation Theory [19–21].

2. Materials and methods

This was a qualitative study consisting of semi-structured face-to-face interviews with senior surgeons working at hospitals that had implemented ACS. Details of our study design and analytic methods have been described elsewhere [22]. In brief, a purposive sampling method was used such that three practice types (community, public/charity, university) would be studied in six geographic regions (Mid-Atlantic, Midwest, New England, Northeast, South, West) to ensure diversity of opinion across 18 face-to-face interviews. Interview questions addressed a range of topics concerning the origins, structures, processes, and future of ACS (see Supplementary data). Interviews were recorded using audio, transcribed, then analyzed with investigator triangulation using an inductive approach with NVivo 10.0 (QSR International, Melbourne, Australia). The analyses resulted in a final taxonomy of codes organized by themes. This study was deemed exempt by the University of Massachusetts

Institutional Review Board and agreement on a date/time of an in-person interview was accepted in lieu of written consent. The results presented here focus on themes (presented in *italics*) that emerged in our analyses related to the future and sustainability of ACS.

3. Results

3.1. Respondents

Of 18 respondents, there were 14 current section/division chiefs for trauma surgery and/or EGS, two department chairs, and two senior surgeons. All represented teaching hospitals; 17 represented level 1 trauma centers. Interviews took 19–84 minutes.

3.2. The origins of acute care surgery

Respondents reported that ACS had existed in some form prior to its formalization by leaders representing the American Association for the Surgery of Trauma (AAST) and the Eastern Association for the Surgery of Trauma [7]. Most (16/18) felt that creation of ACS was partially driven by the need to *revitalize the field of trauma*, stating ACS addressed “threats to trauma surgery”, which was becoming “more nonoperative” in a “declining trauma era”. Eleven mentioned improving operative volume, citing “an opportunity to do more surgery” and “keep their skills up” as primary reasons for adopting ACS. However, six saw ACS as a *rebranding of general surgery*, stating “it’s the new moniker” for “what the general surgeon used to do” or referring to when “they decided to name it [general surgery] something...” “...for marketing purposes”. Another force behind the inception of ACS was the need to provide care for *general surgery patients left behind* (6/18), and one respondent said, “we recognize that the surgical patient has been abandoned in the emergency department”.

When asked when their institution officially adopted ACS, 10 respondents felt that ACS was the *new face of an old practice*. Two respondents said that they had been doing ACS for 30–40 and 27 years, respectively. Five respondents said that they were practicing ACS even before the nomenclature was formalized in 2005, stating, “I am doing what I’ve always done” or “we’ve done this forever”. Six respondents reported that they had “started calling it ACS” even prior to 2005, while 12 reported 8 years since formal adoption of ACS.

3.3. The future of acute care surgery

Most respondents (12/18) were *optimistic* (Table 1), stating that ACS “definitely” had a sound future, using terms like “flourish,” “thrive”, and “grow”. However, there was some *uncertainty*, with three respondents stating that the ACS model had “some issues to work out” but would likely do well, while another three were “not sure”, saying that the future of ACS was “unclear”.

Reasons for optimism regarding the future of ACS fell into three predominant themes (Table 2). ACS provides *better care for emergency surgery patients* (17/18), attributable to their experience with clinical urgency (12/18), critical care expertise (12/18), 24/7 “in-house” presence (6/18), experience with damage control (2/18), and resources already available to trauma centers (2/18). ACS provides *lifestyle benefits* (15/18), both for acute care surgeons

(11/18) – who would have predictable schedules – and elective surgeons (15/18) – who would be freed from the burden of unplanned surgical cases. However, five respondents expressed concern that the lifestyle and workload of ACS may hinder people from entering the field. Still, *attracting residents to trauma* (5/18) and *general surgery* (2/18) were sources of optimism for the future of ACS, with 11 reporting an increase in resident interest in this “exciting”, “challenging”, and “fun” specialty. However, one participant expressed concern that “young people don’t want to take night call any more”.

Despite overall optimism, three themes emerged regarding issues threatening the future of ACS (Table 3). Eight respondents cited *poor continuity of care* and patients not knowing who their surgeon was due to different attendings rounding on different days/weeks on in-patients (4/18) and difficulty ensuring outpatient follow-up (5/18). Ineffective or lack of handoffs to other specialists was also attributed to poor continuity by three.

Lack of institutional resources was perceived as a threat to the future of ACS by 12 respondents. Nine respondents felt short-staffed in terms of attendings (6/18) or mid-levels/health extenders (3/18). Five respondents needed more designated operating room time for EGS and/or an easier way to do add-on cases. Two respondents expressed concern regarding too few beds for EGS patients, resulting in delayed transfers.

Finally, respondents largely agreed (16/18) that ACS is financially viable, due to increased elective surgeon volume (3/18), more efficient patient care (5/18), better outcomes (5/18), and increased volume of in-patients (2/18). However, because ACS brings profits to the hospital as a whole rather than an ACS division, there was some concern about inadequate compensation for acute care surgeons (4/18) and that hospitals would not want to provide the initial funds to set up an ACS service (2/18). One respondent mentioned the large proportion of uninsured patients as a potential threat to the financial viability of ACS. Five respondents opined that ACS may only be financially feasible in certain settings (e.g. large academic medical centers). Irrespective of financial viability, 12 respondents said that ACS was needed to meet the wider community’s need for access to trauma and EGS care. One respondent felt they were a tertiary safety net for sicker people who could not obtain care from smaller hospitals.

3.4. A specialty in evolution

Respondents noted that ACS struggles with identity, both in terms of its definition and scope, and how it fits into the current political landscape. One respondent felt that the definition of emergency surgery varies by institution, depending on whether there are only full-time staff – in which case emergency surgery will be anything that comes through the ED at night – or a blend of private practice and full-time staff. In fact, five cited friction between acute care surgeons and their peers, particularly where there are both private practice and hospital-employed surgeons. One respondent said “private surgeons still – for the most part – see us as the enemy”. Another said that they see about 40–50% of acute surgery cases, with the rest treated by a number of different general surgeons.

There was not a clear sense as to the clinical scope of ACS. While 13 stated ACS constituted trauma, EGS, and critical care, five also included vascular, thoracic, orthopedics, and

neurosurgery as potential components of ACS. However, need to negotiate relationships with subspecialists was also cited by five who feared “becoming the wastebasket” for specialists. One respondent felt that specialists would continue to do procedures of “intellectual, financial, or teaching interest”, and that acute care surgeons could end up acting like surgical assistants.

Four respondents felt that ACS will develop differently in different environments, saying things like “one size does not fit all” and “in a university setting, acute care surgery means something very different than in a community setting”. As one respondent summarized, “I think what we are doing is we are fitting a round hole and the square peg. And as time goes on, we are retooling our processes, our marketing, and our nomenclature”.

4. Discussion

In this qualitative study of 18 stakeholders representing ACS teams implemented at teaching hospitals, we found variation of attitudes towards ACS in terms of its necessity, ideal form, and future. We found a paradox of sorts regarding ACS as an innovation. In many ways, ACS represents a delivery system innovation as described by Chaudoir et al. [21] and is in the process of implementation across the USA today. However, ACS is also a rebranding of a comprehensive model of surgical care – inclusive of trauma and EGS patients – that has long been practiced.

The trauma surgeons who first proposed ACS as a new specialty and training paradigm clearly framed it as an innovation in delivery of surgical care for NTSEs [7]. However, many of our respondents described ACS as a new moniker for an old practice. Indeed, reports have shown that trauma surgeons, even before ACS was first described in the literature, cared for EGS patients [8,10,23,24]. The creation of ACS may therefore represent more of a political realignment of general surgery and trauma.

In many ways, ACS’s overt reorganization of care for patients with NTSEs alongside injured patients led by general surgeons with added qualifications in surgical critical care takes on the form a delivery system innovation that parallels the early hospitalist model. Since its inception in the 1990s, hospitalism has diffused rapidly into practice – shifting care from broad-based generalists to acute care specialists [25]. Primary care physicians – who disrupted their office-based practices to periodically round on in-patients – have largely been replaced with hospitalists, with a model of dedicated, organized in-patient medical care. Our respondents indicate that, today, acute care surgeons have begun to replace general surgeons who would otherwise disrupt their elective surgical practices for EGS patients. In fact, like others [26,27], some of our respondents also referred to ACS as a form of “surgical hospitalism”.

ACS was seen by our respondents to solve many critical issues facing the surgical community, including better care for EGS patients, improved surgeon lifestyle, and invigoration of trauma and general surgery. Studies from centers with ACS support these opinions on its benefits for EGS processes and outcomes (ED wait time, time to operating room, hospital length of stay, mortality) compared with the traditional on-call model for certain acute diseases [11–6]. Although early evidence suggests that ACS is financially

Sixty years of research after Rogers' seminal work suggest that innovations diffuse according to an S-shaped pattern (cumulative distribution curve) once the innovation has been modeled and espoused to the 'society' by a subset of innovators and early adopters.[20] The diffusion is driven by the "perceived attributes" of the innovation. These five attributes are: "relative advantage" (is the innovation an improvement compared to what it is replacing); "compatibility" (is the innovation consistent with existing wants and needs); "complexity" (is the innovation too complicated); "trialability" (is the innovation reproducible in other settings); and "observability" (are the benefits and ease of the innovation evident to others). Based on our analyses of the interviews, we propose that the innovators and early adopters have addressed two of these perceived attributes of ACS very well. They have demonstrated the relative advantage of ACS compared to the 'traditional on-call' model both for the patient and for the trauma surgeon. They have addressed the compatibility of a structured approach to EGS patients with the model that already exists for trauma patients. We theorize that these attributes along with the early, retrospective single center studies extolling the benefits of ACS, [8–11,17,18] were enough to convince the early majority to implement ACS. However, our results suggest that the innovators and early adopters of ACS have thus far failed to describe the complexity of implementing ACS, in particular at hospitals without a trauma model in place, to potential adopters. Similarly, they have not demonstrated the trialability of ACS for smaller, more rural, or non-teaching hospitals. Finally, our results and literature search suggests observability of the results of the innovators and early adopters has not been visible to policymakers or surgeons-at-large who may not read surgical journals or attend surgical meetings. Our application of Roger's Diffusion Innovation Theory to our findings is demonstrated in Figure 1. The question is: what are the continued barriers to the diffusion of this innovation?

According to Chaudoir et al. [21], there are five causal factors (structural, organizational, patient-level, provider-level, and innovation-based) that predict the diffusion and sustainability of health innovations. Our adaption of this conceptual model based on respondent concerns about the future of ACS is shown in Fig. 2. It seems that there are concrete concerns about the organizational challenges facing ACS with a vague sense of the structural issues at hand. Meanwhile, respondents indicated that patient-level (patients present unexpectedly without opportunity for optimizing co-morbidities or socioeconomic resources) and provider-level (dedicated, ever-present surgeons harnessing talents in urgent clinical conditions, critical care, and trauma systems) are fixed and therefore will play a minor role in sustaining ACS.

While much of trauma care has been driven by state-level and national policies for decades, no such policies exist for patients with NTSEs, who will continue to present at the nearest hospital. Still, few of our respondents addressed this larger structural issue, even though others have written about regionalizing care for NTSEs, much like has been done for trauma as a result of policy initiatives [36–38]. In contrast, our respondents frequently referred to tension between acute care and community based general surgeons sharing the same patient population as a threat to the future of ACS. While many community based general surgeons will undoubtedly rely on EGS call to sustain their practices, it is feasible that future policy initiatives through organizations such as the AAST or the American College of Surgeons for

the accreditation of hospitals to provide different levels of ACS – as has been done for trauma – will ameliorate this tension and ensure high standards across hospitals [39].

Meanwhile, at the organizational level, respondents cited myriad concerns that they perceive as threats to the future of ACS, including ensuring continuity of care, lack of hospital resources (e.g. lack of dedicated operating room time, limited in-patient beds), and lack of support for adequate numbers of providers. The impact on quality conferred by frequent handoffs and poor inter-physician communication has been heavily scrutinized in recent years [40,41]. Furthermore, patient satisfaction improves dramatically when they have a reliable, personal relationship with healthcare providers, particularly at times of severe illness [42,43]. For ACS to be sustainable, acute care surgeons have to combine 24/7 availability with skilled handoffs and optimal post-discharge care. They will also have to be responsive to patient satisfaction in a largely shift-based, hospital-employed model of care [44,45]. Meanwhile, acute surgeons will need substantial monetary and infrastructure support to ensure a good ACS service. While this may seem daunting in difficult economic times, there is evidence that downstream revenues will ultimately increase at departmental and hospital levels after implementation of ACS [16,28–30].

Ultimately, our respondents' concerns about the future of ACS reflected lack of standardized practices once the terminology, or new delivery system, had started to diffuse into practice. Reports from US academic hospitals who were early adopters of ACS reveal implementation differences across institutions (e.g. cohorting trauma and NTSE patients in a single clinical team or separately, and inclusion of emergency neurosurgery/orthopedics) [8–16,22–24,28]. Furthermore, though the original curriculum for ACS fellowships included orthopedics, neurosurgery, vascular, thoracic, and hepatobiliary components [46,47], recent data show <20% of trauma surgeons perform all of the encompassed procedures [48]. While some respondents suggested variations would hinder the growth and sustainability of ACS, some believed that ACS will need to look different in different settings, as there is no “one size fits all” model for ACS. Thus, guidelines for credentialing ACS, as have been done for trauma, may be challenging to develop.

As with all qualitative research, our study has several limitations. While we achieved theme saturation after interviewing surgeons from three practice settings within each of six distinct geographic regions, our sample was derived from academic medical centers that have already implemented ACS. Thus, our findings may not be representative of nonteaching, rural, nontrauma center hospitals where the greatest unmet need for EGS coverage has been reported [17,49]. Furthermore, our results do not cover the barriers of implementation of ACS. Additionally, because we only performed one set of interviews, we were unable to determine whether respondents' views changed over time. Finally, we apply theories of diffusion to our results in order to envision the future of ACS; however, these results do not take into consideration the perspective of younger surgeons who arguably will be the future of the specialty. Although multiple studies have been performed regarding the feasibility and benefits of ACS, ours is one of the first to use qualitative data to examine perspectives of senior surgeons, and our exploratory research provides a meaningful insight on a phenomenon that is currently diffusing into practice, whether it is an innovation or a rebranding.

5. Conclusions

Despite concerns over resource allocation and the definition of the specialty, from the point of view of senior surgeons deeply entrenched in executing this care delivery model, ACS represents the new face of general surgery and is here to stay. This is partly out of necessity, with fewer general surgeons willing to take call [4–6,17]; however, it is undoubtedly due to the tenacity of those we interviewed, who were determined to save their profession and apply their strengths from trauma care to EGS. The insights of these key stakeholders regarding ACS implementation and sustainability are starting points for additional research and policy initiatives aimed at optimizing care for trauma and EGS patients as ACS continues to rapidly diffuse into practice.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Future of Emergency Care: Hospital-based Emergency Care at the Breaking Point. Washington, DC: Institute of Medicine; 2006.
2. Engelhardt S, Hoyt D, Coimbra R, Fortlage D, Holbrook T. The 15-year evolution of an urban trauma center: what does the future hold for the trauma surgeon? *J Trauma*. 2001; 51:633–7. discussion 7–8. [PubMed: 11586151]
3. Cohn SM, Price MA, Villarreal CL. Trauma and surgical critical care workforce in the United States: a severe surgeon shortage appears imminent. *J Am Coll Surg*. 2009; 209:446–52. e4. [PubMed: 19801317]
4. Stitzenberg KB, Sheldon GF. Progressive specialization within general surgery: adding to the complexity of workforce planning. *J Am Coll Surg*. 2005; 201:925–32. [PubMed: 16310697]
5. Hudkins JR, Helmer SD, Smith RS. General surgery resident practice plans: a workforce for the future? *Am J Surg*. 2009; 198:798–803. [PubMed: 19969132]
6. Richardson JD. Workforce and lifestyle issues in general surgery training and practice. *Arch Surg*. 2002; 137:515–20. [PubMed: 11982462]
7. Acute care surgery: trauma, critical care, and emergency surgery. *J Trauma*. 2005; 58:614–6. [PubMed: 15761359]
8. Scherer LA, Battistella FD. Trauma and emergency surgery: an evolutionary direction for trauma surgeons. *J Trauma*. 2004; 56:7–12. [PubMed: 14749559]
9. Austin MT, Diaz JJ Jr, Feurer ID, et al. Creating an emergency general surgery service enhances the productivity of trauma surgeons, general surgeons and the hospital. *J Trauma*. 2005; 58:906–10. [PubMed: 15920401]
10. Garland AM, Riskin DJ, Brundage SI, et al. A county hospital surgical practice: a model for acute care surgery. *Am J Surg*. 2007; 194:758–63. discussion 63–4. [PubMed: 18005767]
11. Britt RC, Weireter LJ, Britt LD. Initial implementation of an acute care surgery model: implications for timeliness of care. *J Am Coll Surg*. 2009; 209:421–4. [PubMed: 19801314]
12. Earley AS, Pryor JP, Kim PK, et al. An acute care surgery model improves outcomes in patients with appendicitis. *Ann Surg*. 2006; 244:498–504. [PubMed: 16998358]
13. Ekeh AP, Monson B, Wozniak CJ, Armstrong M, McCarthy MC. Management of acute appendicitis by an acute care surgery service: is operative intervention timely? *J Am Coll Surg*. 2008; 207:43–8. [PubMed: 18589360]
14. Matsushima K, Cook A, Tollack L, Shafi S, Frankel H. An acute care surgery model provides safe and timely care for both trauma and emergency general surgery patients. *J Surg Res*. 2011; 166:e143–7. [PubMed: 21227465]

15. 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. [PubMed: 21601487]
16. Cubas RF, Gomez NR, Rodriguez S, Wanis M, Sivanandam A, Garberoglio CA. 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; 215:715–21. [PubMed: 22863794]
17. Rao MB, Lerro C, Gross CP. The shortage of on-call surgical specialist coverage: a national survey of emergency department directors. *Acad Emerg Med.* 2010; 17:1374–82. [PubMed: 21091822]
18. O'Malley AS, Draper DA, Felland LE. Hospital emergency on-call coverage: is there a doctor in the house? *Issue Brief Cent Stud Health Syst Change.* 2007;1–4. [PubMed: 18051263]
19. Rogers, EM. *Diffusion of Innovations.* New York: Free Press of Glencoe; 1962.
20. Dearing JW. Evolution of diffusion and dissemination theory. *J Public Health Manag Pract.* 2008; 14:99–108. [PubMed: 18287914]
21. Chaudoir SR, Dugan AG, Barr CH. Measuring factors affecting implementation of health innovations: a systematic review of structural, organizational, provider, patient, and innovation level measures. *Implement Sci.* 2013; 8:22. [PubMed: 23414420]
22. Santry HP, Pringle PL, Collins CE, Kiefe CI. A qualitative analysis of acute care surgery in the United States: it's more than just "a competent surgeon with a sharp knife and a willing attitude". *Surgery.* 2014; 155:809–25. [PubMed: 24787108]
23. Spain DA, Richardson JD, Carrillo EH, Miller FB, Wilson MA, Polk HC Jr. Should trauma surgeons do general surgery? *J Trauma.* 2000; 48:433–7. discussion 7–8. [PubMed: 10744280]
24. Kim PK, Dabrowski GP, Reilly PM, Auerbach S, Kauder DR, Schwab CW. Redefining the future of trauma surgery as a comprehensive trauma and emergency general surgery service. *J Am Coll Surg.* 2004; 199:96–101. [PubMed: 15217636]
25. Wachter RM, Goldman L. The emerging role of "hospitalists" in the American health care system. *N Engl J Med.* 1996; 335:514–7. [PubMed: 8672160]
26. Maa J, Gosnell JE, Carter JT, Wachter RM, Harris HW. The surgical hospitalist: a new solution for emergency surgical care? *Bull Am Coll Surg.* 2007; 92:8–17. [PubMed: 18041231]
27. Wall E. Surgical hospitalism: a perspective from the community hospital. *Surgery.* 2007; 141:327–9. [PubMed: 17349843]
28. Ciesla DJ, Cha JY, Smith JS 3rd, Llerena LE, Smith DJ. Implementation of an acute care surgery service at an academic trauma center. *Am J Surg.* 2011; 202:779–85. [PubMed: 22137137]
29. Roettger RH, Taylor SM, Youkey JR, Blackhurst DW. The general surgery model: a more appealing and sustainable alternative for the care of trauma patients. *Am Surg.* 2005; 71:633–8. discussion 8–9. [PubMed: 16217944]
30. Procter L, Bernard AC, Korosec RL, Chipko PL, Kearney PA Jr, Zwischenberger JB. An acute care surgery service generates a positive contribution margin in an appropriately staffed hospital. *J Am Coll Surg.* 2013; 216:298–301. [PubMed: 23195202]
31. Hadzikadic L, Burke PA, Esposito TJ, Agarwal S. Surgical resident perceptions of trauma surgery as a specialty. *Arch Surg.* 2010; 145:445–50. [PubMed: 20479342]
32. Moore HB, Moore PK, Grant AR, et al. Future of acute care surgery: a perspective from the next generation. *J Trauma Acute Care Surg.* 2012; 72:94–9. [PubMed: 22310121]
33. Coleman JJ, Esposito TJ, Rozycki GS, Feliciano DV. Acute care surgery: now that we have built it, will they come? *J Trauma Acute Care Surg.* 2013; 74:463–8. discussion 8–9. [PubMed: 23354239]
34. Stawicki SP, Brooks A, Bilski T, et al. The concept of damage control: extending the paradigm to emergency general surgery. *Injury.* 2008; 39:93–101. [PubMed: 17888435]
35. Becher RD, Meredith JW, Chang MC, Hoth JJ, Beard HR, Miller PR. Creation and implementation of an emergency general surgery registry modeled after the National Trauma Data Bank. *J Am Coll Surg.* 2012; 214:156–63. [PubMed: 22153352]
36. Diaz JJ Jr, Norris PR, Gunter OL, Collier BR, Riordan WP, Morris JA Jr. Does regionalization of acute care surgery decrease mortality? *J Trauma.* 2011; 71:442–6. [PubMed: 21825946]

37. Santry HP, Janjua S, Chang Y, Petrovick L, Velmahos GC. Interhospital transfers of acute care surgery patients: should care for nontraumatic surgical emergencies be regionalized? *World J Surg.* 2011; 35:2660–7. [PubMed: 22002495]
38. Block EF, Rudloff B, Noon C, Behn B. Regionalization of surgical services in central Florida: the next step in acute care surgery. *J Trauma.* 2010; 69:640–3. [PubMed: 20838135]
39. Selden NR. American College of Surgeons trauma center verification requirements. *J Am Coll Surg.* 2013; 216:167. [PubMed: 23246029]
40. Arora VM, Manjarrez E, Dressler DD, Basaviah P, Halasyamani L, Kripalani S. Hospitalist handoffs: a systematic review and task force recommendations. *J Hosp Med.* 2009; 4:433–40. [PubMed: 19753573]
41. Riesenber LA, Leitzsch J, Massucci JL, et al. Residents' and attending physicians' handoffs: a systematic review of the literature. *Acad Med.* 2009; 84:1775–87. [PubMed: 19940588]
42. Fan VS, Burman M, McDonell MB, Fihn SD. Continuity of care and other determinants of patient satisfaction with primary care. *J Gen Intern Med.* 2005; 20:226–33. [PubMed: 15836525]
43. Schers H, Webster S, van den Hoogen H, Avery A, Grol R, van den Bosch W. Continuity of care in general practice: a survey of patients' views. *Br J Gen Pract.* 2002; 52:459–62. [PubMed: 12051209]
44. Jha AK, Orav EJ, Zheng J, Epstein AM. Patients' perception of hospital care in the United States. *N Engl J Med.* 2008; 359:1921–31. [PubMed: 18971493]
45. Westbrook KW, Babakus E, Grant CC. Measuring Patient-Perceived Hospital Service Quality: Validity and Managerial Usefulness of HCAHPS Scales. *Health Mark Q.* 2014; 31:97–114. [PubMed: 24878401]
46. Britt LD. Acute care surgery: A proposed training curriculum. *Surgery.* 2007; 141:304–6. [PubMed: 17349837]
47. Program Requirements for Graduate Medical Education In Acute Care Surgery. The American Association for the Surgery of Trauma; 2010.
48. Cothren CC, Moore EE, Hoyt DB. The U.S trauma surgeon's current scope of practice: can we deliver acute care surgery? *J Trauma.* 2008; 64:955–65. [PubMed: 18404062]
49. Thompson MJ, Lynge DC, Larson EH, Tachawachira P, Hart LG. Characterizing the general surgery workforce in rural America. *Arch Surg.* 2005; 140:74–9. [PubMed: 15655209]

Fig. 1. Rogers' Diffusion of Innovation Theory. Adapted from Dearing [20] and Rogers [19].

Fig. 2.

A multilevel framework predicting implementation outcomes. Shaded areas represent areas where 18 key informants identified potential areas of concern for the future of acute care surgery (ACS) as a sustainable specialty. EGS = emergency general surgery. (A) reproduced from Chaudoir et al. [21], with permission under the Creative Commons License (<http://creativecommons.org/licenses/by/4.0/>).

Table 1

Predictions of 18 key stakeholders regarding the future of acute care surgery.

Theme	Pertinent quotes
Optimism	<p>"I think that more and more the model's going to be that that they're going to create systems that provide this [ACS]. They may call it something else, emergent surgery or hospital surgery."</p> <p>"I think it meets needs from both sides, meets the hospital and patient needs, it also meets the needs of people that are doing trauma, general surgery and EGS. So I think the future is bright for it."</p> <p>"My best guess is that we are going to thrive, because I do not think the elective surgeons are going to get hungry enough to want to come back in the hospital and take call."</p> <p>"I think the future for ACS is just that, ACS is the future of emergency surgery, of trauma surgery, of surgical critical care. I don't think that those three services can be artificially separated anymore, especially as we move forward with a money crunch and a manpower crunch in medicine."</p> <p>"So yes, this is definitely the way things will go in the future. No question. It is not going to go backwards."</p>
Uncertainty	<p>"...one size does not fit all. We have got to recognize that. We have got to figure out... And to a certain extent, various institutions may or may not be able to embrace the model."</p> <p>"[the future of ACS is] ill defined.... There are still a few things that are unclear. Where does general surgery stand as far as ACS? That is number one. Number two, how much you are going to be doing as ACS?"</p> <p>"I think that ACS, in general, is going to be mainly hospital-employed physicians that are doing this and will be mainly at academic institutions. I find it very difficult for institutions that may not have residents or significant mid-level base to be able to maintain this kind of quality or the expectations that I foresee in an ACS program."</p> <p>"...the reason I hesitated to answer your question about what is our future, the American College has to really decide is this something that deserves support and maturation into a real field."</p>

ACS = acute care surgery; EGS = emergency general surgery.

Table 2

Reasons for an optimistic outlook on the future of acute care surgery as cited by 18 key stakeholders.

Theme	Pertinent quotes
Better care for emergency surgery patients	<p>"[EGS patients are] going to be cared for in a timely manner, and if timeliness can be equated to outcomes, and I think in large part they can, then they're going to get better care and they're going to get it faster."</p> <p>"Having someone who is in house who is taking care of emergency surgery problems, so there is really for the most part no delays in terms of seeing the patient, there is no delays in terms of getting therapy for the patient, there is no delays in taking them to the operating room and I think that is clear."</p> <p>"We have an effect at increasing efficiency, we have already shown that... When you decrease the time from arrival to definitive surgery by 6 hours and you plummet the complication rate because of not delaying for something as simple as an obstructed appendix that has huge ramifications on a health system."</p> <p>"Having that person [acute care surgeon] in house giving you that kind of safety net where that surgeon is always in-house available."</p> <p>"Because until now, nobody can answer the question from me of why the biology of disease at 2 a.m. is different from the biology of disease at 2 p.m.? And so our mantra is we provide the same quality of care at 2 a.m. as we provide at 2 p.m."</p> <p>"I am ready to go because me and my guys are here and we can operate on him in an hour or 2 hours and not have to wait 6 hours until this colon surgeon finishes their clinic or disrupts their clinic."</p> <p>"I think the biggest strength is the ability to function as a group, which allows you to maintain the same level of competency and quality, night and day, in every setting."</p> <p>"We have a body of surgeons who are very interested in doing, again, what I would call sort of time-sensitive high acuity surgical work, who are experts in, not just operation, but in resuscitation and in surgical critical care."</p> <p>"There are many innovations in trauma care that translate into very effective general surgery techniques under emergency conditions, for instance, the acute abdomen damage control; the sort of segmented surgery stuff where you do one part of an operation and you come back and you finish the other day."</p> <p>"If you are true critical care, your patients tend to be critically ill. You actually have the advantage of being able to take care of them. You can make the argument that perforated colon cancer lives or dies because of their critical care and perioperative management, more so than their cancer operation."</p> <p>"I think that the real safety net is having that trauma center with all those resources that are required to meet the standards and having those folks in-house and available to you."</p> <p>"[ACS] evolved because of the desire in some parts of surgery to have more control over their lifestyle."</p> <p>"In my mind [ACS is] an attempt to make a lifestyle-friendly form of surgical hospitalism."</p> <p>"Some of [ACS] lends itself to shift work, which makes it attractive to individuals."</p> <p>"If you free your general surgeons – say, your liver surgeons – from call, they can no longer tell you, well, I cannot do more cases because I am post call. You can maximize their ability to do what they want to do and you can free them from the discomfort [EGS call] that they do not particularly like."</p> <p>"[ACS serves as a] model for surgical trainees how to pursue a career in general surgery and made general surgical training a very attractive and viable option to our surgical trainees at the time of fragmentation and disintegration of their surgical training."</p> <p>"It's kind of the last great general surgery service... There is a breadth and a depth to it, so I think it's appealing in that respect, and of course all the trauma."</p> <p>"Having said that, getting back to none of the residents here even considered [ACS/trauma]. Now I think in each class we have two or three residents who are interested in this as a career."</p> <p>"...the exposure that the residents have to what ACS can be or is evolving to be. I can say that that has opened the eyes of a number of our residents as to this is a potential career for us in the future."</p> <p>"...and we've had, in recent years, kind of a string of residents now – good residents that have chosen to go into trauma, critical care fellowships – and we have three or four in the pipe that want to do it, so there's certainly some interest on the part of a number of our residents, male and female, but particularly it's been interesting to me that we've had a disproportionate number of female residents that have actually gone and done this."</p> <p>"I think we've been able to show the residents that this is really interesting stuff and this is a very interesting kind of career to have, and we've been able to demonstrate that we've kind of taken the lifestyle problems out of it because it's more shift work and that you don't have to be in the hospital 24/7 to do this kind of work."</p>
Attracting residents to trauma/general surgery	<p>ACS = acute care surgery; EGS = emergency general surgery.</p>

Table 3

Issues threatening the future of acute care surgery as a specialty as reported by 18 key stakeholders.

Theme	Pertinent quotes
Poor continuity of care	<p>“People and physicians, and referring physicians [have] expectations that we have one surgeon. I know my doctor, I know my surgeon. I am going to see this surgeon, pre-op. He'll do my operation and I'll see him post-op. We have to live up to this and we don't.”</p> <p>“We have to build a practice pattern that is attractive to referring physicians... They will never refer people to us if we are providing inadequate care without continuity – why should I refer my patient to a doctor who is not going to see the patient again where I refer to some place where I don't know who is going to do my operation?”</p> <p>“There is always somebody different who is rounding. That could be one person running during the week and then the weekend maybe somebody else. And when you have other services involved with a patient, they may get a little confused in terms of who they are supposed to talk to.”</p> <p>“There are some cases that the emergency general surgery team is managing settling down and then in the outpatient setting referring to the other division.”</p>
Lack of institutional resources	<p>“The problem is just it's the staffing. You know it's continuing to find people that are willing to do it and want to do it that can be compensated appropriately, and enough people to take calls so the call is not burdensome or excessively burdensome.”</p> <p>“I think the weakness is manpower. There's just not enough of us and that's an old story – I don't know that there's an institution in this country that has enough people, which is probably why well-trained trauma surgeons can pick their jobs.”</p> <p>“Our main problem, the gigantic problem is operating room time. We are fighting and struggling and have been for years to have dedicated operating room time similar to trauma dedicated room times.”</p> <p>“I hope eventually we can get ourselves a real dedicated operating room so these things can move ahead more expeditiously – I think if someone comes in with an appendicitis and they have to wait 24 hours before it's taken care I'm sure we don't look too good...”</p> <p>“I think the other weakness is that the biggest weakness of any of these quaternary hospitals is that despite having – I do not know what it is – 700 beds, we do not have enough beds. This is amazing, but the average occupancy rate, 365 days a year this institution is 96%. And then when you look at the elective days, so starting at about Monday afternoon definitely by Tuesday morning through Saturday morning, there are solid weeks where we are 104%, 105%, 106% filled.”</p>
Financial viability	<p>“...looking at call reimbursement, global services reimbursement for the trauma center, particularly for the right hemicolectomies – elective versus emergent. Emergency right hemicolectomies, the patients are twice as sick, they have twice the mortality, they have twice the length of stay, twice the ICU length of stay. The reimbursement is the same. It is twice the effort. So we are working hard, we are not getting that in.”</p> <p>“We got to spend money to make some money, you know, and I think we need to be reasonable about trying to support ourselves in this economic model of American medicine.”</p> <p>“I think that hospitals have to cover emergency rooms, so they may be willing to support and even use this kind of service as a loss leader, but is that going to be sustainable with changes in healthcare financing? I just don't know. I'm not positive of it.”</p> <p>“If we do it right, we can build a major practice to this. It will become very financially viable. It will die away if we don't give a good job to referring. In order to get financial viability we have to be attractive to referring physicians.”</p>

ICU = intensive care unit.