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The Relationship between Patient Mortality Post Emergency Laparotomy and Admitting Specialty

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Abstract

Objectives: Emergency laparotomy remains one of the most common general surgical procedures in the UK. It is associated with an increased risk of mortality. This paper examines the relationship between mortality following an emergency laparotomy and admission to the correct specialty.

Method: This was a retrospective cohort study. The emergency theatre logbooks of December 2014 to January 2019 were reviewed to identify those patients that had undergone an emergency laparotomy. Dates of (admission, operation, discharge and death) were collected, as well as admitting specialty. Exclusion criteria: Gynecological, vascular conditions such as AAA, as well as direct ED to theatre cases. The cohort of patients was then divided into groups as per admitting specialty (Medical and Surgical wards) and analyzed.

Results: 578 laparotomies were included in the study. Mean age was 63 for both surgical and medical admissions. Overall mortality at 30-day, 90-day, 1 and 3-year were 13.1%, 16.9%, 23.5% and 32.4% respectively. General surgical mortality at 30-day, 90-day, 1 and 3-year were 11.6%, 15.2%, 21.2% and 29.6% respectively. Medical mortality at 30-day, 90-day, 1 and 3-year were 19.8%, 23.4%, 33.3% and 44.1% respectively. P-values were <0.021, <0.037, <0.007 and <0.003 for 30-day, 90-day, 1-year and 3-year mortality respectively.

Conclusion: Mortality is higher in patients that need a laparotomy when admitted under medical specialties. Reasons are likely multifactorial. However, we conclude that timely recognition for a need for laparotomy by a general surgeon is likely to reduce mortality. We recommend that all attempts be made to appropriately admit patients with abdominal pain to surgery.

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Introduction

Laparotomy was first performed by Dr. McDowell in 1809. In the early19th century, physicians were unaware of the mortality associated with laparotomies [1].

In modern surgical practice, emergency laparotomy remains one of the most common general surgical procedures performed in the UK [2], with approximately 50,000 emergency laparotomies being performed annually [3], with the incidence of emergency laparotomy quoted as 1 in 1100 patients [4]. Numerous studies have demonstrated an increased risk of morbidity and mortality associated with emergency laparotomies [5-9]. Unsurprisingly, there is a higher risk of morbidity and mortality associated with emergency laparotomy compared to elective laparotomy [10]. Age is a recognized factor associated with poor prognosis, with postoperative mortality up to 50% in patients aged over 80 years; this is perhaps due to increasing comorbidities and decreased functional capacity leading to poor recovery. Numerous studies have demonstrated higher mortality and a slower postoperative recovery in elderly patients following emergency laparotomy [11,12].

As surgeons, we must strive to improve patient outcomes following emergency surgery, particularly in those groups in whom the risk is highest.

In a study conducted within this institution in 2015, 30-day and 1-year mortality rates were quoted as 12% and 25% respectively following an emergency laparotomy, in a two-year retrospective analysis [9]. Moreover, a report published by the Association of Surgeons of Great Britain and Ireland (ASGBI) in 2007 concluded that the standard of care for emergency surgical admissions was unsatisfactory. Inadequate senior input, poor use of resources and being admitted under the wrong specialty were identified as key contributing factors to poor patient outcomes following laparotomy [2].

Table 1: Comparison of patient demographics and outcomes between Medical and Surgical admissions.

	Medical Admissions	Surgical Admissions	p-value
	111 (19.2%)	467 (80.8%)	
Age at laparotomy in years (mean ± SD)	60 ± 22	63 ± 18	0.200
Number of Patients >80 years	22 (19.8%)	93 (19.9%)	0.982
Sex (Female)	63 (56.8%)	224 (48%)	0.959
Postcode:			
• DD (Dundee)	76 (68.4%)	325 (69.6%)	
• PH (Perth)	18 (16.2%)	73 (15.6%)	
• KY (Fife)	15 (13.5%)	46 (9.9%)	
• Others	2 (1.8%)	23 (4.9%)	
Admitting Ward:			
• **Acute Medical Unit and gastroenterology**	63 (57%)	NA	
• **Other Medical Wards** (MFE, Renal, Oncology, Paediatrics)	48 (43%)	NA	
• **Acute Surgical Receiving and general surgery**	NA	447 (96%)	
• **Other Surgical wards** (Urology, Neurosurgery)	NA	20 (4%)	
Time from Admission to Laparotomy in days	10.03	4.47	<0.0001
Time from theatre to discharge in days	25.2	18.9	<0.035

This paper examines the relationship between mortality following an emergency laparotomy and admission to the correct specialty, and we postulate that patients undergoing an emergency laparotomy have higher mortality if admitted under the medical team rather than under the general surgical team. The reasons for this poor prognosis is likely to be multifactorial, but one of the contributing factors might be the general surgeon's ability to better recognize surgical signs, thus reducing time to investigation and definitive surgical management.

This retrospective cohort study, therefore, aims to investigate whether the admitting specialty (Medicine or Surgery) has any influence on the mortality rates of patients undergoing emergency laparotomy by comparing 30-day, 90-day, 1-year, and 3-year mortality for patients admitted via their general practitioner or the emergency department to the care of either the medical or surgical team.

Methods

This study received Caldicott Guardian Approval from the Department of Public Health, Division of Population Health Sciences. Therefore, the need for patient consent was not required.

Patient population

The study was undertaken in Ninewells Hospital and Medical School, a large university teaching hospital and tertiary referral centre serving a population of 405,721 patients. The hospital has a fully staffed emergency theatre, which runs 24 h a day, seven days a week. Patients are either discharged to the general surgery ward, to HDU or ITU.

Exclusion criteria

The exclusion criteria included: (1) Emergency laparotomies performed by obstetrics and gynecology; and, (2) vascular conditions such as abdominal aortic aneurysms, (3) emergency laparotomies straight from the emergency department to theatre.

Data collection

This was a retrospective cohort study. The emergency theatre surgical logbooks of January 2009 to December 2014 were reviewed to identify those patients that had undergone an emergency laparotomy. A note was taken of the Community Health Index (CHI) number as well as the date of operation. These numbers were stored securely and anonymously using a password protected pre-prepared Microsoft Excel document.

The Open Patient Administration System (TOPAS) was used to identify: (1) admission date, (2) admitting specialty, (3) confirm the date of operation, (4) sex, (5) date of birth, (6) date of death, and (7) postcode.

Twenty-one patients identified from the emergency theatre logbooks were not identified on TOPAS due to documentation errors. In total, 578 patients in the study matched our inclusion criteria. All patients were followed up postoperatively by reviewing clinical letters on clinical portal.

Statistical analysis

The overall mortality was identified at 30 days, 90 days, 1 year and 3 years. The cohort of patients was then divided into groups as per admitting specialty (Medical and Surgical wards). Medical wards included in the study were the acute medical unit, gastroenterology, medicine for the elderly, nephrology, oncology and pediatrics. Surgical wards were primarily the acute surgical receiving and general surgery wards (such as upper GI, HPB and colorectal surgery); in addition patients from urology and neurosurgery were included in the study. Age, number of patients above 80, sex, postcode, time from admission to theatre and mortality were all compared.

Results were expressed as a mean ± standard deviation or frequency with percentages. Mortality was further demonstrated using a bar graph. Continuous variables (age, time from admission to theatre, and time from theatre to discharge) were analyzed using Mann-Whitney U-test. Categorical variables (number of patients above 80, Sex, and Mortality) were analyzed using χ^2 test in 2 × 2 contingency tables. Significance was denoted by a p-value <0.05.

Results

578 laparotomies of 599 laparotomies were included in the

Table 2: Total patient numbers and 30 day, 90 day, 1-year and 3-year mortality for patients following laparotomy when admitted under Medicine *vs.* Surgery.

	Patient Numbers	Medical Admissions	Surgical Admissions	p value (Medical *vs.* Surgical Mortality)
	578	111 (19.2%)	467 (80.8%)	
30 day mortality	76 (13.1%)	22 (19.8%)	54 (11.6%)	<0.021
90 day mortality	97 (16.85%)	26 (23.4%)	71 (15.2%)	<0.037
1 Year mortality	136 (23.5%)	37 (33.3%)	99 (21.2%)	<0.007
3 Year mortality	187 (32.4%)	49 (44.1%)	138 (29.6%)	<0.003

analysis: 467 laparotomies derived from surgical admissions (80.8%); 111 laparotomies were initially admitted under medicine (19.2%), and the remaining 21 patients could not be identified.

Patient demographics: Medical *vs.* surgical admissions

The mean age at laparotomy for medical admissions was 60 yrs ± 22 SD and 63 yrs ± 18 for surgical admissions, and this was not statistically (p=0.20). The number of patients over the age of 80 yrs was not statistically significant between the medical and surgical admission groups (p=0.98). There were slightly more females in the medical admissions group. However, this was not statistically significant (p=0.96). There was no difference in the postcodes between the patients in each cohort. Almost all patients under surgical admissions came from general surgery (96%), while the majority of patients admitted medically came from the acute medical unit or gastroenterology (57%). The duration of time from admission to theatre was approximately 10 days for those admitted to medicine compared to 4.47 days for those patients admitted to surgery, and this was statistically significant (p<0.0001). The time from theatre to discharge was significantly better if the patient was admitted surgically compared to this time when the patient was admitted medically (p<0.035) (Table 1).

Mortality: Medical *vs.* surgical admissions

The overall mortality for the cohort of 578 patients was 13.1%, 16.9%, 23.5% and 32.4% for 30 days, 90 days, 1 year and 3 years, respectively. The overall mortality for patients admitted to a surgical ward was statistically lower than those admitted to a medical ward (Table 2).

Discussion

Mortality rates for emergency laparotomies are unacceptably high [9]. Surgeons must change their mindset regarding emergency patients. It is no longer acceptable for junior surgeons to be performing laparotomies with junior assistants. Patients should be reviewed pre-operatively by a consultant surgeon and anesthetist and a decision regarding surgery made based on the patient's functional status incorporating a pre-operative decision on post-operative management (ward, surgical HDU or ICU) taken to reduce this mortality following emergency laparotomy. This study emphasizes the importance of appropriate emergency department and general practitioner referral of emergency surgical patients to the care of the general surgical team.

This study has generated several important conclusions that warrant discussion. Primarily, in a large tertiary referral centre, the overall 30-day mortality in patients undergoing emergency laparotomy was 13.1%. This is in keeping with national figures (14.9% 30-day mortality) [2] and international figures (14% 30-day mortality) [13]. Age was a significant risk factor for mortality in both studies [2,13]. This mortality is considerably higher than elective laparotomies for gastrointestinal surgery, where mortality ranges from 2% to 5% [14]. Another important finding from this study was that patients admitted to a medical ward had statistically higher mortality than those admitted to a surgical ward pre-operatively (Table 2).

In this study of 578 patients, 111 (19.2%) were initially admitted to a medical ward, and 467 (80.8%) were admitted to surgery. Unsurprisingly the majority of admissions of patients with abdominal pain are to surgery. However, 19.2% of patients who were subsequently diagnosed with an abdominal pathology requiring emergency laparotomy were admitted by their general practitioner or emergency department to a medical ward.

The reasons that some patients who ultimately required emergency surgery were not investigated in depth. Several patients with known inflammatory bowel disease were admitted under gastroenterology and referred to surgery due to failure of medical management. Other patients were referred with presumed referred pain to the abdomen due to basal pneumonia but subsequently found to have primary surgical pathology requiring emergency laparotomy.

The increase in mortality demonstrated in those patients who were initially admitted to medicine is likely due to the delayed investigation and diagnosis with subsequently delayed referral prior to surgical review and definitive surgical management.

As previously stated, mortality for patients admitted to a medical ward was significantly higher than that seen when patients were admitted to a surgical ward. The 30 day, 90 day, 1 year and 3 year mortality were: 19.8% *vs.* 11.6% (p<0.021); 23.4% *vs.* 15.2% (p<0.037); 33.3% *vs.* 21.2% (<0.007); and 44.1% *vs.* 29.6% (<0.003) respectively. Patient demographics and post-operative management on the surgical ward were also considered as in this study. In both cohorts, the mean age, the number of patients older than 80, and the patient's postcode were similar, reducing variability between the cohorts. Interestingly when a patient was admitted to a surgical ward their time from admission to surgery was significantly reduced (4.5 *vs.* 10 days), and the time from surgery to discharge was also significantly shorter (18.9 *vs.* 25.2 days).

One difference in patient demographics between the two studied groups was patient sex. Almost 57% *vs.* 48% of patients requiring emergency laparotomy were female in medical and surgical admissions, respectively. This would appear to be an important difference; however, such a discrepancy between the cohorts may be reflected by the difference in cohort size between the two groups (111 *vs.* 467). In addition, the result was not significant, and therefore, it was not considered to be a confounding factor contributing to the difference in mortality between the two groups.

Most of the patients admitted to surgical wards were seen by a general surgeon. General surgeons undergo an intensive training

program where they are exposed to various subspecialties, as well as to exposure to an abundant number of surgical patients, making them skillful when managing surgical problems. Naturally, this has the effect of reducing the time taken to make a diagnosis which naturally reduces the time from admission to theatre as well as the time from theatre to discharge and this is reflected in our study. This statistically significant time between admission and surgery and between surgery and discharge demonstrated in those patients admitted to and rapidly triaged by surgeons is postulated to be responsible for the reduction in postoperative mortality. For the purposes of this study, it shall be assumed that medical practitioners are exposed to fewer surgical patients.

This paper concludes that a surgeon's ability to recognize the need for surgical intervention in a timely manner is a significant factor contributing to the difference in mortality rates between admitting specialties.

This study, however, has several limitations. It is a retrospective study from one large teaching hospital. Moreover, multiple surgical conditions were grouped together under 'emergency laparotomy.' Perhaps the presenting complaint and provisional diagnosis of patients presenting to medical and surgical specialties were different, making it more challenging to come to determine that the patient required surgical intervention. It is possible that the combination of the general surgeon's ability and the above explain the difference in time between admission and theatre.

Conclusion

In this large teaching hospital, patients requiring an emergency laparotomy who were admitted to a medical ward had higher 30-day mortality than those admitted to a surgical ward (19.8% *vs.* 11.6% respectively) and higher mortality than national and international figures (14% to 15%). 2, 13 90-day, 1-year, and 3-year mortality were also higher in medically admitted patients in this study. No statistically significant factors were identified to account for this. The reasons for these findings are likely to be multifactorial. However, admission under a general surgeon reduced time to theatre (4-days *vs.* 10-days) and this was likely responsible for the reduction in mortality demonstrated in the group of patients admitted directly to surgery. It is the recommendation from this study that all attempts are made to appropriately admit patients with abdominal pain to surgery, and that those patients who are admitted to medicine with abdominal pain are reviewed by a senior medical doctor and a timely referral to a general surgeon made so that delays in diagnosis and appropriate surgical management are reduced, and this is likely to reduce subsequent post-operative mortality.

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