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Introduction to NAP7 perioperative cardiac arrest



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Perioperative cardiac arrest was the topic chosen for the Seventh National Audit Project (NAP7) following a call for proposals and a competitive process. Here we discuss why perioperative cardiac arrest was chosen for NAP7 and some background to the project. The NAP7 topic of perioperative cardiac arrest was chosen in 2018 with a plan to launch the project in 2020. NAP7 is the most ambitious and largest NAP so far. The start was delayed by the pandemic and we started in June 2021. We have worked with the UK anaesthetic community to study anaesthetic practice and perioperative cardiac arrest over a one-year period. We have made recommendations with the aim of improving how we care for our patients our prime concern. In our recommendations we have also recognised the importance of caring for our colleagues and ourselves.

Why perioperative cardiac arrest?

With the discovery of general anaesthesia came the issue of cardiac arrest during anaesthesia. In 1848, Hannah Greeney, a 15-year-old girl from Newcastle-Upon-Tyne having her toenail removed under chloroform anaesthesia was the first patient reported to have a cardiac arrest and die during general anaesthesia (Knight 2002). It was a frequent occurrence in the early days of anaesthesia and in 1897, Hill wrote, 'in a certain institution in Great Britain, in the course of a recent year, there were out of some three or four thousand administrations no fewer than twelve fatalities' (Hill 1897), a mortality rate of at least 1 in 250 cases. The belief at that time was that any death during anaesthesia was avoidable. In 1946, Human wrote about perioperative cardiac arrest (Human 1946):

Some phenomena in anaesthesia occur so rarely that no single anaesthetist is ever likely to encounter any one of them more than four or five times, and one hesitates to publish conclusions drawn from so small a record. However, if all such observations are published by all anaesthetists it will in time be possible to form a correct assessment of the value of any sign, however rare its occurrence.

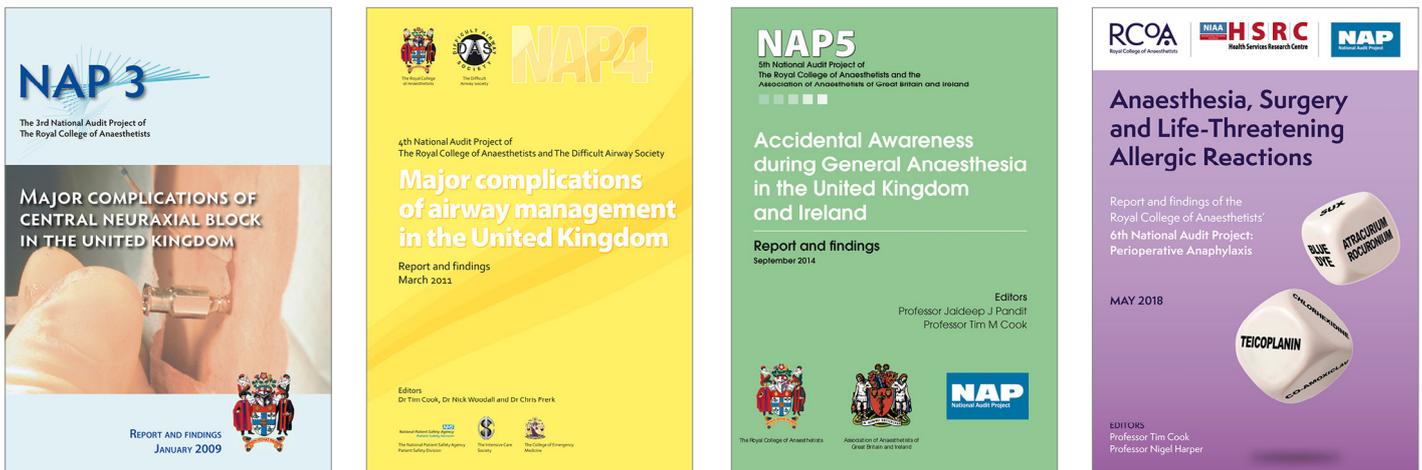
Seventy-five years later, in 2021, NAP7 set out to achieve this collaboration of anaesthetists for perioperative cardiac arrest.

The NAPs examine complications associated with anaesthesia that are rare, important to patients and anaesthetists, difficult to study by other methods and incompletely understood (Cook 2016; Figure 2.1). Although uncommon, perioperative cardiac arrest is a less specific topic than those of previous NAPs and has generated a larger number of cases. Driven by patient-reported anxieties of undergoing anaesthesia, NAP5 addressed the risks of waking up during anaesthesia (Pandit 2014). Not waking up after anaesthesia is another strong fear of anaesthesia reported by 65% of patients (Mavridou 2013) and up to 76% of those undergoing major surgery (Burkle 2014). Over 90% of anaesthetists sampled in a recent survey thought that it was an important topic for them to understand and for patient care (Association of Anaesthetists 2019a).

Billing data from the United States give an estimated intraoperative cardiac arrest rate of 5.7 per 10,000 anaesthetics, with a 35.7% in-hospital mortality rate compared with 1.3% for patients who do not arrest (Fielding-Singh 2020). Other sources suggest that it may be as low as 2.1 per 10,000 (Hur 2017) or up to 13 per 10,000 (Sebbag 2013). Variability may be due to case mix and complexity, reporting and/or coding methods, historic databases and health care setting. For instance, cardiac, transplant and vascular surgery patients have high relative risks, as do the elderly, patients with significant cardiorespiratory comorbidities and patients undergoing emergency surgery (Fielding-Singh 2020).

NAP7 fills a gap in the reporting of cardiac arrests that currently exists: UK systems exist for reporting out-of-hospital cardiac arrests (Perkins 2015) and for in-hospital cardiac arrests attended by the resuscitation team following an emergency cardiac arrest call (eg '2222' in the UK). Cardiac arrests in the operating theatre are commonly missed as, generally, no emergency call is made for a resuscitation team (Harrison 2014). NAP7 has investigated cardiac arrests occurring up to 24 hours post-procedure. Data on cardiac arrests occurring following anaesthesia are limited,

Figure 2.1 Previous NAPs



but this represents an important group of patients to study. It is clearly possible that intraoperative anaesthesia care could impact the risk of cardiac arrest in the immediate postoperative phase.

The optimal treatment of perioperative cardiac arrest is uncertain. In the UK, the Association of Anaesthetists' *Quick Reference Handbook* provides sensible immediate steps (Association of Anaesthetists 2019b) and directs readers to follow Resuscitation Council UK and European Resuscitation Council Guidelines. These guidelines are generic for all cardiac arrests and not specific to the perioperative setting. The '4Hs and 4Ts' framework to identify and treat potentially reversible causes has some limitations during anaesthesia and surgery. As one example, thrombosis, which in most settings is likely to include pulmonary embolism, during surgery may need to include bone cement implantation syndrome, gas embolism and amniotic fluid embolism. More recent European and North American guidelines based on expert consensus have begun to address intraoperative cardiac arrest treatment (Lott 2021).

The scope of NAP7

NAP7 defined perioperative cardiac arrest as 'chest compressions and/or defibrillation in a patient having a procedure under the care of an anaesthetist', in line with other cardiac arrest audits (Nolan 2014). The definition used by NAP7 accepted that some patients not in cardiac arrest as traditionally thought are included (eg severe refractory hypotension where chest compressions are started ; Harper 2019). At the other end of the spectrum, a patient in whom a decision had been made not to start cardiopulmonary resuscitation could have a true cardiac arrest but would not be reported as no chest compressions or defibrillation occurred. We used standardised international consensus definitions for studying the cardiac arrest process (Nolan 2019).

NAP7 had three parts, the Baseline Survey, the Activity Survey and case reporting (Figure 2.2), with the case reporting period launching on 16 June 2021 for one year.

After discussion with stakeholders, for NAP7, the perioperative period was defined as the start of anaesthetic intervention until 24 hours after surgery was complete. Again, while the focus was on events occurring in the operating theatre, it was important, as we learnt from NAP4, to capture events associated with anaesthesia interventions taking place elsewhere. Although capturing this activity was challenging, NAP7 provided a unique opportunity to learn lessons from anaesthetic practice beyond the theatre setting and in the period following anaesthesia. The launch poster for anaesthetic departments covered the key issues (Figure 2.3).

One of the strengths of the NAPs is the confidential reporting system. All reporting to NAP7 was confidential, such that the project team could not identify who or which hospital reported a specific case for the Activity Survey or the individual case reports. Individual case data were also anonymised.

With ever-increasing attention on patient and clinician wellness, NAP7 has provided an opportunity to assess how the high-stress situation of perioperative cardiac arrest impacted patients and clinicians both in the workplace and at home.

NAP7 was the first undertaken in the COVID-19 and post-COVID-19 periods, and the pandemic delayed the project launch by over a year and created additional challenges for everyone involved in the project. NAP7 was able to examine and report the impact of COVID-19 on anaesthetic and critical care activity and provide new learning that went beyond the original scope of the project.

Thank you to the Anaesthesia UK community

NAPs are challenging projects that require a huge amount of collaboration – they are even more challenging when there has been a pandemic during the project. It is therefore of huge credit to Anaesthesia UK that the largest and most ambitious NAP to date has been delivered. We thank all the individual anaesthetists and anaesthesia associates who took part in the Activity Survey

Figure 2.2 Three parts of NAP7

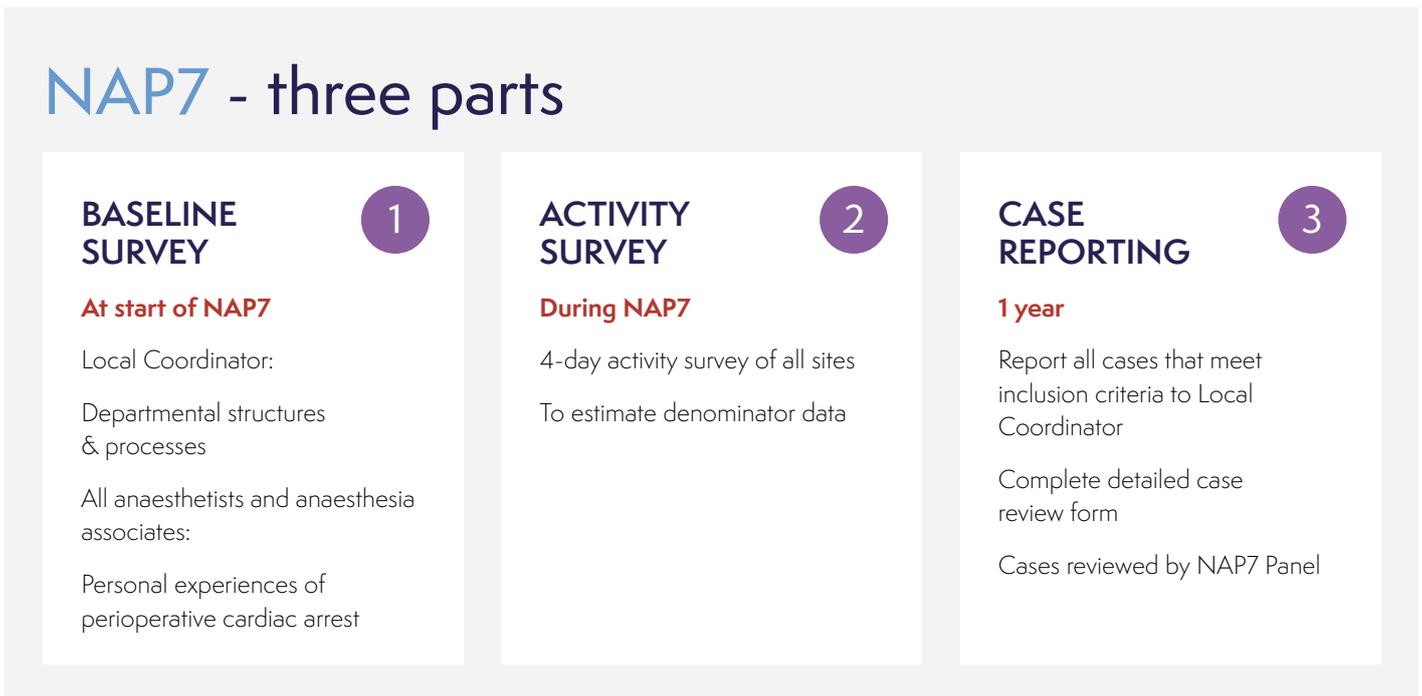


Figure 2.3 NAP7 launch poster



Perioperative Cardiac Arrest

NAP7 starts on 16 June 2021 for one year



Inclusion criteria

All new reports of Perioperative Cardiac Arrest in adults and children from start of anaesthesia care and up to 24 hours after handover (e.g. to recovery or ICU).

Which patients should be reported?

YES Did the patient have 5 or more chest compressions and/or defibrillation?

YES Were they having a procedure under the care of an anaesthetist?

NO

NO

Do NOT report

REPORT CASE via Local Coordinator

There will be a **Baseline Survey** starting on 9 June 2021.
 An **Activity Survey** will take place in September 2021.
 To report: contact your Local Coordinator. For more information contact the NAP7 Team at nap7@rcoa.ac.uk.

Your NAP7 Local Coordinator is:

and who have shared their personal experiences of perioperative cardiac arrest. We thank all the Local Coordinators and their helpers and anaesthetic departments that took part in NAP7.

We hope that NAP7 will support changes in practice concerning perioperative cardiac arrest. The NAP7 report makes recommendations aimed to improve how we care for our patients, colleagues, and ourselves – now it is time to make these happen.

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