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Introduction

A fear of not waking up after general anaesthesia is very common (Burkle 2014) and the importance of this issue for patients was one of the reasons the topic of perioperative cardiac arrest was chosen for NAP7. The following quote was posted on a popular chat forum:

"Am having surgery in a few weeks. I haven't had a GA since I was young and I can't really remember much about the procedure. I am feeling more apprehensive about that rather than the surgery itself! I have been told I won't be able to meet the anaesthetist until the day of my surgery so am bottling up more nerves. I think my main fear is not waking up afterwards – I feel really silly admitting that! Anyone had a similar anxiety?"

The Royal College of Anaesthetists (RCoA) information for patients states a 1 in 100,000 risk of death as a direct result of anaesthesia in a healthy adult having a general anaesthetic for routine surgery (RCoA 2019) (Figure 16.1). This equates to a risk that is very rare and reinforces the fact that anaesthesia per se is a safe medical intervention.

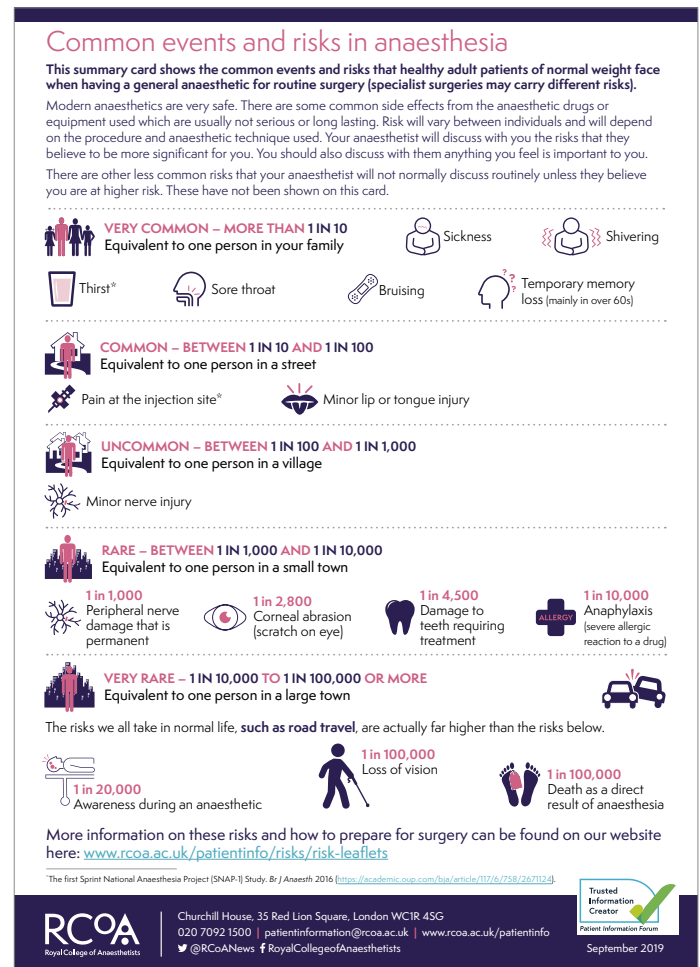
A patient death in the perioperative period (30-day mortality) is uncommon and varies between the elective and emergency surgical population from 0.4% to 6.2%. The EuSOS group (Pearse 2012) found a crude mortality of 4% in all non-cardiac surgery patients across Europe. More recently the mortality risk for a wide range of surgeries in high income countries was reported to range between 0.1% and 6% (Nepogodiev 2019). However, the vast majority of deaths related to surgery occur postoperatively and the intraoperative period is somewhat less studied.

The incidence of perioperative cardiac arrest before NAP7 was reported as 4.3–34.6 per 10,000 cases (Braz 2006, Sprung 2003, Nunally 2015). The mortality from those cardiac arrests was reported as 58.4% (Nunally 2015) with most (> 60%) occurring in ASA 3–4 patients (Nunally 2015). However, cardiac

arrests and patient deaths do occur in low-risk pathways and individuals and organisations should be aware of such risks and the actions to take in event of an unexpected 'death on the table'.

There are inconsistencies in how and what risks are communicated to a patient and, in England, the Montgomery ruling in 2015 states that 'A material risk is one that a reasonable person in the patient's position is likely to attach significance

Figure 16.1 Risks for a healthy adult patient having general anaesthesia for routine surgery



to, or if the doctor is or should reasonably be aware that their patient would be likely to attach significance to it' (Supreme Court 2015). Death is irrefutably significant to all individuals.

What we found

We defined a low-risk pathway as anaesthesia care for patients with an ASA 1 or 2, ie patients with no medical problems or mild systemic disease; (ASA 2020) where death was not part of an inexorable fatal process that had developed during the current surgical procedure (eg uncontrollable haemorrhage, drug resistant anaphylaxis). We acknowledge that there may be many other cases in NAP7 where a cardiac arrest or death was unexpected but use this pathway in an attempt to identify deaths in particularly unexpected settings.

Activity Survey

The NAP7 Activity Survey showed that, for elective day case surgery, perioperative cardiac arrest was rare (around 1 in 1600 cases) and there were no deaths reported among 10,045 cases (very rare). There was one (ASA 2) reported death among a total of 14,201 elective cases. The cause of death appeared to be haemorrhage, most likely unexpected. In the Activity Survey, there were 12 cases reported where chest compressions or defibrillation was given during elective care (Figure 16.2). This included one case that did not meet the NAP7 inclusion criteria for perioperative cardiac arrest, as there were fewer than five chest compressions. Perioperative cardiac arrest meeting the NAP7 inclusion criteria among all elective cases was rare (< 1 in 1,000 cases) and deaths were very rare (< 1 in 10,000 cases).

In urgent, immediate or expedited cases, there were 24 cardiac arrests (1 in 415 cases) and 8 deaths (1 in 1250 cases) from a total of 9971 cases. Of the eight deaths, one was ASA 1 and one ASA 2.

Of note, we treat the cardiac arrest data in the Activity Survey with some caution; it is possible that some cases were reported in error due to mis-clicks and, as numbers are very small, a small number of such errors would significantly reduce estimated incidences.

Case reviews

Among 881 NAP7 cases, 235 cases were classed as ASA 1 or ASA 2. When survivors ($n = 200$) and deaths considered to be the result of an inexorable process ($n = 24$) were removed, the number of cases fell to 11. On detailed review of the case report forms, seven of those cases were clearly misclassified, with all being at least ASA 3 and some ASA 5, and one was a high-risk case despite appropriate ASA grading. In two of the remaining cases (one aged > 75 years with a fractured hip and one aged > 65 years with cardiovascular and renal disease), it was uncertain whether they were ASA 2 or 3. The third case had a rheumatological condition. It was a notable feature, both in the

Activity Survey and in case reports that ASA was underscored. This left three patients (none of whom were ASA 1) who met the criteria used to define a 'death in a low risk patient'.

Two of these deaths occurred in the independent sector and further details can be found in [Chapter 14 Independent sector](#). One was most likely an unexpected primary cardiac event (care was judged good throughout) and in one case the cause was uncertain but high doses of local anaesthetic were noted to have been administered with the relevance of this unknown (care was judged good and poor throughout). The third death occurred in an NHS hospital and was reported as a thrombotic event in a patient undergoing fixation for a fractured neck of femur. This was considered a probable bone cement implantation syndrome event – this patient would not be considered low risk by many anaesthetists.

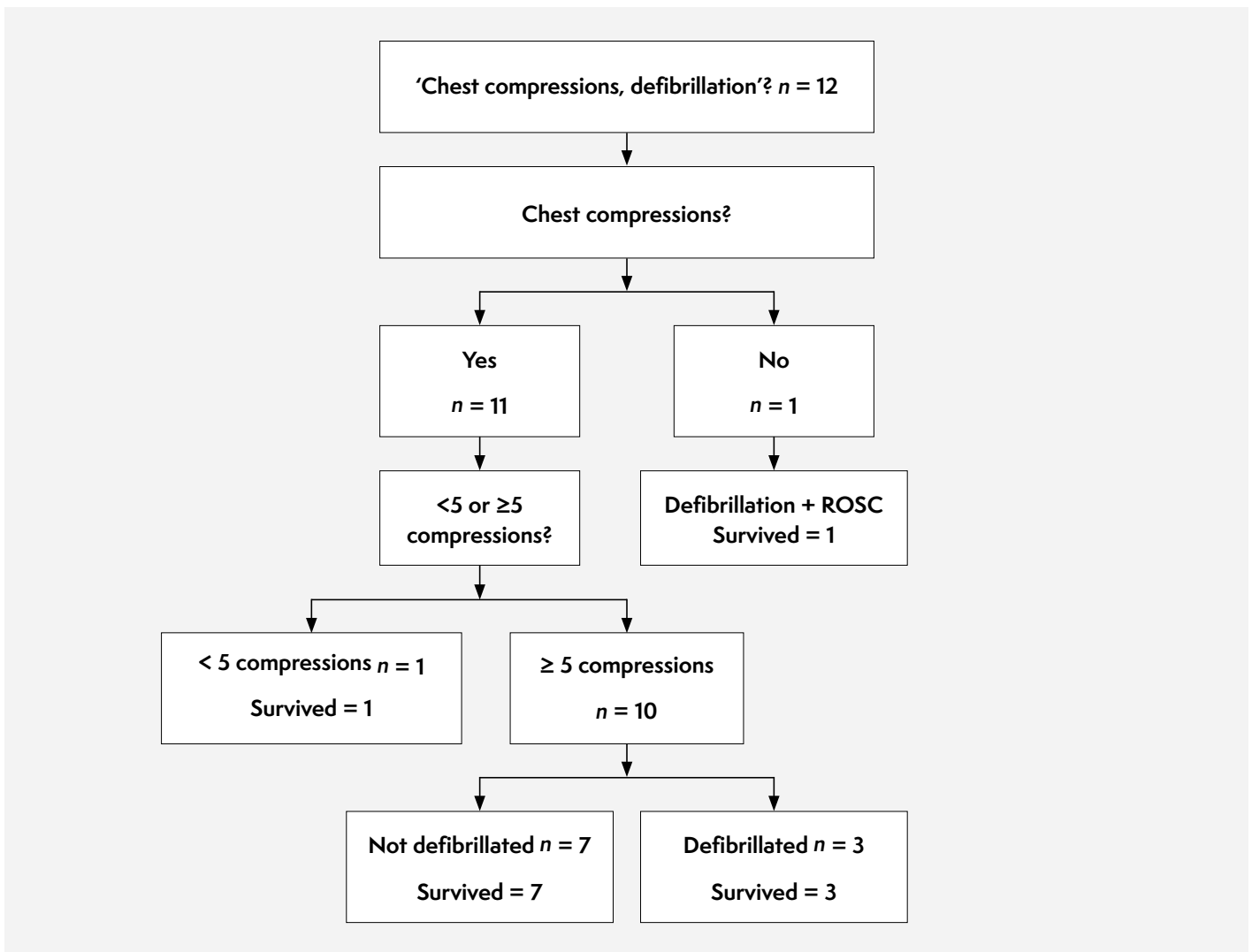
Discussion

NAP7 shows that deaths 'out of the blue' during anaesthesia and surgery among low-risk patients are very low incidence events indeed. In this regard, NAP7 is very reassuring for the public and all involved in safe healthcare. However, such deaths do occur, and it is important that patients are aware of such risks before deciding to have surgery and that organisations have plans for managing such (very rare) events.

A 'zero' risk preoperative pathway does not exist and even in low-risk pathways there is a risk of cardiac arrest and an occasional death in this cohort of patients. The issue of risk prediction is complicated and is covered in more detail in [Chapter 19 Risk assessment](#). However even in apparently low-risk patients there remains an intraoperative risk from unexpected events, which may be both unexpected and not preventable. These include anaesthetic events (eg unexpected airway management difficulty, anaphylaxis), surgical events (eg haemorrhage, bone implantation syndrome, gas or air emboli) or patient factors (eg thromboembolic events, previously undiagnosed cardiac disease leading to arrhythmias or acute cardiac events). The evidence from NAP7 is that, particularly in the elective setting, the risk of such events in patients apparently ASA 1–2 is reassuringly low and even when these events do occur most patients survive. However, as such deaths do occur, there remains a question about consent.

There are inconsistencies in how and what risks are communicated to a patient and the Montgomery ruling of 2015 (Supreme Court 2015) attempted to clarify the importance of the individual when communicating risk. Since the Montgomery ruling, the law requires that all patients must be informed of risks that they would consider important. Death is irrefutably significant to all individuals and, as the process of consent continues to evolve, there is a strong argument that any risk of death should be communicated to the patient in some way.

The Royal College of Anaesthetists risk infographic quotes a rate of 1 in 100,000 for death as a direct result of anaesthesia in a healthy adult having routine surgery (RCoA 2019). However, anaesthesia does not occur in isolation and there are important

Figure 16.2 Cardiac arrest among patients having elective care in the NAP7 Activity Survey (ROSC, return of spontaneous circulation)

patient and surgical factors that will affect that risk for any given individual. The risk of anaesthesia is therefore only one part of perioperative risk. This emphasises the importance of a multidisciplinary approach to consent, with an overall risk communicated to the patient rather than for instance 'a surgical risk' and 'an anaesthetic risk' being each communicated, in isolation. This supports the role for a robust preoperative pathway and patient assessment in the weeks and months before elective surgery. Patients need to be given time to consider the risks of the entire perioperative pathway, possibly more so in these low-risk pathways.

The effect of an unexpected death on the family of the patient will be catastrophic, as no preparation for such an event will have occurred. There should be a multidisciplinary team plan for communication with the next of kin and their continuing support. There is an argument for a checklist design to aid in these highly charged situations.

The staff involved will also be affected. It is likely that this will be more than in higher-risk cases where they had mentally run through scenarios where death could occur and the 'second

victim' effect may be stark in these cases. The effect on the staff involved in perioperative cardiac arrest is considered further in [Chapter 17 Aftermath and learning](#), and it is notable that anaesthetist psychological impact was more frequent in cardiac arrests in patients at lower risk (ASA 1–2) and when the cardiac arrest resulted in death.

In the same way that departments should have policies to manage the aftermath of an unexpected death in theatre, in terms of patient care and communication to family, such a policy should also address actions to take to support the staff involved, both at the time and subsequently. The Royal College of Surgeons of England has a good practice guide to support surgeons after adverse events (RCSE 2020). The Association of Anaesthetists has previously published a guideline on dealing with the aftermath of 'catastrophes in anaesthetic practice' (Association of Anaesthetists 2005) and will publish an updated document soon after the publication of NAP7.

Although the small number of deaths in low-risk patients is reassuring, it is possible that some cases of perioperative death in a low risk patient were not reported. Patients and their families

expect to receive a consistent high level of care, experience and outcome, whenever and wherever their operation happens. As anaesthetists we should remember that 'ultimately, it's the patient who takes the risk' ([Chapter 3 Lay perspective](#)).

Recommendations

National

- National organisations (eg government and royal colleges) should provide leadership and guidance regarding the management of rare and unexpected fatalities in anaesthetic and surgical practice, which should be updated regularly.
- Management of the aftermath of unexpected fatalities should be included in anaesthesia and surgical curricula.

Institutional

- Each organisation providing anaesthesia and surgery should have a policy for management of an unexpected death associated with anaesthesia and surgery. The policy should include the allocation of a senior individual to oversee care. Such a policy should include care of the deceased patient,

communication with and care of the family, and provision for staff involved being relieved from duty and subsequently provided with appropriate support mechanism.

- Mortality and morbidity processes should review all unexpected perioperative deaths, with particular focus on patients in ASA 1–2, and the learning should be shared across the whole perioperative team. Consideration should be given to reviewing significant 'near misses' to highlight learning.
- Information provided to patients as part of the consent process should routinely include the risk of death during anaesthesia and surgery.

Individual

- The individual involved in an unexpected death should be stood down from clinical duties wherever practical. Early and subsequent psychological support should be provided.

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