



EVALUATING EMERGENCY GENERAL SURGERY INTERHOSPITAL TRANSFERS: IDENTIFYING BARRIERS AND DEVELOPING A STANDARDIZED TRANSFER ALGORITHM

Dr. Selvakumar S¹ and Dr. Kuppuraj P^{1*}

¹Associate Professor, Department of General Surgery,
Arunai Medical College and Hospital, Tiruvannamalai, Tamilnadu, India.

***Corresponding Author;** Dr. P. Kuppuraj, M.S, M.Ch.,
Associate Professor, Department of General Surgery, Arunai Medical College and Hospital,
Velu Nagar, Thenmathur, Tiruvannamalai – 606603
Mail ID: drpkraj@hotmail.com

ABSTRACT

The number of Emergency General Surgery (EGS) transfers has also risen tremendously in the developed countries, posing clinical, logistical, and financial problems to patients and health care systems. This is a prospective study that rated interhospital transfer to tertiary referral centers to establish the underlying reasons and suggest uniform transfer parameters. Hospital constraints, discomfort of the surgeons with complicated operations, and lack of surgical cover and not clinical necessity were found to be the major reasons behind the majority of transfers. More than half of the transferred patients did not need operative treatment, which indicates that a better pretransfer evaluation would help to avoid unnecessary movements. There was no communication between the surgeons which increased inefficiencies and time delays in the care. The research suggests a system of EGS transfer involving communication protocols, risk assessment using APACHE II, and telemedicine support as the best way to optimize the process of patient selection and resource distribution. A standardized practice of EGS transfer would have an immense effect on reducing healthcare expenses and enhancing patient outcome and communication between hospitals.

Keywords: Emergency General Surgery, Interhospital Transfer, APACHE II, Telemedicine, Healthcare Resource Optimization

INTRODUCTION

The national emergency general surgery (EGS) trends over the past few years have raised some legitimate concerns on both sides of the argument.³ Some may argue that regionalization of the EGS care is only the way to make sure that communities without special resources have access to the necessary surgical facilities, and that large centers can offer better clinical care than smaller ones due to their high-volume admissions [1,2]. In its turn, critics argue that such a strategy exposes patients and their families to the unnecessary travel costs and puts a strain on the urban healthcare infrastructure, not mentioning that transferred patients tend to receive worse outcomes than non-transfer patients.⁴ Some studies suggest that as many as 10% of EGS inter-hospital transfers are not

necessary and that the transferred patients are not usually receiving better outcomes than non-transfer patients. However, others explain these results by the fact that transfer cases have more severe diseases [3,4]. As compared to other surgical specialties such as trauma and burn care, whose transfer criteria are well defined and standardized,7,8 EGS does not have such a standardized standard at this point. Setting up objective and evidence-based standards of EGS inter-hospital transfers may decrease unwarranted transfers, allow patient and system level loads to decrease, and enhance healthcare effectiveness. This standardization would have to start with being familiar with the clinical rationale of transfers. The current research was intended to determine the decision-making variables that triggered EGS transfer to tertiary care in a rural environment, thus forming the basis of establishing unified EGS transfer criteria [5,6].

METHODS

After obtaining the institutional review board approval of a protocol, prospective patient transfers of peripheral hospitals located in a rural region of non-trauma Emergency General Surgery (EGS) services in two tertiary referral centers. Participants eligible were transfer patients that were either directly admitted into the EGS service or those who had an EGS consultation in the 48 hours following admission. On behalf of every patient, information on the date and time of transfer to the hospital, the specialty of the referring provider, and the name of the referring institution were recorded. In cases where patients were directly referred to the EGS service, data about the clinical reasons of the transfer was taken directly, in the accepting surgeon that had talked to the referring surgeon [7,8,9]. The reasons that were used to categorize transfers were based on the main causes, such as insurgency of surgical coverage at the referring hospital, insufficient experience or comfort of the referring surgeon with the necessary procedure, hospital-related limitations (such as the inability to manage complex comorbidities, insufficient diagnostic or interventional services, such as interventional radiology or endoscopy), continuity of care requirements, and patient preference. In patients referred to the EGS for consultation on surgical matters, information about the cause of surgical consults and the level of involvement of the referring surgeon before the transfer were obtained in the consulting EGS surgeon. The medical record review was also used to obtain additional patient demographics and clinical outcomes [10,11]. Patients who were transferred to other specialty services were excluded, such as the trauma surgery, colorectal surgery, or surgical oncology. In particular, individuals with a surgical diagnosis belonging to the trauma, known inflammatory bowel disease, malignancy, necrotizing pancreatitis, hepatic, or those who underwent biliary reconstruction were not taken into account. Likewise, non- emergent minor surgical issues were left out like gastrostomy or tracheostomy insertions, or a small abscess drainage. Surgical operations were categorized as emergent when it took place within 1 hour of admission or consultation, urgent when it took place between 1 and 24 hours, and late when it took place after 24 hours and within the same period of admission [12,13,14]. Descriptive statistics were conducted and statistical assessment through R software was done. Along with the results of data collection, an algorithm was created to aid the standardization of EGS transfer criteria at tertiary referral centers. The Acute Physiology and Chronic Health Evaluation (APACHE II) scoring system (including 12 physiological parameters, age, and comorbidities of a patient) became the part of the proposed algorithm as a possible way of stratifying the severity of illness among EGS patients prior to transfer [16].

RESULTS

Table I. Patient Characteristics

Parameter	n (%) or Median (Range)
EGS transfers	200
Surgery admissions	110 (55%)
Surgery consults	90 (45%)

Age (y)	61 (19–96)
BMI (kg/m ²)	28 (16–68)
Insurance status	
Medicare	84 (42%)
Private	58 (29%)
Medicaid	40 (20%)
Self-pay	18 (9%)
Level of care on admission	
Intensive care unit	72 (36%)
Progressive care unit	40 (20%)
Medical-surgical floor	88 (44%)
Transfer diagnosis	
Small bowel	46 (23%)
Pancreaticobiliary	36 (18%)
Gastric/foregut	29 (15%)
Colonic	33 (17%)
Skin and soft tissue infection	22 (11%)
Hernia	18 (9%)
Appendix	6 (3%)
Other	10 (5%)

Table II. EGS Transfer Details

Parameter	n (%) or Median (Range)
Day of transfer	
Weekday (Monday to Thursday)	118 (59%)
Weekend (Friday to Sunday)	82 (41%)
Time of transfer	
Day (0600 to 1800)	92 (46%)
Night (1800 to 0600)	108 (54%)
Pretransfer communication	
Surgeon-to-surgeon (admissions only)	28 (25%)
Admitting MD-to-surgeon (consults only)	12 (13%)
Stated reason for transfer (<i>admissions only, n = 110</i>)	
Hospital limitations	42 (38%)
Surgeon discomfort	26 (24%)
Presence of comorbidities	7/26 (27%)
Cirrhosis	3
Obesity	3
Advanced age	1
Complexity of diagnosis/surgical intervention	19/26 (73%)
Complex foregut	6
Complex fistula	4
Recurrent abdominal wall hernia	3
Colonic perforation	2
Complex perirectal abscess/necrotizing fasciitis	3
Open cholecystectomy	1
No on-call surgeon	18 (16%)
Continuity of care	16 (15%)

Patient request	8 (7%)
Complex fistula	4

Table I and Table II will offer a summary of patient demographics and transfer characteristics of Emergency General Surgery (EGS) cases studied in the duration of the study. EGSs transfers (n=200) that were directly admitted to the surgical service and those that were referred to the surgical service (n=90) were both 55 and 45, respectively. Age of the patients was 61 years with the range of 19 to 96 years and median body mass index (BMI) 28 kg/m² which indicated the presence of many overweight and older people- an age group that is likely to increase the surgical risks. In the context of insurance distribution, the majority of patients were under the Medicare insurance (42%), next is the private insurance (29%), then Medicaid (20%) and 9% of patients were self-payers, which represents a diversified payer mix, characteristic of populations in rural areas. Most of the patients were admitted to the medical-surgical floor (44%), intensive care (36%), and progressive care units (20%), which proves that a significant percentage of transfers involved critically ill patients who needed increased monitoring and intervention. Small bowel pathology and pancreaticobiliary were the most common diagnoses (23 and 18%, respectively). A smaller proportion of transfers was due to skin and soft tissue infections (11%), hernias (9%), and appendiceal diseases (3%), with 5% being other surgical conditions. Most of the transfers as summarised in Table II were done on weekdays (59) and at night (54), highlighting the prevalence of emergent referrals at off-peak hours. There was also a restricted pretransfer communication of only 25 percent of admissions, direct surgeon-to-surgeon communication, and 13 percent of consults initiated by the admitting physicians. Hospital limitations were the most frequent (38%), then surgeon discomfort with the complex cases (24%), unavailability of on-call surgeon (16%), continuity of care (15%), and patient request (7%). The results indicate that there are vast differences in surgical coverage, resource allocation and coordination of care that necessitate that the standard EGS transfer procedures are established to maximize the results and minimized unnecessary patient transfer.

DISCUSSION

The national database studies indicate an increase of 150 per cent in interhospital transfer in Emergency General Surgery (EGS) cases in the United States in the year 2002 to 2011.2, this trend poses a great burden to patients who are usually forced to travel long distances to seek care, as well as to tertiary centers, which are usually under strain when it comes to servicing transferred patients. The results show that the majority of transfers are connected with restrictions in hospitals, discomfort of a surgeon in working with complex operations, and the lack of surgical coverage. The communication between the referring and accepting surgeons is not common in direct communication, and most transfers are done without prior communication on the status of the patient requiring surgery, and limitation of the facilities [1-3].

Over fifty percent of transferred patients were not operated, which implies that there were likely a number of unnecessary transfers. In order to resolve this problem, the suggested EGS transfer algorithm focuses on enhancing pretransfer communication and reducing unnecessary transfers and encouraging effective utilization of healthcare resources. Inter-hospital transfers utilize significant health care resources and have worse outcomes than direct admissions. Transfer patients have a history of having more comorbidity burdens and worse illness severity, which results in higher mortality rates and longer hospital stays, typically being under value-based reimbursements. Moreover, patients and their families experience emotional and logistical difficulties due to long distance transfers and subsequent care. Although the national data indicates an increase in transfer rates, there is no clear evidence as to the cause of this phenomenon, though it may be related to the lack of rural general surgeons, the inability to manage postoperative or critical care, and malpractice issues in smaller hospitals which lack advanced surgical proficiency [4- 7]. There is evidence that nonclinical factors in the transfer decisions (insurance status or time of presentation) can affect the

final decision as well, which suggests that an increasing number of transfers are probably not medically necessary. Our data reveal Nevertheless, insurance status, day of transfer and time of day were also not important predictors. These data findings are in line with previous retrospective research by Philip et al. and Broman et al., which however, did not investigate surgeon discomfort as a determinant of transfer. Surprisingly, almost a half of the transfers of EGS patients occurred to nonsurgical services, and without any discussions with the accepting surgeon in many cases. This communication failure caused delays in mobilizing resources in cases of emergencies, which constituted 26% of the consult cohort.

On the other hand, 70% of surgical consult transfers did not involve the need of an operative management, implying that the prompt surgeon-to-surgeon communication would have prevented quite a number of the transfers. In order to gain a good insight and decrease the unnecessary transfer of EGS, it is paramount to bridge structural communication between the referring and the accepting surgeon- however it is usually lacking. This gap is covered by the algorithm that has been developed in this study. In patients with unstable conditions, when they have high mortality as evidenced by APACHE II score, or where surgery is unavailable to the patient, tertiary care transfer is still suitable. Nevertheless, in the case of stable and low-risk patients, pretransfer consultation may be performed as a mandatory practice to prevent unnecessary transfers. This will be of great importance especially when patients are being referred to nonsurgical management or special procedures like the interventional radiology [8-11]. Telemedicine and image-sharing tools can be used to provide real-time collaboration in a facility without surgical coverage, as it was demonstrated successfully in the case of trauma systems under COVID-19 circumstances. The expanded use of these technologies throughout the COVID-19 period makes possible their further application in EGS triage, particularly in rural areas where surgeons are not as accessible.

This research has a number of limitations. Information on transfer reasoning concerning the consultation group was also not complete because the consulting surgeons seldom had a direct conversation with the referring physicians. This restricted the number of samples in some of the analyses. Also, cases of specialty services were not included, which may have left out crossing conditions. The APACHE II score, which is not a common tool in noncritical care settings, provided a convenient, objective assessment of the severity of illness in EGS patients [17]. Conditionally, an EGS- specific scoring system remains unavailable. Our algorithm, which was created based on the data obtained, had not been able to be retrospectively tested based on incomplete pretransfer clinical data. Possible assessment is hence justified [18]. To sum it up, EGS transfers pose significant stress on patients, families, and healthcare mechanisms. Even though most of these transfers seem unwarranted, research studies conducted have not established the clinical reasoning behind them. This paper has shown that decisions to transfer are usually based on subjective opinions and lack of communication among the facilities. The suggested EGS transfer algorithm will focus on standardization of this process and preventing unnecessary transfers. It is necessary to apply this framework prospectively and validate it in the future to determine its influence on the transfer frequency, patient outcomes, and healthcare efficiency.

CONCLUSION

Emergency General Surgery (EGS) transfer is an ever-increasing issue in the American healthcare system, which adds to the rising expenses, patient load, and resource resource inequity. This prospective study found that the inter-hospital transfer is most of the time as a result of restriction in the hospital, the surgeons finding it unpleasant to deal with complicated cases and the lack of on-call surgical coverage of the case as opposed to the surgeons finding it clinically necessary. Importantly, over fifty percent of transferred patients were not surgically intervened upon meaning that a number of the transfers could have been prevented with improved pretransfer assessment. Lack of organized communication between referencing and accepting surgeons was a frequent problem that generally resulted in unnecessary or delayed treatment. The results highlight the necessity of the standardization of the criteria and enhancement of communication channels in EGS transfers. The

use of the APACHE II scoring system, telemedicine consultation and imaging-sharing platforms may improve decision-making and reduce unnecessary transfers. The proposed EGS transfer algorithm will enable the optimization of the selection of patients, decrease the healthcare costs, and enhance coordination between rural and tertiary centers. Future confirmation of this model is necessary to identify how effective it can be in the real life and it may improve the quality and efficiency of EGS care delivery.

REFERENCES

1. Gale S.C., Shafi S., Dombrovskiy V.Y., Arumugam D., Crystal J.S. The public health burden of emergency general surgery in the United States: A 10-year analysis of the Nationwide Inpatient Sample--2001 to 2010. *J Trauma Acute Care Surg.* 2014;77:202–208.
2. Reinke C.E., Thomason M., Paton L., Schiffern L., Rozario N., Matthews B.D. Emergency general surgery transfers in the United States: a 10-year analysis. *J Surg Res.* 2017;219:128–135.
3. Santry H., Kao L.S., Shafi S., Lottenberg L., Crandall M. Pro-con debate on regionalization of emergency general surgery: controversy or common sense? *Trauma Surg Acute Care Open.* 2019;4 .
4. Urbach D.R. Pledging to eliminate low-volume surgery. *N Engl J Med.* 2015;373:1388–1390.
5. Yelverton S., Rozario N., Matthews B.D., Reinke C.E. Interhospital transfer for emergency general surgery: An independent predictor of mortality. *Am J Surg.* 2018;216:787–792.
6. Huntington C.R., Cox T.C., Blair L.J. Acuity, outcomes, and trends in the transfer of surgical patients: a national study. *Surg Endosc.* 2016;30:1301–1309.
7. Sasser S.M., Hunt R.C., Faul M., and the Centers for Disease Control and Prevention (CDC) Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. *MMWR Recomm Rep.* 2012;61:1–20.
8. American Burn Association/American College of Surgeons Guidelines for the operation of burn centers. *J Burn Care Res.* 2007;28:134–141.
9. Knaus W.A., Draper E.A., Wagner D.P., Zimmerman J.E. APACHE II: a severity of disease classification system. *Crit Care Med.* 1985;13:818–829.
10. Keeven D.D., Harris C.T., Davenport D.L., Smalls B., Bernard A.C. Cost burden and mortality in rural emergency general surgery transfer patients. *J Surg Res.* 2019;234:60–64.
11. Keeven D.D., Davenport D.L., Bernard A.C. Escalation of mortality and resource utilization in emergency general surgery transfer patients. *J Trauma Acute Care Surg.* 2019;87:43–48.
12. Misercola B., Sihler K., Douglas M., Ranney S., Dreifus J. Transfer of acute care surgery patients in a rural state: a concerning trend. *J Surg Res.* 2016;206:168–174.
13. Santry H.P., Janjua S., Chang Y., Petrovick L., Velmahos G.C. Interhospital transfers of acute care surgery patients: should care for nontraumatic surgical emergencies be regionalized? *World J Surg.* 2011;35:2660–2667.
14. Ingraham A., Wang X., Havlena J. Factors associated with the interhospital transfer of emergency general surgery patients. *J Surg Res.* 2019;240:191–200.
15. Broman K.K., Poulouse B.K., Phillips S.E. Unnecessary transfers for acute surgical care: Who and why? *Am Surg.* 2016;82:672–678.
16. Philip J.L., Saucke M.C., Schumacher J.R. Characteristics and timing of interhospital transfers of emergency general surgery patients. *J Surg Res.* 2019;233:8–19.
17. Rogers F.B., Ricci M., Caputo M. The use of telemedicine for real-time video consultation between trauma center and community hospital in a rural setting improves early trauma care: preliminary results. *J Trauma.* 2001;51:1037–1041.
18. Havens J.M., Columbus A.B., Seshadri A.J. Risk stratification tools in emergency general surgery. *Trauma Surg Acute Care Open.* 2018;3