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Vulnerability of emergency surgery to the working conditions of new doctors

How insufficient training and staffing affects patient experience.

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About 30–40% of emergency patients undergo surgery, which has an increased risk of serious complications and death.[1] Despite this, newly qualified doctors are often responsible for reviewing patients who present themselves at emergency.[2] Up to 90% of patient mortality within 48 hours of admission happens in emergencies[3] and this high-risk group can comprise up to 80% of postoperative mortality.[4] Staffing and workload issues in emergency departments have been implicated,[1] which makes organisational support for new doctors something that is pivotal to the process, although precisely what counts as sufficient staffing in hospitals is under discussion.[5]

Studies have highlighted the importance of adequate clinical supervision,[6] with one study showing that the presence of a consultant is associated with better outcomes after emergency surgery.[7] The problem is that consultants in emergency departments are often overloaded with demands. Their workload can average 101 different tasks per hour and two-fifths of their time can be spent communicating with others.[8] There is also a serious under-representation of senior doctors whose expertise is emergency surgery[1,4] as well as underfunding of research into emergency surgery.[9]

Emergency surgery is a field of medicine that requires a very high level of expertise to guide urgent decision-making, putting new doctors at risk of delayed or erroneous decision-making. Patients typically arrive with external trauma, acute diseases that are life-threatening or internal bleeding/rupture.[10,11] Delays of diagnosis or investigation can therefore be lethal. Some hospitals have put measures in place to address the staffing and organisational process problems, and research has shown that these successfully reduce emergency patient mortality.[2] However, there remains concerning variation across

hospitals in the standards of emergency surgery care;[12] for example, across 35 hospitals, patient mortality after an emergency laparotomy can range from 3.6% to 41.7%.[4] As a step towards explaining these organisational differences and identifying a realistic solution, this study examined the interaction of new doctors' working conditions with surgical and emergency contexts.

METHODS

This naturalistic experiment had three independent variables and one dependent variable (the quality of patient care). It was exempt from ethics review because the data on which the analysis is based are secondary data in the public domain. (See details below.) The independent variables (IVs) and the conditions within them were:

- IV1: new doctors' working conditions (negative or positive)
- IV2: emergency context (emergency or non-emergency)
- IV3: surgery/procedure (present or absent)

IVs 2 and 3 were derived from the inpatient survey dataset comprising adults who were in hospital for one night or more and who were discharged in 2013 (between June and August).[13] IV1 was created from Care Quality Commission (CQC) quality reports,[14-19] as described below.

Randomisation and coding

The list of 156 National Health Service trusts (organisations) was sorted by alphabetical order and numbered. Twenty organisations were then randomly selected using a random number-generating tool, producing the numbers 64, 22, 140, 38, 34, 93, 148, 89, 139, 103, 119, 55, 69, 77, 106, 51, 109, 139, 20 and 38. As two numbers were duplicates, two further runs of the random number generator produced numbers 21 and 88. Data about the 20 organisations were collated from CQC reports. Information noted for this experiment included the date of the most recent inspection, the organisation's sum rating out of 5 (1 point was awarded if the CQC labelled the organisation as 'good/outstanding' on a standard) and text in the report mentioning the term 'junior doctors'.

This produced 6 organisations with complete data: full inspections had not yet occurred in 12 organisations and 2 organisations had no data about junior doctors. The organisations and their sum quality rating by the CQC were: Chelsea and Westminster Hospital NHS Foundation Trust (sum rating = 5),[14] Northampton General Hospital NHS Trust (sum rating = 1),[15] Sherwood Forest Hospitals NHS Foundation Trust (sum rating = 1),[16] East Kent Hospitals University NHS Foundation Trust (sum rating = 1),[17] Frimley Park Hospital NHS Foundation Trust (sum rating = 5)[18] and Kettering General Hospital NHS Foundation Trust (sum rating = 3).[19] Kettering General Hospital NHS Foundation Trust was excluded from further analysis because the only reference to junior doctors presented an ambiguous interpretation about their working conditions.

The next stage was coding of the text from the CQC reports about junior doctors. (The term 'new doctors' is used from here onwards.) A score of 0 was given to organisations reporting negative working conditions for new doctors and 1 to organisations reporting positive working conditions. The quotes from the CQC inspection reports are presented in Appendix 1 (available online). The score of 0 or 1 was allocated as an overall summary of the conditions for new doctors in each organisation given the information provided in the CQC inspection report.

Patients

The new independent variable (new doctors' working conditions) was added to the inpatient survey data from the organisations that were randomly selected (n=1,808 patients). The patients' length of stay averaged 5.98 days (±11.63 days), 69.9% were emergency patients, 60.6% of patients had surgery/a procedure and 21% of patients were in the intensive care unit/high dependency unit/critical care unit. The dependent variable was the patient's rating of his or her overall experience on a scale of 0 ('I had a very poor experience') to 10 ('I had a very good experience').

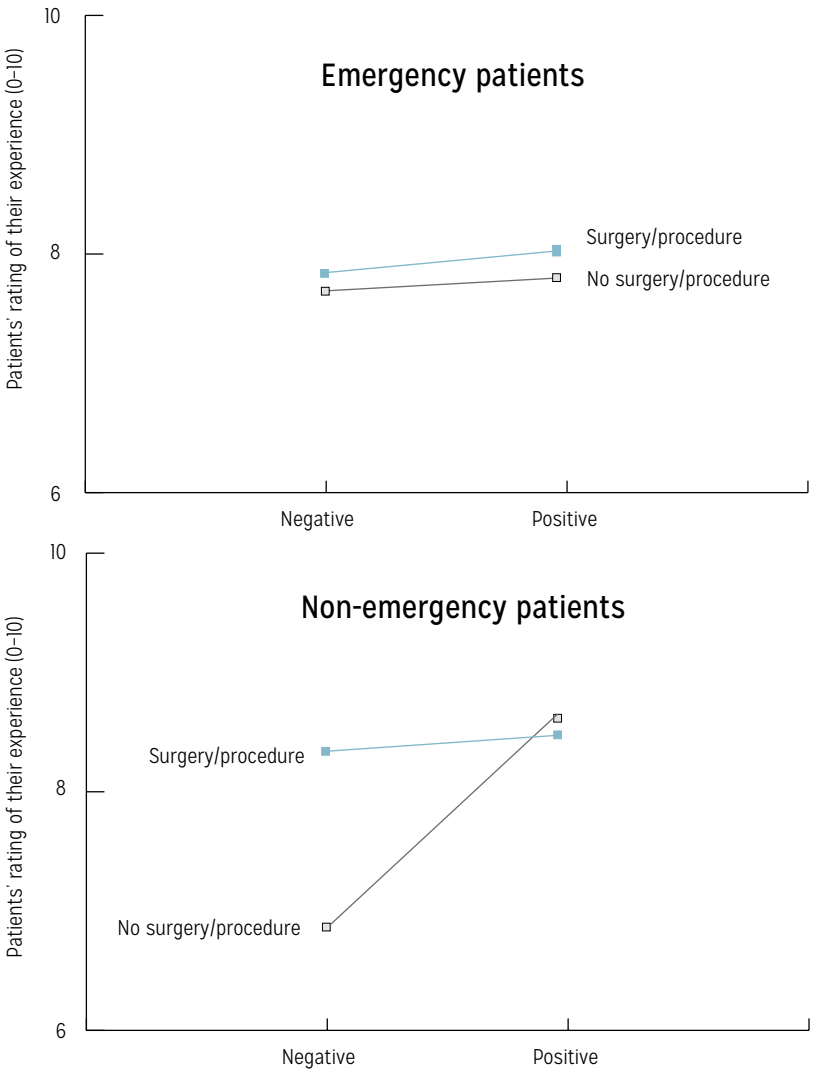
RESULTS

A 2x2x2 univariate analysis found a significant main effect of new doctors' working conditions (F (1, 1679) = 6.31, p=0.012, η2=0.004). The means (M) and standard errors (SE) are reported in Table 1 for all significant effects (p<0.05). Patients in hospitals where new doctors experience negative working conditions rated their experience worse (M=7.74, SE=0.20) than patients treated in hospitals where new doctors report positive working conditions (M=8.35, SE=0.14). There was a significant simple interaction of new doctors' working conditions and emergency context (F (1, 1679) = 4.01, p=0.045, η2=0.002). Non-emergency patients in hospitals where new doctors have good working conditions rated their

Table 1 Patients' ratings of their experience where significance of the effect was p<0.05

	Non-emergency patients		Sub-mean	Emergency patients		Sub-mean	Row mean
	Surgery/ procedure	No surgery/ procedure		Surgery/ procedure	No surgery/ procedure		
New doctors have positive working conditions	M=8.59, SE=0.13	M=8.93, SE=0.54	M=8.76, SE=0.28	M=8.04, SE=0.12	M=7.84, SE=0.10	M=7.94, SE=0.08	M=8.35, SE=0.14
New doctors have negative working conditions	M=8.46, SE=0.13	M=6.86, SE=0.76	M=7.66, SE=0.38	M=7.83, SE=0.13	M=7.80, SE=0.13	M=7.82, SE=0.09	M=7.74, SE=0.20

Figure 1 2x2x2 interaction effect of surgery, emergency admission and new doctors' working conditions on patients (*n*=1,808)



care highest (M=8.76, SE=0.28), followed by emergency patients in the same hospitals (M=7.94, SE=0.08), followed by emergency patients in hospitals where new doctors have poor working conditions (M=7.82, SE=0.09), followed by non-emergency patients in those hospitals (M=7.66, SE=0.38).

There was a significant three-way interaction of new doctors' working conditions, emergency context and surgery (F (1, 1679) = 4.71, p=0.030, η2=0.003) (Figure 1). In emergency surgery contexts, there was a large disparity in patient care when comparing hospitals where new doctors have good working conditions (M=8.04, SE=0.12) with hospitals with poor working conditions (M=7.83, SE=0.13). In contrast, there was little disparity between hospitals with positive and negative working conditions in non-surgical emergency care (M=7.84, SE=0.10; and M=7.80, SE=0.13 respectively). Similarly, there was little disparity in non-emergency surgical care (M=8.59, SE=0.13; and M=8.46, SE=0.13 respectively). However, there was a large disparity in non-emergency non-surgical care. Patients in hospitals where new doctors experience poor working conditions rated their care worse (M=6.86, SE=0.76) than patients in hospitals where doctors have good working conditions (M=8.93, SE=0.54).

DISCUSSION

This naturalistic experiment examined the main effects and interactions of three independent variables that were created from a randomised sample of hospitals. Textual data from CQC reports generated an indicator of new doctors' working conditions in each hospital and this was triangulated with data from 1,808 patients, taking on board the presence/absence of surgery and emergency admission. There was a significant three-way interaction effect, meaning that new doctors' working conditions, emergency context and surgical context significantly predict patient care. The evidence shows the vulnerability of emergency surgery (not surgery as a whole) to new doctors' working conditions, shedding some light on the reasons why emergency surgery is a vulnerable context, given the high rate of mortality following emergency surgery that led The Royal College of Surgeons of England (RCS) in 2014 to call for an urgent discussion of the causes.[4]

The experiment found a significant disparity in patient care in emergency surgery contexts, comparing hospitals where new doctors have good working conditions with hospitals with poor working conditions. In contrast, the disparity was smaller in non-surgical emergency care and also in non-emergency surgical care, which is likely to involve stringent controls on staffing and experienced surgeons. Further evidence that the critical factor is the emergency context is offered by the significant simple interaction effect found between new doctors' working conditions and emergency context. Emergency patients in hospitals where new doctors have good working conditions rated their care more highly than emergency patients in hospitals with poor working conditions.

Among the possible causes discussed by the RCS was a lack of enough consultants in emergency departments and the subsequent lack of enough supervision for new doctors.[4] The present study has shown that hospitals where new doctors lack sufficient staffing and training support produce significantly worse care. Additionally, taking on board the

clinical context, there was a greater disparity in emergency surgical care when comparing hospitals with positive/negative working conditions for new doctors than when comparing emergency non-surgical care and non-emergency surgery.

Previous studies analysed patient mortality after emergency surgery[1,3] whereas the present study analysed patients' experiences of their care, providing a different viewpoint involving recovering patients who were eligible for discharge. A weakness of the current study is the absence of outcome measures connected more directly with mortality, such as adverse outcomes of emergency surgery. Future research should therefore test the replicability of the three-way interaction effect found using patient mortality data from the hospitals that were randomly sampled. The present difficulty is accessing data that map precisely on to the timeframe covered by the quality reports and the inpatient data. Furthermore, it would be beneficial to explore the reasons for the wide disparity between surgical and non-surgical care for non-emergency patients found in the present study, comparing hospitals according with new doctors' working conditions.

In the context of emergency patients who require a decision about their diagnosis and referral to surgery, a number of measures need to be considered to help accurate, rapid decision-making by new doctors. First, learning opportunities are vital and these were discussed in the hospitals that were coded as having good working conditions.[16] Remedial activities should include induction programmes that focus on specific procedures.[20] Second, the hospitals with good conditions in the present experiment had sufficient numbers of consultants and registrars to support new doctors.[14,18] Such hospitals could share their data about staffing levels to identify the optimum ratio of senior-to-new doctors in hospital emergencies. This would help address the problem of serious variations between hospitals in the number of consultants who are available in emergency departments, particularly during out-of-hours periods.[21]

The long-term solution is to address the issue of staffing levels in emergency medicine, given the disparity between the number who enter this field and those in other specialties,[22] and considering the strain that emergency departments face because of patient numbers. Introducing emergency surgery as a subspecialty in countries where it currently is not will also help.[11] Future research should explore the impact of improving new doctors' working conditions on the level of patient mortality after emergency surgery.

CONCLUSIONS

A significant proportion of emergency patients require unplanned surgical care and the level of mortality after emergency surgery is problematic. Understaffing has been identified as a contributing factor. This study found that insufficient support for new doctors (in terms of staffing and training) produces significantly worse patient experiences after emergency surgical care. The results are one step towards explaining why there is such wide variability between hospitals in patient mortality after emergency surgery. Hospitals should share ideas about best practice and consider introducing induction programmes that improve new doctors' proficiency at unplanned surgical procedures.

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