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Are We Selecting Patients Appropriately for ITU Following Major Abdominal Operation? – A Retrospective Review

Batt J*, Vincent R**

Institution
*North Bristol NHS Trust, Southmead Rd, Bristol BS10 5NB, UK

**The Royal United Hospital, Combe Park, Avon BA1 3NG, UK

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Abstract

Introduction: Like any other medical treatment, intensive care is a limited resource that needs to be utilised appropriately. Our study aimed to identify the demographics of patients admitted to ITU in a busy district general hospital and examine patient outcomes.

Methods: We performed a retrospective observational study of 1059 patients undergoing laparotomy who were admitted to ITU. We sub-classified cases by mode of admission and risk prediction scores and analysed outcomes of mortality, ITU length of stay and hospital length of stay.

Results: The mean age of patients who did not survive was older than those who survived, with higher APACHE and ICNAR observed in patients who died. Emergency admission was also an indicator of increased mortality. Survivors' APACHE scores were the same if they were elective or emergency admissions, although survivors' ICNAR scores were higher in emergency than in elective. Patients who did not survive had a longer length of ITU stay than those who survived, whereas elective survivors had shorter LOS ITU than the emergency survivors. Regardless of this, the hospital length of stay was the same for both elective and emergency survivors.

Conclusion: The most unwell patients had the highest risk prediction scores, were more often admitted in the emergency setting, required longer stays in ITU, and had less favourable outcomes. However, ITU did appear to expedite the hospital discharges of emergency patients to match their elective counterparts. Decisions around when and to which patients ITU is an appropriate intervention remains a difficult decision and one that cannot be made without full consideration of all aspects of patient factors.

Key Words
ITU; Intensive Care; Laparotomy

Corresponding Author:
Mr Jeremy Batt; E-mail: jeremy.batt@doctors.org.uk

Introduction:

Major abdominal surgery, both open and laparoscopic, are commonly performed operations in both emergency and elective settings. Such highly invasive procedures carry with them significant investment, both in terms of time and resource. It is estimated that 30,000-50,000 emergency laparotomies are performed in the UK each year, at the cost of approximately £13,000 per patient.[1,2] However, across the world, it is estimated that one in six patients will die within a month of surgery.[3] It is for this reason that many initiatives in the UK, and indeed across the world, are focused on reducing the morbidity and mortality with laparotomy, improving outcomes. The National Emergency Laparotomy Audit (NELA) has been set up by the Royal College of Anaesthetists to outline key standards to improve the quality of care for patients undergoing these procedures. One such standard is the use of a pre-operative mortality and morbidity score founded on the principle of providing individualised risk assessment and subsequent individually tailored care. The most frequent surgically adopted of these is P-POSSUM, though later in the course of the patients care other scoring systems such as APACHE are utilised in critical care. Our aim was to review a series of data assessing outcomes after major abdominal surgery and identify demographic trends in how patients were treated.

Methods:
A retrospective observational study of ITU patients undergoing major abdominal operations between 2007 and 2015 was performed and cross referenced with a database kept by the general surgical department. Patients whose data was incomplete or who had conflicting information between the two data sets were excluded. A master list was created from these data and subsequent analysis was performed. There were no exclusion criteria based on age, gender, or type of surgery. T-tests were used to analyse the remaining data.

Results:
1059 patients were identified between 2007 and 2015. The mean age was 72.9 years (+/-15.5 years) and there were 524 female patients compared to 535 who were male. There were 182 deaths across all patients (17.15%). 218 patients were admitted electively compared to 841 who were emergency admissions. The mean age of patients who died were older (77.25 years vs 71.77 years, p<0.01) and had higher APACHE and ICNAR scores compared to those who survived (17.9 vs 12.3 and 20.0 vs 12 respectively, p<0.01). Deaths were also more frequently as a result of an emergency admission rather than an elective one (19.9% vs 6.9%). Perhaps interestingly, patients who died had a longer length of stay in ITU than those who survived (5.68 days vs 3.6 days, p<0.01). The mean length of stay of all survivors was 21.08 days regardless of the nature of their admission. Contrary to what would have been expected, there was no difference in hospital length of stay between elective and emergency survivors (18.57 days vs 21.84 days, p not significant) but elective survivors had a shorter length of stay in ITU than their emergency counterparts (2.87 days vs 3.80 days, p=0.02). Survivors' APACHE scores were no different regardless of whether they were elective or emergency admissions (12.68 vs 12.25, p=0.2) although their ICNAR scores were different (10.4 vs 12.44, p<0.01). The APACHE and ICNAR scores were consistently higher in patients who died compared to those who survived, regardless of their mode of admission (elective vs emergency; Apache 14.47 vs 18.18, p=0.02 and ICNAR 12.67 vs 21.63 respectively, p<0.01).

Discussion:
Mean age of patients who died was older than those who survived
Advanced age is thought to be associated with a poorer prognosis in critically unwell patients.[4] However, it is important to note that any studies involving outcomes of elderly patients in the critical care setting may be skewed due to selection bias, as particularly invasive treatments, including admission to intensive care, are often withheld in this cohort. In our data, patients who were admitted to ITU, and died, were older than those who survived (mean age 77.25 years vs 71.77 years respectively, p<0.01). Similar findings are well documented across the board in medical literature, with one particular study reporting that, independent of severity of illness, Acute Physiology Score, admission source, diagnosis and comorbidity, age greater than 70 years old is associated with an additional 2% increase in mortality.[5] However, when discussing the influence of age, one must remember that it is not chronological age, per say, that influences outcome but rather the associated features such as degrees of frailty and physiological reserve that impact on 'biological age'. In this way, age may be seen as a surrogate marker for frailty and may not be an independent predictor of mortality.[6] Indeed, frailty, in this context relating to functional status before admission to hospital, has been shown to be a very strong independent predictor of hospital outcomes amongst elderly patients and it is unsurprising that impaired functioning in daily life is more prevalent in the elderly.[4], [7] It is therefore unsurprising that a new Emergency Laparotomy and Frailty Study (ELF) has been launched this year, with results expected in 2018.[8]

Patients who died had higher APACHE and ICNAR scores
Emergency admissions more frequently had less good outcome
The Acute Physiology and Chronic Health Evaluation (APACHE II) is one of several severity-of-disease classification systems used in the critical care setting in the UK. A recent systematic review concluded that APACHE demonstrated the best and most consistent discriminator of individual outcomes of a varied group of patients undergoing laparotomy when used either pre or post operatively.[3] Our data set revealed that patients who died had higher APACHE II scores compared with the survivors (17.9 vs 12.3, P<0.01). Similarly, the ICNAR (Intensive Care National Audit and Research) score was higher in those who did not survive compared to those who did (20.0 vs 12.0, P<0.01). This result confirms what would be generally expected with more critically unwell patients having a lower survival probability. Similarly expected is that those who were admitted as emergency patients showed a higher mortality compared to their elective counterparts (19.9% vs 6.9%, P<0.01) which perhaps could relate to reduced opportunity for pre-operative optimisation amongst the emergency group.

Survivors' APACHE scores were the same even if they were elective or emergency. Survivors' ICNAR scores were higher in emergency than in elective

In our data set, mode of admission made little difference to APACHE scores in those who survived. In the emergency group, survivors' APACHE scores were not significantly different to the scores of those who were admitted in the elective setting (12.68 vs 12.25, p=0.2). This is not what was expected to be observed and is different to what is seen in other similar studies where APACHE scores were higher in those with emergency admissions ([9]). However, mode of admission did change the ICNAR score where we observed that survivors' ICNAR scores were higher in the emergency patients than their elective counterparts (12.4 vs 10.4, p<0.01). This is more in keeping with what we would expect to see as we know, from above, that those who were admitted as emergency had less favourable outcomes. Does this therefore imply that in our dataset ICNAR has been shown to be a better prognostic tool than APACHE? Whilst the information here would seem to suggest this, as far as we are aware there have been no other formal studies performed for comparison to validate this outcome. The closest similar evaluation that was found compared ICNAR to POSSUM and concluded that the ICNAR model was the superior risk prediction model when analysed by ROC curve comparison and went on to discourage the use of APACHE and favour the use of ICNAR in the emergency laparotomy setting.[10] Further studies will be needed if this question is to be robustly answered.

Those who died had a longer length of ITU stay than those who survived

Elective survivors had shorter LOS ITU than the emergency survivors

It is not difficult to believe that the most unwell patients require the most intensive treatments and, as represented above, those with the worst risk prediction suffer the worst outcomes. It is therefore no stretch to understand that the most unwell also require additional time for input, here represented by length of stay in the ITU. In this study patients who did not survive, when not sub-divided by mode of admission, spent longer in the department than those who survived (5.68 days vs 3.6 days, p<0.01). When sub-classifying this further, it was also apparent that elective survivors had shorter length of stay in ITU than the emergency survivors (2.87 days vs 3.80 days, p=0.02). This reinforces the notion that patients with less significant clinical demands may represent those who are relatively easier to manage and undergo a less stormy recovery in the immediate ITU post-operative period than those with higher demands. These less demanding patients, with lower risk prediction scores, may require less ITU intervention than their more complex counterparts, and thus have an expedited return to the ward resulting in a shorter length of stay in ITU. Conversely, those with higher demands, emergency patients, higher risk prediction scores and requiring longer length of stay in ITU represent a cohort ultimately less likely to survive. Does this therefore imply that the longer you require ITU treatment the worse outcome you may expect, representing length of stay in ITU as a negative prognostic indicator? Certainly in other studies, increased ITU length of stay was associated with higher APACHE score and emergency admission, both being independent predictors for increased ITU length of stay.[9] Interestingly, in those who were admitted to the ITU for greater than 21 days, APACHE score was observed to plateau.[9]

Length of hospital stay of all survivors was the same, regardless of emergency or elective admission

When considering patients who survived a successful discharge from hospital, it was apparent that total length of stay in hospital was similar for both those admitted elective and as an emergency (18.57 days vs 21.84 days, p not significant, mean 21.08). What this seems to suggest in combination with the above is that, whilst the total hospital admission remains the same between elective and emergency patients, the location of their stay is proportionally different. It can be concluded that elective patients spend shorter time in ITU and longer on the general ward whereas emergency patients spend longer in ITU and proportionally shorter time on the general ward. Does this therefore imply that the ITU admission expedites time to discharge for the emergency cohort, matching the elective counterparts? Would keeping the elective cases on ITU longer also expedite their hospital discharge and represent a reduction in the total hospital admission length of stay? If so, would this be an economically viable idea to help free up bed space in the hospital and ease bed pressures and could this be reproduced in ward based high care settings? More studies are needed!

Conclusion:

Appropriate patient selection to ITU is a challenging and difficult decision. Who is appropriate? Who is not? The ability to affect outcome, both positively and negatively, is not something to be taken lightly. There is no doubt that intensive care does make a difference to patient outcomes and, if, as suggested above, longer ITU stay does expedite hospital discharge and reduces overall length of hospital stay in emergency patients, will a similar observation be seen electively? If elective patients had longer spells in ITU, would their whole hospital stay be even shorter?

As we have seen, patients who did not survive had longer length of stay in ITU. Are we in a situation of

'once in, all in'? Do we need to improve at identifying when things are not progressing and when we are fighting a losing battle? Or, does this simply reflect something that is widely accepted – those who are sicker, with higher risk prediction scores, have higher demands and longer treatment requirements, with longer length of stay in ITU? Such patients inherently are at higher risk of not surviving and therefore skew the data.

In conclusion, what we need is a more in depth review of these particular cases; ones with the long ITU length of stay and see if any trends can be identified to better highlight the patients who are most appropriate for ITU intervention.

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