



D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

1. Perioperative Fellow, The Alfred Hospital, Melbourne
2. Specialist Anaesthetist, The Alfred Hospital, Melbourne
3. Adjunct Lecturer, Monash University

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## Emergency vs Elective Surgery

### Key Points

- Patients have worse outcomes following emergency surgery compared to elective patients
- Those particularly at risk include the elderly, those with multiple comorbidities, a high ASA status
- Post-operative complications are far more likely to occur in patients requiring urgent or emergent surgery. Once a postoperative complication occurs outcomes are much worse with increased lengths of stay and mortality risk
- Protocols to streamline care and highlight patients as high risk are beginning to demonstrate a improvement in outcome
- Strategies to anticipate and recognise postoperative complications in the high risk patient include admission to HDU, but may not be cost effective

### MCQ

1. True or False?
  - Immediate surgery is considered life threatening and should occur within minutes of the decision to go to theatre.
  - Elective surgery is planned in advance of routine admission to hospital
  - Fractured neck of femur surgery can be considered elective as the limb is not considered at risk
  - The 30 day mortality for patients having surgery considered urgent is approximately 10%
  - A patient with perforated bowel and peritonitis should be considered for “urgent” surgery



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2. True or False?
  - Overall risk for all surgery is 1.3% while for elective surgery it is 0.5%
  - Preoperative assessment of high risk patients for elective surgery does not reduce mortality rates
  - Emergency inpatient admissions are longer than elective inpatient stays
  - Elderly patients undergoing emergency surgery have high in hospital mortality.
  - Worse outcomes are seen in those with higher ASA and those with post-operative complications
  
3. True or False?
  - Compliance to Enhanced Recovery After Surgery protocols has not been shown to reduce post-operative complications
  - The post-operative complication with the greatest mortality risk is acute kidney injury
  - Mortality in those who develop a complication, is twice as high than in patients who don't develop a complication
  - Adverse events in theatre are more significant to a patient than post operative complications
  - Procedures associated with the highest mortality rates are emergency abdominal aortic aneurysm repair and emergency laparotomy
  
4. True or False?
  - Patients requiring emergency surgery often benefit from a period of preoptimisation on HDU.
  - Delays in transferring the patient to operating room for emergency surgery are not associated with increased risk of in-hospital mortality
  - Delays in transferring patients to theatre for emergency surgery has been found to be associated with longer inpatient stays
  - Adverse event in theatre are more significant to a patient than post operative complications
  - High risk patients who go to the ward post operatively have a higher mortality risk than those who go to HDU

MCQ Answers: 1. TFFFT, 2. TFTTT, 3. FFTFT, 4. FFTFT



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## Introduction

The National Confidential Enquiry into Patient Outcome and Death reclassified their definitions of emergency and elective interventions in 2004. These classifications expanded the definitions to include the type of surgery that might enter the various categories and also included guidance regarding the timeline in which these cases might occur.

The clinical condition dictates the category as assessed by medical staff. It facilitates clear communication when deciding when to operate on a patient and also empowers those involved in patient care to expedite review and transfer of patients to theatres.

## The categories are:

- **Immediate**  
This describes when an intervention is either life, limb or organ-saving. Surgery is likely to be required to occur within minutes and resuscitation should occur simultaneous with the intervention.
- **Urgent**  
Here the intervention is for acute onset or clinical deterioration of conditions thought to be potentially life threatening. Interventions are expected to need to occur within hours of the decision to operate. Examples would include fixation of fractures.
- **Expedited**  
The condition is not life threatening but early treatment is required, usually within days of decision to operate.
- **Elective**  
This is the planned admission to hospital for intervention. The timing is to suit patient, hospital and staff.

These definitions highlight the importance of understanding the clinical condition that requires treatment and the timelines in which they must be treated. The degree of operative urgency is closely linked to mortality.<sup>1</sup> Almost 13 % of patients having surgery classed as



D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

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immediate will not survive beyond 30 days; those having surgery classed as urgent 30 day mortality is around 4% and for high risk patients having elective surgery it is <1%.

### **Patient Outcomes after Surgery**

Around 2.3 million surgical procedures are performed in the NHS<sup>2</sup> and around 310 million procedures are performed worldwide each year.<sup>3</sup> Overall mortality for all surgery is 1.34%,<sup>4</sup> for elective surgery it is 0.5%.<sup>5</sup>

It has long been known that patients presenting for emergency surgery have poor outcomes. This is particularly true for the elderly population. In 1987 a study reviewing outcomes in elderly populations presenting for general surgery found a 20% mortality and 31% morbidity in patients over 70 presenting for emergency surgery compared to mortality of 1.9% and morbidity of 6.8% in elective patients.<sup>6</sup> By 2007 things had not improved with Kim et al<sup>7</sup> reviewing the past four years of emergency vs elective bowel resection in a large public teaching hospital in USA. They found a complication rate of 38.1% in the urgent group compared with a complication rate of 13.3% in the elective group. Large population studies in America have identified that elderly patients undergoing emergency surgery have an in hospital mortality of 12%-14% with a high incidence of cardiac events and post-operative delirium.<sup>8,9</sup> Worse outcomes are seen in those with higher ASA and those with post-operative complications.

Major emergency procedures such as AAA repair, CABG and laparotomies cost over \$7000 more per-patient in hospitalisation costs compared with elective patients in the USA. This represents a 29% increase and it's estimated that if 10% of these emergency cases were performed electively this could save almost \$ 1 billion.<sup>10</sup>

### **Why are outcomes bad in emergency patients?**

The clear advantage of elective surgery is that high risk patients can be identified, and modifiable risk factors managed. There is time for key interventions such as prehabilitation, smoking cessation and haemoglobin optimisation. Appropriate intra-operative plans can be discussed with the patient and multidisciplinary teams while also appropriate post-operative destination planning can take place. Conditions such as diabetes and obstructive sleep apnoea that may have been unrecognised and/or untreated can be optimised.



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Indeed, the opportunity to risk stratify and initiate a collaborative team approach may result in deeming surgery is not necessarily the best treatment pathway to pursue for the patient. High risk patients presenting for elective surgery that are not seen in a pre-assessment clinic have a drastically increased 30-day mortality compared to those that are (4.8% v 0.7%).<sup>1</sup>

Although ideally comprehensive pre-operative assessment should happen for emergent surgery, often the window of opportunity to act is small and clearly there is limited opportunity to modify risk factors. Also, the choice of treatment pathway can be challenging. Patients have limited time to consider their options and delaying surgery can significantly affect the outcome, so often deciding to operate is an easier option than to not.

### **High risk groups**

A review of over 4 million surgical procedures<sup>11</sup> identified a high risk group within the surgical population; unsurprisingly, this population was older, with multiple comorbidities, often undergoing more complex surgery. This higher risk group which makes up 12.5% of patients accounted for over 80% of deaths. Three procedures with the highest mortality rates are all emergency procedures, these being major and very major abdominal procedures and emergency aortic surgery.<sup>12</sup> Not only are mortality rates higher but length of stay is longer for emergency admissions.

These numbers are confronting but more concerning is that only one in five of these high risk patients were admitted to the critical care post operatively and that highest mortality rates were seen in those who were admitted to ICU following initial care on the ward.

### **What can be done for Emergency patients pre-operatively?**

We have recognised that there are barriers to achieving the same outcomes after emergency surgery. Many of these relate to the pre-operative period - the poor condition of patients presenting in the emergency situation and the lack of time to optimise chronic conditions and establish a collaborative care plan.



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A number of pathways have looked to improve outcomes in emergency surgical patients; some have been taken on as national campaigns and have indeed reduced mortality.<sup>13</sup> The well-publicised National Emergency Laparotomy Audit (NELA) and the emergency laparotomy pathway quality improvement care (ELPQuIC) bundle focussed to improve mortality in patients undergoing laparotomy highlighted these seemingly simple pre-operative evidence based interventions:

- initial assessment with early warning scores
- early antibiotics
- operation within 6 hours

However, access to operating rooms isn't always simple. Delays in transferring the patient to operating room for emergency surgery is associated with increased risk of in-hospital mortality, longer length of stay and higher total hospital costs. This can be due to institutional system delays such as availability of clinicians and physical resources such as operating theatres. However, it should also be appreciated that when the delay is for clinical reasons it is likely these patients are more unwell, require pre-operative resuscitation and therefore are already at a greater risk of death.<sup>14</sup>

It is well recognized that if patients who present with a fractured neck of femur do not get their operation within 48 hours then there is an increased risk of death and associated increased risk of postoperative complications.<sup>15</sup> Other examples highlighting the importance of ready access to theatre are patients presenting with perforated gastric or duodenal ulcer (which has a high mortality of 25-30%). Each hour delay in surgery is associated with a 2.4% decreased probability in survival and if the delay is over 24 hours then 30-day mortality rises to 80%.<sup>16</sup>

### **Risk prediction**

The value of risk prediction in the elective and emergency surgical population is being increasingly appreciated and with that more tools are being validated for use. There are many validated risk prediction tools in use such as POSSUM, PPOSSUM, APACHE II, NSQUIP risk prediction tool, SORT, Lee cardiac risk index. Each have strengths and weaknesses, the analysis of which is beyond the scope of this article. Understanding patient and operation specific risk allows appropriate prioritisation and allocation of resources throughout the perioperative journey. We do this in the elective setting by defining the urgency of elective



D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

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surgery, for example cancer surgery is appropriately prioritised over other surgery. In the emergency setting it is often less clear which order cases should be given prioritised access to the operating room. Likewise, some institutions will not proceed with high risk elective surgery unless a critical care bed is available, an option the emergent patient doesn't have.

### **Surgical Pathways**

Pathways can be seen as an extension on bundles of care and it was the Institute for Healthcare Improvement that developed the concept of care bundles in 2001. They can be seen commonly in the intensive care setting in the insertion and subsequent care of central venous access lines to reduce infection. A care bundle is a number of interventions (usually less than six) that separately may not have an impact, but together achieve a significant impact of patient outcome.<sup>17</sup> Can care bundles improve outcomes in patient undergoing emergency surgery?

In Denmark a perioperative care protocol was introduced in seven centres for patients undergoing emergency surgery for peptic ulcer perforation in 2008-2009. The perioperative care protocol incorporated many well established perioperative principles including prompt review by senior clinicians, the incorporation of septic screening and broad spectrum antibiotics. They aimed for surgery within 6 hours and early preoperative review by consultant anaesthetist and surgeons. The use of Apache II scoring systems allowed for identification of high risk patients who were then optimised with early goal directed therapy and broad spectrum antibiotics. A post-operative nutrition plan had to be made within 12 hours of diagnosis. Post operatively patients were reviewed by consultant anaesthetists and surgeons. Received chest physio for a minimum of 3 days and had a daily septic screen for 3 days. Mortality was 17% in the intervention group compared to 27% in the controls.<sup>18</sup>

In the UK, Torbay Hospital introduced an emergency pathway to improve outcomes for patient with a fractured neck of femur. This was in response to National Institute for Health and Clinical Excellence (NICE) recommendations that surgery should be undertaken on the day of admission or the following day. Meta-analysis data has shown improvement in mortality at 1 year with a reduction in complications with early surgery.<sup>19</sup> The pathway aimed to minimise time delay from admission to surgery. A multidisciplinary approach was used with pre admission alerts from paramedics to the trauma coordinator who would receive handover in the ambulance bay identifying key medical issues and key discharge issues at first arrival to hospital. The patient, after x-ray would then move straight to an



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optimisation area in the recovery suite of the theatre complex facilitating review by surgeon and anaesthetist and analgesia with local anaesthetic block. If required ICU review would occur at this point. The INR was checked and if prolonged the agreed protocol was for the use of prothrombin complex and allow immediate surgery. The mean time to theatre was reduced from 44.95 hours to 29.25 hours. The mean length of stay was decreased from 10 days to 9 days. There was no change in 30-day mortality rates (6.4%) Some unmeasured but anecdotal effects were reported by the multidisciplinary team: physiotherapists were able to mobilise patients on day 1 more easily. While not directly measured in the study the productivity had improved and the authors were confident that this would lead to savings.

### **Enhanced Recovery After Surgery**

Enhanced recovery after surgery (ERAS) pathways have become a familiar part of modern day surgical practice and improve patient outcomes. Although not defined as ERAS care, cardiac surgery is possibly the best example of the benefits of care pathways. By standardising pre-operative assessment, consistent and familiar operative teams and critical care pathways have resulted in what would be intuitively a high risk surgery produce mortality rates of less than 2%.<sup>20</sup> While appreciating only a minority of patients presenting for cardiac surgery do so as an emergency, this outcome remains seemingly impressive and offers a possible guidance to how high risk emergency cases could be managed.

ERAS has increased the divide in outcomes between elective and emergency patients by better results seen in a range of specialties for their elective surgical cases. The ERAS compliance group reviewed over 2000 cases of colorectal cancer surgery in 14 countries and confirmed that increased compliance to ERAS protocols improves patient outcomes, reducing length of hospital stay, reducing patient complications and improving patient mortality. Laparoscopy, balanced intravenous fluid therapy, early mobilisation and early dietary intake are the factors independently associated with shortened length of stay.<sup>21</sup> While there are barriers to implementing the same steps in emergency surgery (eg laparoscopic approach surgery) there are efforts underway to establish enhanced recovery programs for emergency surgery. Such pathways allow a coordinated, pre-defined response to challenging clinical situations which can improve the efficiency and reduce the variability of the hospital response. For example, if a patient presenting for an emergency laparotomy triggers a mandatory response that has been established with involvement from multi-disciplinary teams then getting a senior clinician, early radiological scanning, early



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antibiotics, rapid access to theatre and access to a critical care bed becomes much easier and likely to happen in the time limited setting. It now is unthinkable to have a trauma patient arrive in hospital and not have a coordinated response by multidisciplinary staff who work within a defined framework. In the NHS, hospitals with greater ICU and HDU bed numbers and greater access to CT scanning facilities have significantly better outcomes.<sup>22</sup> Is it time to limit emergency presentations to hospitals with this capability?

Centralisation of specialist service is well established for elective services. There is mounting evidence for centralisation of emergency services. In the UK, centralisation of acute stroke services has reduced mortality and length of hospital stay<sup>23</sup> Following the implementation of The Victorian State Trauma System (VSTS) in Australia there has been a significant decrease in the risk of mortality for major trauma patients with an injury severity score greater than 15; this has fallen from 14.6 per cent in 2001-02 to 11.3 per cent in 2006-07.<sup>24</sup> This led to the UK to follow suit and centralise trauma services beginning in London in 2011. It is anticipated that outcomes in ruptured AAA will improve following the implementation of regionalized services as part of a standardized guideline for ruptured abdominal Aortic Aneurysm in the UK.<sup>25</sup>

### **Post-operative Care**

The American National Surgical Quality Improvement Program (NSQIP) identified that development of a postoperative complication within 30 days is a much more important determinant of long term survival than either preoperative comorbidities or intraoperative adverse events.<sup>26</sup> The post-operative complications with the greatest mortality risk include stroke, deep wound infection and septic shock.<sup>27</sup> Mortality in those who develop a complication, termed “failure to rescue” is 2.8%, more than 5 times higher than those who don’t develop a complication.

Silber et al<sup>28</sup> used the term ‘failure to rescue’, as a measure of hospital quality. It is this failure to recognise the deteriorating post-operative patient on the ward that is likely to contribute to the poor outcomes. What is clear is that the patient groups who are identified as high risk, develop complications and have prolonged complicated inpatient stays with an increased risk of death. With high rates of complications in the emergency patients, it would appear there is an opportunity to improve. The obvious solution would be champion greater access to critical care beds, which although sounds intuitively beneficial, surprisingly



D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

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lacks strong evidence. This is a costly solution and so alternatives have been established in the form of extended recovery units, critical care outreach teams and dedicated perioperative teams.

The report following the national laparotomy database suggested that post-operative HDU and ICU admissions were inappropriately low given the observed mortality of 6.7% of those discharged to a general ward, echoing the work from the NSQIP studies. It is likely that patients identified as high risk are best to be placed in a high dependency setting where close observation facilitates the identification of deterioration.

## Conclusions

Much of the focus behind perioperative systems improvement has been on the elective surgical patient. Due to the high rates of emergency surgical complications and deaths, there are great opportunities to make system changes to significantly improve on the current situation. Understandably, it has been deemed unacceptable that mortality in emergency surgical admissions is almost 8 times that of elective ones<sup>29</sup>. Early identification of the high risk emergency surgical patient and initiation on a standardised pathway within an institution adequately resourced seems the way forward.

Appropriate focus is now falling on this patient group in attempt to reduce the mortality and complication gap that exists with the elective patient group. In recent years, there has been increasing discussion surrounding surgical futility. It is a challenging situation particularly in the emergency setting, when time is limited, deciding if surgery is the right option for the patient and family.

Following the decision to proceed with emergency surgery, senior multidisciplinary teams should outline individualised pre-operative, intra-operative and post-operative care plans. These should include, patient and family discussions to understand patient wishes and establish ceiling of care and appreciating when surgery is futile. Once the surgical option is chosen, facilitating timely access to theatre is key and early post-operative destination planning. Specific interventions such as respiratory and haemodynamic pre-emptive optimisation (goal-directed resuscitation before surgery) has proven benefit<sup>30</sup> and should be considered within a bundle of interventions in the perioperative journey.



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Complications signal a concerning risk and close observation and prompt intervention is required to prevent significant deterioration. For emergency surgical patients the post-operative journey is likely to be rocky. A focus on improving resources in this area facilitating senior specialised perioperative teams to achieve cost effective care could be one of many answers.

The inclusion of audit distinguishes ERAS from a clinical pathway, auditing emergency pathways ensures compliance to stated guidelines and facilitate our learning and improves care being delivered.

Cardiac, day case, elective colorectal and orthopaedic surgery have all had focused efforts over the years to establish streamlined and clinically effective pathways. The focus has now fallen on the emergency surgical patient and there appears good reason to be optimistic of significant improvement in the care of these patients.

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D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

1. Perioperative Fellow, The Alfred Hospital, Melbourne
2. Specialist Anaesthetist, The Alfred Hospital, Melbourne
3. Adjunct Lecturer, Monash University

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D LEHANE<sup>1</sup> and JJ NICHOLSON<sup>2,3</sup>

1. Perioperative Fellow, The Alfred Hospital, Melbourne
2. Specialist Anaesthetist, The Alfred Hospital, Melbourne
3. Adjunct Lecturer, Monash University

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