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Original research

Reliability in the process of care during emergency general surgical admission: A prospective cohort study☆

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HIGHLIGHTS

- 22 key processes for the admission of emergency surgical patients were identified.
- Reliability was poor, with 19.9% of processes omitted, 3.59 omissions per patient.
- There were significant differences in reliability between the 5 hospitals studied.
- Process reliability per hospital was significantly correlated with length of stay.

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ABSTRACT

Introduction: Emergency general surgery (EGS) is responsible for 80–90% of surgical in-hospital deaths and the early management of these unwell patients is critical to improving outcomes. Unfortunately care for EGS patients is often fragmented and important care processes are frequently omitted.
Methods: This study aimed to define a group of important processes during EGS admission and assess their reliability. Literature review and semi-structured interviews were used to define a draft list of processes, which was refined and validated using the Delphi consensus methodology. A prospective cohort study of the 22 included processes was performed in 315 patients across 5 acute hospitals.
Results: Prospective study of the 22 selected processes demonstrated omission of 1130/5668 (19.9%) processes. Only 6 (1.9%) patients had all relevant processes performed correctly. Administration of oxygen to hypoxic patients (82/129, 64%), consultant review (202/313, 65%) and administration of antibiotics within 3 h for patients with severe sepsis (41/60, 68%) were performed particularly poorly. There were significant differences in the mean number of omissions per patient between hospitals (ANOVA: $F = 11.008$, $p < 0.001$) and this was strongly correlated with hospitals' median length of stay (Spearman's rho $= 0.975$, $p = 0.005$).
Conclusions: Reliability of admissions processes in this study was poor, with significant variability between hospitals. It is likely that improvements in process reliability would enhance EGS patients' outcomes. This will require engagement of the entire surgical team and the implementation of multiple interventions to improve the effectiveness of the admission phase of care.

1. Introduction

Emergency general surgery (EGS) comprises of about half of all operations but 80–90% of all in-hospital deaths [1]. EGS has an increasingly frail, elderly population of patients, often with multiple co-morbidities and, unlike elective care, patients have deranged physiology prior to arrival in the operating theatre. Optimal early management of these patients is therefore critical to improve physiology and subsequent outcomes. As the intensity of medical care has increased, so the number of processes and procedures involved in the care of acutely unwell EGS patients has risen too. It is the responsibility of the admitting team of surgeons and other

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healthcare professionals to ensure that processes are performed optimally but we know that errors and omissions are common [2,3].

Reliability in healthcare is defined as failure-free operation over time [4]. Unfortunately healthcare is far from failure-free and this has important implications for patients. The majority of healthcare processes are performed very unreliably with few systems and strategies to reduce the risk of failure embedded in the system. Most are performed with a failure rate of about 10% [4]. There is increasing evidence that improvements in the reliability of the process of care can make a significant difference to patient outcomes, especially when evaluated as a group of complementary processes. This has been demonstrated on the surgical ward and in the operating theatre, using the SURPASS [5] and WHO checklists [6] and in the intensive care unit, using care bundles to reduce ventilator associated pneumonia [7] and central line sepsis [8]. Improvements in reliability of this type have the power to produce huge changes in patient outcomes but they remain underutilised, especially in the setting of emergency surgery.

The normal pattern of EGS admission is via the emergency department (ED), either through direct general practitioner referral or self-presenting patients who are referred to surgery by ED physicians. In addition to patients requiring urgent operations, the surgical team will treat around 65% of admissions non-operatively, typically with pancreatitis, cholecystitis and diverticulitis [9]. New admissions are usually reviewed by junior and senior resident surgeons and by a consultant within 24 h [10]. As a result of these sequential reviews of new patients there are ample opportunities to ensure that important clinical processes are performed. The admissions process typically culminates with a morning "post-take" ward round of patients arriving in the preceding 24 h by the admitting consultant.

The aim of this study was to identify those processes of care most likely to improve outcome during EGS admission and investigate the reliability with which they are performed.

2. Methods

2.1. Design

This study consisted of a literature review and semi-structured interviews to identify potentially important processes, a Delphi consensus process to consolidate and validate these processes and a prospective multicentre cohort study to evaluate the reliability of the chosen processes.

2.2. Literature review and interviews

Due to the lack of robust evidence for many of the processes performed during the admission of an EGS patient it was necessary to use a variety of sources to develop the initial list of processes that may affect patient outcome. Literature review of journals, textbooks, guidelines and publications from professional bodies were used to generate an interview protocol. Eighteen semi-structured interviews with nursing and medical staff from wards, theatres, intensive care, anaesthetics and surgery were undertaken by a surgeon and a psychologist with backgrounds in patient safety. From transcripts of the interviews and the results of the literature search, a preliminary list of care processes undertaken during the admission of emergency general surgical patients was developed (Table 1). This preliminary list was piloted by 10 surgical research fellows prior to submission to the Delphi process.

2.3. Delphi process

Delphi is a consensus methodology, commonly used in healthcare for establishing treatment guidelines and setting quality standards [11]. The Delphi process consists of a series of rounds of anonymous, independently completed questionnaires, in which participants are asked to score their agreement with a number of statements on a numerical (Likert) scale. Results are tabulated and median and interquartile ranges of participants' responses calculated. Statements that have a narrow interquartile range (indicating consensus between participants) and a median score above a predetermined threshold for inclusion in a final list are accepted. Items with a narrow interquartile range and a median below the cut off for inclusion are discarded. Statements without consensus, based on interquartile range, were submitted, along with any new statements suggested by the respondents, to a further round of questionnaires, in which the results of the preceding round are available to the participants.

Delphi was undertaken by 15 experienced surgical healthcare staff with equal representation from surgical consultants and registrars, intensive care and theatre based anaesthetists and surgical ward nurses (mean 5.9 years in existing role). Purposive sampling was used to ensure equivalent participation from all parts of the multidisciplinary healthcare team.

A cut-off value for inclusion in the final list of processes was set as a median score of 8 on the nine point (1–9) Likert scale used. Consensus was considered to be achieved once the interquartile range fell below 1.5. After two rounds of Delphi questionnaires, 21 out of 28 processes surveyed were accepted for inclusion into the list of admission processes (Table 1).

2.4. Reliability of care processes

Included patients were limited to those with acute abdominal symptoms, including rectal bleeding, because this represents a discreet group of patients that were easily identified by investigators and make up the majority of EGS admissions in the UK. Patients with vascular surgical, trauma, gynaecological or urological diagnoses were excluded and patients under the age of 50 were also omitted from the study. Younger patients were excluded to ensure a cohort of patients with greatest potential to benefit from high quality process of care, to exclude large numbers of patients with non-specific abdominal pain or uncomplicated appendicitis and to maximise the chance of identifying a correlation between admissions process reliability and outcomes. Patients who died before the post-take ward round were excluded, as were those patients admitted directly to the intensive care unit (ICU). ICU patients were excluded because the type and intensity of care provided to these patients differs markedly from that available on an open ward and, as a result, process of care adherence is not easily comparable between patients in these different locations.

Patients were identified for inclusion in the study at the "post-take" handover, in the morning following their admission. Basic demographic data were collected from the casenotes and, following the post-take ward round, adherence to the 21 included processes were assessed as either performed correctly, not applicable or not performed. In addition to the original 21 processes, the use of thromboprophylaxis was also assessed, despite its omission from the original Delphi list. This was done because of the strong research evidence in favour of its use and National Institute for Health and Care Excellence (NICE) guidance that prophylaxis should be used in "acute surgical admission with inflammatory or intra-abdominal condition", which covers almost all the patients in this study [12]. A second data collection was performed at