

The United Kingdom National Audit Projects: a narrative review

G Thomas^a and TM Cook^{a*}

^aRoyal United Hospital Bath NHS Foundation Trust, Bath, UK; G. Thomas is a Core Trainee in anaesthesia; TM Cook is a Consultant in Anaesthesia and Intensive Care Medicine and Director of the National Audit Project programme, Royal College of Anaesthetists

*Corresponding author, Email: timcook007@gmail.com

The Royal College of Anaesthetists' National Audit Project (NAP) programme has been running in its current form since 2006. Since NAP3 was commissioned the NAPs have examined rare but important complications of anaesthesia and related sub-specialties. The topics covered include major complications of central neuraxial block (NAP3), major complications of airway management in hospitals (NAP4) and accidental awareness during general anaesthesia (NAP5). NAP6 is currently studying severe perioperative anaphylaxis. The NAPs have shed new light on the major complications of anaesthesia, providing both quantitative (frequencies, prevalence, incidence, risk factors) and qualitative (themes, patient stories, human factors) knowledge that has led to new learning, recommendations and changes in practice. This article describes the background, nature and processes of the NAPs.

Keywords: Audit, Anaesthesia, Central neuraxial blockade, Airway, Awareness, Complications

Introduction

The Royal College of Anaesthetists' (RCoA's) National Audit Project (NAP) programme has been running since 2003. NAP1 and NAP2 examined processes of internal anaesthetic governance but in 2006 the direction changed. Since NAP3 was commissioned the NAPs have examined rare but important complications of anaesthesia and related sub-specialties. This article describes the background, nature and processes of the NAPs.

What is a NAP?

The NAPs are a prospective, observational, registry-based cohort studies of rare events which focus on events that are:

- potentially serious for patients;
- of interest to patients;
- of interest to anaesthetists;
- incompletely studied;
- uncommon enough to require a national approach to collect adequate data.

Of note is that the NAPs are not 'audit' projects in the true sense of the word, but rather combine elements of a national survey, service evaluation and registry study. As the NAP programme has developed the projects have increasingly become quality improvement projects, with each NAP making a series of recommendations whose implementation leads to practice improvement that can be measured. The consensus-based recommendations are all based on the findings of the reports with the ultimate aim of improving safety and outcome for patients.

The NAPs are funded by anaesthetists, with topics chosen by anaesthetists, and are performed by anaesthetists for patient benefit.

Background and history

The NAPs have developed sequentially — with a step change in purpose from NAP3 onwards. NAP1 and NAP2 were national surveys of anaesthetic process examining departmental supervision (NAP1) and morbidity and mortality reporting (NAP2). Given the change in focus of NAP3–6 we will not consider NAP1 and 2 further here.

Since NAP3 the projects have followed a fairly similar pattern. Each NAP makes a coordinated effort to study a major complication of perioperative care. The topics chosen so far have been:

- NAP3: Major complications of central neuraxial blockade in the UK.
http://www.nationalauditprojects.org.uk/NAP3_home#pt
- NAP4: Major complications of airway management in the UK
http://www.nationalauditprojects.org.uk/NAP4_home#pt
- NAP5: Accidental awareness during general anaesthesia in the UK and Ireland
<http://www.nationalauditprojects.org.uk/NAP5home#pt>
- NAP6: Perioperative anaphylaxis in the UK
<http://www.nationalauditprojects.org.uk/NAP6home#pt>

In one respect the fundamental purpose of the NAPs is to 'shine a light' on selected topics; to highlight the importance of the topic, to collect data and by disseminating those data to generate discussion.

There was a degree of serendipity in the genesis of NAP3. In 2006 the RCoA was seeking to pursue a further audit project to follow NAP2 and a council member — Professor Tony Wildsmith — decided that a topic related to central neuraxial blockade (CNB) would be suitable and Dr David Counsell of the acute pain special interest group of the Pain Society approached the RCoA to

explore how complications of acute pain management could be studied. Dr Tim Cook was invited to lead this project and after a small number of meetings a novel approach to the project was agreed in principle. NAP3 was designed with two phases: a national survey of activity in the practice of CNB and a year-long national registry seeking to capture all cases of major (i.e. apparently permanent) complications of CNB.

The methodology includes both quantitative and qualitative elements. The national registry (numerator cohort) and activity survey (denominator) enables both descriptive statistics and characterisation of a large cohort of patients, which when combined produce an estimate of incidence. The detail in the registry and activity surveys enables relative risks to be estimated in areas where the evidence base was previously limited to case reports and case series. However, the qualitative information derived from the NAPs is arguably what has made these projects so valuable. The registry contains considerable details of each reported case and structured analysis of these data enables thematic analysis. This has provided new insights around potential causations and associations, potential preventative strategies and early signs of complications. These in turn have led to recommendations for future practice.

NAPs 1–4 were supported and managed by the Professional Standards Department of the Royal College of Anaesthetists. Since NAP5 the projects have been managed by the Health Services Research Centre (HSRC), with oversight by the RCoA council. The HSRC was set up in 2011 as part of the National Institute of Academic Anaesthesia (NIAA) to become a hub for world-class anaesthesia research.

The NAPs have included considerable working collaborations. NAP4 was a partnership with the Difficult Airway Society (DAS) and NAP5 was co-funded by the College and the Association of Anaesthetists of Great Britain and Ireland (AAGBI). In addition to these high-level partnerships each NAP involves wide collaboration with patient groups, numerous anaesthetic sub-specialty groups, other medical and surgical groups (e.g. NAP3 — neurologists, NAP4 — surgical specialties, NAP5 — psychologists, NAP6 — allergists and immunologists) and other professionals (e.g. NAP5 — medico-legal lawyers).

Topic selection

For NAP3 and NAP4 the topic was elected by committee decision. NAP3 arose out of discussions within College council. NAP4 was

chosen soon after two high-profile airway deaths:^{1,2} this, with interest from the DAS, made the choice of airway complications a compelling option.

In 2010 the decision was taken to put the topic for NAP 5 'out to tender' and this has become the standard process. Widespread advertising sought expressions of interest from any interested party. For each proposal a very brief formal application was requested.

For NAP5 there were 43 proposals and for NAP6 86 (including submissions from the UK, Ireland, Australia, New Zealand and Canada). For NAP5 the proposals were reviewed and shortlisted before a topic was chosen and for NAP6 an interview of shortlisted proposals was introduced. The commonest reasons to exclude proposals at an early stage was because they would be better investigated with a different research methodology or could be sufficiently studied by a smaller project run by a specialist society. The involvement and support of a specialist society generally adds to the strength of a proposal. Although the process of choosing the topic has become increasingly structured there remains an element of 'committee decision' and this approach was supported in Professor Moppet's review of the NAP process.³ The process of seeking topics is combined with seeking a clinical lead for the project and these processes typically take around one year.

Process

The basic NAP process can be summarised as follows

- baseline survey;
- national registry;
- activity survey.

The baseline survey comprises a national survey, usually sent to all anaesthetists in the UK, to establish pre-NAP knowledge and practices. The baseline survey has an important role in benchmarking practice enabling change in practice/impact to be measured after completion of the project. The baseline survey collects information from up to 12 000 anaesthetists.

The national registry is the main data-collection phase of the NAP. Cases meeting the inclusion criteria for the project are sought from all hospitals in the UK for one calendar year. Each case generates a case report form detailing the setting of the

Table 1: Inclusion criteria

Project	Inclusion criteria
NAP3	Major complications of central neuraxial block with the potential for serious patient harm, including infection, haematoma, nerve damage, and cardiovascular collapse. Wrong route errors
NAP4	Complications of airway management during anaesthesia, or in the emergency department and intensive care that led to: <ul style="list-style-type: none"> • death • brain damage • the need for an emergency surgical airway • unanticipated ICU admission, or prolongation of ICU stay
NAP5	A new report to a healthcare worker of an event where the patient (or his/her representative or carer) made a statement that he/she had been aware for a period of time when he/she expected to be unconscious
NAP6	A case of life-threatening (Grade 3–5) perioperative anaphylaxis

Table 2: Engagement in the projects

Project	Response rate to NAP census	Cases reviewed (all reports)
NAP3	100% hospitals, approx. 88% anaesthetists	84 (109)
NAP4	100% hospitals, approx.. 90% anaesthetists	184 (286)
NAP5	100% hospitals, approx.. 90% anaesthetists	321 (471)
NAP6	In progress	In progress

event, patient characteristics, management and outcome in considerable detail. The summary data derived from the national registry provide the numerator data for later analysis. Inclusion criteria for NAP3–6 are summarised in Table 1. The registry typically receives between 100 and 400 reports.

The activity survey is a survey of practice, the purpose of which is primarily to determine national activity levels of relevant practices. The activity survey is performed over a period of 2–7 days and collects data on up to 20 000 anaesthetic procedures. These data serve as a denominator for calculating incidences.

Comparison of frequency distribution of factors in the registry and activity surveys also serves to identify associations between these factors and identified complications.

The local coordinator network

Perhaps the most important component in the success of the NAPs is the local coordinator (LC) network. All hospitals are invited to appoint a senior anaesthetist to 'run' the project in their local hospital(s). This individual is responsible for implementation of all aspects of the project: advertisement, data collection for surveys, supervision and governance of reporting cases and after the project, dissemination of findings and implementation of recommendations. Clearly these individuals, who perform the role voluntarily, provide the backbone of the NAPs and without their compliance the projects would fail. For NAP3–6 all UK hospitals appointed an LC and all engaged actively with the projects, making the NAPs truly *national* audit projects. This high level of local-national engagement is one of the greatest strengths of the NAP programme (see Table 2).

Data collection: anonymity, data protection and governance

The topics under study by the NAPs are important major complications of anaesthesia and their occurrence is likely to have a significant impact on both the patient and the clinician. These are also the type of events most often associated with litigation.⁴ For these reasons, in addition to requirements for data protection, the NAPs are run on an entirely anonymous basis.

At the point when case reports are reviewed (see below) it is not possible for the reviewers to identify the patient, the clinicians or the hospital involved.

When a case is reported to the NAP project administrator a series of screening questions are asked to ensure that the case meets the inclusion criteria. Once this is confirmed, the reporter is issued with an automated unique username and password. These are then used to access the secure, encrypted, password-protected reporting website. When first logging on a mandatory password change is required. The reporter then completes the data-collection process — no patient, clinician or hospital identifiers are requested and each page reminds the reporter to avoid entering any of these. On completion of the data collection

form, the reporter closes the form and it is locked and forwarded to the NAP clinical lead. The administrator has no involvement in case review but is able to track when reports have been closed. The NAP clinical lead (and subsequently reviewers) receives no identifiable data. Thus there is no link between the clinician reporting to the NAP administration team and the subsequently reviewed clinical report.

This virtual firewall is an essential element of the reporting system as these are rare events and it is important that those involved cannot be identified, to ensure maximal uptake and reporting. It enables clinicians to report the details of these sometimes career-changing cases without fear of redress: the NAP process relies on the generosity and honesty of numerous clinicians who are willing to report their involvement in cases leading to serious complications and sometimes significant patient harm. As a national audit those running the project would not disclose information to those seeking it, but the firewall provides further security as the lack of linkage between cases means it would not even be feasible to disclose information (e.g. a case from a certain hospital) as no one would know if it had been reported, and if it had, which case report it was.

From NAP4 onwards, for cases where a reporter was uncertain as to inclusion criteria, the project provided a 'moderator'. This individual was a consultant anaesthetist available to discuss any case confidentially and advise whether it met inclusion criteria or not. The moderator was not involved in review of cases and took no other part in the project.

Negative reporting

During NAP3 and NAP4 data were collected into a simple case registry. It was therefore difficult to be certain whether any cases had been missed. Statistical analysis performed on NAP4 data (examining patterns of timing of reports, variation in number of reports by hospital and bias towards reporting by local coordinators) was consistent with the project capturing all of the data, but also consistent with up to 75% of cases having been missed.

In view of the potential for missed cases it was decided to introduce negative reporting as used by the UK Obstetric Surveillance System (UKOSS; <https://www.npeu.ox.ac.uk/ukoss>) for NAP5 and NAP6. Each month local coordinators were required to report the number of cases reported from their hospital — including when that number was zero. This mechanism serves to improve the reliability of the NAP numerator used for calculating incidences.

Review and analysis

Each case reported to a NAP undergoes structured review. Data extracted include:⁵

- whether all inclusion criteria are met;
- case summary;

- type of event (category);
- clinical outcome (degree of harm);
- contributory factors (using NPSA classification of harm);⁵
- quality of care;
- whether the event was preventable;
- potential learning points or recommendations.

The exact details of the data extracted vary with the project topic. However, the structured review ensures each case is reviewed similarly, and provides data for subsequent quantitative and qualitative analysis.

A review panel was convened for each NAP by inviting relevant specialty and sub-specialty organisations to nominate individuals to represent them. Lay and trainee representatives were similarly invited. Thus the review panel was chosen not by the NAP team but by relevant stakeholders. Review was performed face-to-face and all data and discussions kept confidential to the meeting.

The review panel meets monthly to review cases. At each meeting the reviewers were advised to be aware of the risks of hindsight bias⁶ and outcome bias.⁷ Hindsight bias is the exaggerated belief (when reviewing an event that has already occurred) that a poor outcome would have been predicted while outcome bias recognises that the knowledge of a poor outcome when reviewing an event tends to lead to a 'harsh judgement' regarding quality of care.

Each case is reviewed twice. First a small review group — a minimum of four and often six — reviews each case to extract data as above. The groups are balanced to ensure cross-specialty and lay inclusion. When this phase is complete the case is presented to a larger group of around 20 reviewers. The larger group confirms or moderates the small group's analyses of the case. It is well recognised that if two groups review a medico-legal case they each reach consensus quickly; however, those consensus decisions are often different from each other.⁸ This likely arises because of most individuals' desire to reach agreement and consensus and perhaps where a group is for example dominated by an alpha member.^{9,10} The large group signs off the structured output from each case. Outcome data from each case are then entered into a database for subsequent analysis.

On completion of the analysis phase of review the panel discuss themes and findings and works towards consideration of findings, learning points and recommendations.

Report writing

The reports and academic papers are written by the review panel supported by an editorial team. For the report a structured approach has been adopted, each chapter being presented as follows.

- *Headline.* A summary of the new knowledge provided by the project in this area of practice.
- *What we already know.* A brief editorial-style summary of knowledge in the relevant area before the NAP.
- *Case review.* A description of relevant cases, particularly those illustrating important themes in the area of practice under discussion.
- *Numerical analysis.* A description of the quantitative findings in that area of practice.

- *Discussion.* An analysis of how the data and thematic analysis arising from the NAP advances or modifies our knowledge, including uncertainties and limitations to our knowledge.
- *Learning points.* Key new findings.
- *Recommendations.* In NAP5 these were divided into 'Recommendations for Research' and 'Recommendations for Clinical Practice'.
- *References.*

Each chapter is illustrated and contains vignettes. Both are important to improve the accessibility of the report. The vignettes — or patient stories — are known to be popular with readers and describe illustrative cases. Importantly they are true descriptions of reported cases (i.e. not modified or combined) but are stripped of patient detail to maintain anonymity.

In NAP3 the chapters contained only 'learning points'. Early in the NAP4 process the possibility of making recommendations was considered — a lay member of the review panel stated that: 'Learning points are for doctors to read and ignore, recommendations are for organisations to implement.' From NAP4 onwards each report has included recommendations.

It is important that recommendations, which are made by consensus, are always based on cases reported to that NAP — they are not admissible if simply an opinion of review members — but require supportive evidence from the project itself. Recommendations are generally presented in tiers:

individual: requiring action by individual practitioners;
departmental: requiring action by a hospital department;
organisational: requiring action by a hospital;
national: requiring action by a national body such as the Royal College or similar.

While the NAP team has no regulatory authority to impose its recommendations it carries the authority of the project and those backing it. The recommendations are widely quoted and have been included in RCoA and other organisations' regulatory reports^{11,12} as well as finding their way into medico-legal settings.

Results

It is not the purpose of this article to describe in any detail the results of the NAPs: these are all available in numerous forms on the NAP website. However, some broad comments are merited.

The NAPs have shone a focus on the topics studied. They have provided new quantitative and qualitative information in the areas studied.

NAP3 (http://www.nationalauditprojects.org.uk/NAP3_home#pt)^{13,14} included 52 cases meeting inclusion criteria. It reported for the first time the number of CNB performed annually in the UK (≈700 000) and the distribution by type (spinal 46%, epidural 41%) and indication (obstetric 45%, perioperative 44%). It estimated the risk of permanent injury following CNB as pessimistically 1 in 24 000 and optimistically 1 in 51 000 and of paraplegia or death as pessimistically 1 in 55 000 and optimistically 1 in 142 000. It identified perioperative epidurals as the indication/procedure of highest risk (comprising 1 in 7 CNBs but accounting for half of all major complications, risk of permanent harm pessimistically 1 in 6 000, optimistically 1 in 12 000). It focused on vertebral canal haematoma, vertebral canal abscess and vertebral ischaemia as the prime causes of permanent CNB-

related harm. It identified delays (organisational and individual) in identifying and acting on signs of neurological compromise as a contributory factor in cases of avoidable patient harm.

NAP4 (http://www.nationalauditprojects.org.uk/NAP4_home#pt)^{15–17} included 184 cases meeting inclusion criteria. It reported for the first time the number of general anaesthetics delivered annually in the UK (2.9 million) and the type of airway used (supraglottic airway 56%, tracheal tube 38%, face mask 5%). It reported an incidence of major airway complications of anaesthesia of 1 in 22 000 and mortality of 1 in 180 000. It identified mortality rates by location — anaesthesia 14% of events leading to death/brain damage, emergency department 33% and ICU 61%. It identified obesity as a major patient factor and aspiration as the single commonest cause of airway-related death or brain damage during anaesthesia. It highlighted issues around airway assessment, decision-making, training and communication as major contributors to airway complications. It reported a > 60% failure rate during front of neck airway rescue by anaesthetists. It identified areas outside theatres and especially ICU as places of relative danger for airway complications and obesity and the presence of a tracheostomy as risk factors in ICU. It identified failure to use capnography as a contributor to 80% of airway deaths in ICU. It reported that overall care was good in fewer than 1 in 5 reported cases. NAP4 made 141 recommendations.

NAP5 (<http://www.nationalauditprojects.org.uk/NAP5home#pt>)^{16–28} included more than 260 cases meeting inclusion criteria including 141 certain/probable reports of accidental awareness during general anaesthesia (AAGA). NAP5 reported an estimated incidence of patient reports of AAGA of 1 in 19 000 anaesthetics, ranging from 1 in 8 000 when NMB was used to 1 in 136 000 without it. It reported that most events are brief (< 5 minutes), most occur before or after surgery (31% during surgery), and approximately half lead to distress and this is to a great extent driven by the use of neuromuscular blocking drugs (NMBs). Only 18% reported pain during AAGA. Caesarean section (1 in 670) and cardiothoracic anaesthesia (1 in 8 600) were identified as high-risk surgical specialities. NAP5 redefined risk factors for AAGA: female gender, age (younger adults but not children), obesity, previous AAGA, use of NMB, thiopental, total intravenous anaesthesia, emergencies and RSI and difficult airway management, and identified the following as not risk factors for AAGA: ASA physical status, race, nitrous oxide. Approximately 40% of reports were associated with significant psychological sequelae and this was associated with distress at the time of the event. Cases of brief awake paralysis due to drug errors led to the highest psychological morbidity. Reports of AAGA after sedation comprised 20% of reports to NAP5 with an incidence as high as after general anaesthesia. Approximately 70% of reports described avoidable events. NAP5 made 65 recommendations.

Dissemination

The dissemination of the National Audit Projects has been one of its most important aspects. All output from the projects is published on a website and made freely available (http://www.nationalauditprojects.org.uk/NAP_home).

The projects lead to the publication of a Report of Findings^{29–31} and summary papers in the academic literature.^{13–28} These are published concurrently with a launch event. The process of dissemination, like many other aspects of the projects, has matured and improved sequentially.

NAP3 was launched as a single lecture in a safety meeting. A single paper was published for the activity survey¹³ and project report.¹⁴ NAP4 and NAP5 were launched as whole-day events

and NAP5 even had a public launch including poetry and music commissioned for the launch as part of a public engagement in science initiative. NAP5 produced seven separate papers, most of which were published in both the British Journal of Anaesthesia and Anaesthesia.^{16–28} Each project has been supported by numerous editorials — in the case of NAP5 seven in various journals.

In addition to publication of written material the projects are disseminated as widely as possible.

Taking NAP5 as an example the project website includes the following, all in a downloadable form:

- full project report (<http://www.nationalauditprojects.org.uk/NAP5report#pt>);
- individual project chapters (<http://www.nationalauditprojects.org.uk/NAP5report#pt>);
- executive summary (<http://www.nationalauditprojects.org.uk/NAP5report#pt>);
- recommendations (<http://www.nationalauditprojects.org.uk/Other-NAP5-Presentations#pt>);
- patients and carers summary (<http://www.nationalauditprojects.org.uk/For-Patients#pt>);
- slide-sets of each launch talk (<http://www.nationalauditprojects.org.uk/article.php?newsid=1229>);
- podcasts of each launch talk (<http://www.nationalauditprojects.org.uk/Video-1#pt>);
- a recommended pathway for management of awareness (<http://www.nationalauditprojects.org.uk/NAP5-Anaesthesia-Awareness-Pathway#pt>);
- additional summary slide-sets (<http://www.nationalauditprojects.org.uk/article.php?newsid=1234>).

The launch of each NAP includes press briefings and each NAP has led to global news reports — for example NAP5 was featured on > 400 news websites in > 50 countries in the weeks after its launch.

The project leads and review panels actively engage in dissemination and lectures are given nationally and internationally on the projects. Finally i-Phone 'apps' were produced for NAP3 and NAP5 to enhance the immediate availability of the data and bring them to the patient's bedside.

Impact

It is difficult to measure the precise impact the NAPs have had but certain metrics are available.

As a comparator it has been reported that it can take up to 13 years for high-quality published literature to lead to changes in practice.³²

The projects reports were widely read (e.g. NAP3 > 15 000 downloads in > 50 countries in the three months after publication, NAP4 > 25 000 downloads in > 30 countries) and continue to be widely accessed (e.g. NAP4 webpages: up to 1 000 hits per month from up to 30 countries). The main papers are extensively cited (the NAP3 paper and the two main NAP4 papers are currently ranked 2nd, 5th and 7th most cited articles on the British Journal of Anaesthesia website.³³ The articles led to numerous editorials (NAP3 — one, NAP4 — two, NAP5 — seven) and items of correspondence after publication (NAP3 — five, NAP4 — eight, NAP5 — six).

Within four months of its publication national and international guidance on capnography use had been altered by the AAGBI,³⁴ the Intensive Care Society,³⁵ and the European Board of Anaesthesiology.³⁶ NAP4 has been a major influence in the drawing up of the recently published DAS 2015 guidelines for difficult intubation³⁷ and NAP5 in the standards for minimum monitoring guidelines.³⁸

As a direct result of NAP4 the RCoA established Departmental Airway Leads to improve training, compliance with best practice and reliability of airway care throughout hospitals:³⁹ more than 90% of UK hospitals now have an individual in this post. The Airway Leads are supported by resources developed at both the RCoA (<http://www.rcoa.ac.uk/clinical-standards-quality/rcoa-das-airway-leads>) and the DAS (<https://www.das.uk.com/content/das-rcoa-airway-lead-forum>).

One year after publication of NAP3 more than 50% of UK hospitals and individuals had changed aspects of their practice in managing epidurals and spinals as a consequence of the report.⁴⁰

Two years after publication of NAP4 98% of UK hospitals responding to a survey (98% of anaesthetic departments, 95% of ICUs, 80% of emergency departments) had changed practices as a direct result of NAP4 recommendations (authors' data).

As NAP5 has only recently been published it is too early to assess its impact. Importantly the report almost doubles the number of cases of AAGA in the literature. The NAP5 report included a structured plan for management of cases of AAGA, the Anaesthesia Awareness Support Pack to redress the distinct lack of policies or protocols for management of reports of AAGA.⁴¹ Evaluation of the impact of NAP5 is due to be performed.

Of interest is that several countries have considered repeating the project to generate locally relevant data and in some cases projects based on NAPs are under way.

Time course

The NAPs currently run to an approximately 3½ to 4-year cycle.

Phase 1 (18 months): topic selection; appointment of clinical lead and steering/review panel; design of data-collection tool and IT platforms: regulatory approvals: creation of local coordinator network; advertising.

Phase 2 (15 months): data collection from registry (1 year with data collection tool open for 12–18 months); baseline and activity surveys.

Phase 3 (15 months): case review and analysis.

Phase 4 (9 months): report writing and publication.

Phase 5 (6 months): dissemination, efforts to embed recommendations and change practice.

Phases 2–4 overlap such that the time from project launch and first data collection to publication of the full report is approximately 30 months. During the final year of any given NAP phase 1 of the next NAP is under way so that the interval between publication of a NAP report and the next NAP launch is approximately 9–12 months.

Evolution

Over a relatively short period of time the NAPs have evolved from an idea to a structured programme of projects of national and arguably international importance. The key evolutionary steps are as follows.

NAP3. This was the origin of the NAPs as they now exist. This project included the main elements of a national survey of activity, a one-year confidential registry, structured multi-specialty review and analysis and a clinical report.

NAP4. Electronic case reporting was introduced. The project expanded from anaesthesia to include the emergency department and intensive care. An electronic firewall between reporter/administrator and reviewers was introduced. Recommendations were made for the first time.

NAP5. The project expanded geographically to include Ireland. Baseline surveys were introduced to identify existing knowledge and practices. The UKOSS system of monthly confirmation of cases reported was introduced. The report included recommendations for research for the first time.

NAP6. This was the first NAP to co-partner with a non-anaesthesia based specialty (allergy and immunology). Baseline survey was moved from paper to electronic returns.

Costs

The NAPs are predominantly funded by the Royal College of Anaesthetists. These funds in turn come from members' subscription fees so that the NAPs are directly funded by anaesthetists, without any major external funding. Contributions to costs for NAP3 came from the National Patient Safety Agency, for NAP4 from the DAS and NAP5 was jointly funded by the RCoA and AAGBI. Directly identifiable costs are

- NAP3: £50 000;
- NAP4: £60 000;
- NAP5: £150 000;
- NAP6: estimated £160 000.

The increases in costs between NAP4 and NAP5 relate in part to the increasing complexity of electronic solutions, associated security and the costs of a larger review panel.

It must be acknowledged that much of the cost of running the NAPs is absorbed into the costs of running a National Health Service and the projects are also supported by individuals giving their time for free. If the costs of the time spent by individual anaesthetists, local reporter/coordinators, review panellists, project administrators and leads were fully funded the true cost might approach £1 million.

Most randomised clinical trials, often setting out to ask a single clinical question, cost upwards of £5 million and on this basis the NAPs are likely to be judged good value for money.³

Successes and limitations

At their worst the NAPs are a series of case reports on the basis of which consensus (low evidence grade) recommendations for practice are made by a group of peers. However, the breadth and novelty of the NAPs means they are likely viewed in a better light: the NAPs provide new insights into current anaesthetic practice,

new numerators, new denominators, new incidences, new patient stories and new focuses on old problems.

In 2013 the RCoA commissioned an independent review of NAP3 and NAP4.³ The executive summary of this report states: 'The National Audit Projects are internationally important reports with the potential significant impact on patient outcome and experience during and after anaesthesia and surgery.... The chosen topics are relevant to patients, anaesthetists and the wider health service.... The NAPs are of generally very high quality in terms of process, data collection and analysis.... The NAPs represent good value for money for the Royal College of Anaesthetists and the anaesthesia profession as a whole.

The report recommended that: 'The dissemination process should be an integral part of the project from the start.... Consideration should be given to the role of repeating/closing the loop at an appropriate interval ... and consideration should be given to a defined parallel process for producing recommendations for practice.... The possibility of exporting the NAP "brand" to other countries should be considered.'

Funding – None.

Conflicts – T.M. Cook is director of the Royal College of Anaesthetists National Audit Project programme. G. Thomas declares no potential conflict of interest.

References

1. Harmer M. Independent Review on the care given to Mrs Elaine Bromiley on 29 March 2005. http://www.chfg.org/resources/07_qrt04/Anonymous_Report_Verdict_and_Corrected_Timeline_Oct_07.pdf (accessed 31 December 2015)
2. Ruxton LM. Fatal Accident inquiry into the death of Gordon Ewing. Sheriffdom of Glasgow and Strathkelvin 2010 <https://www.scotcourts.gov.uk/search-judgments/judgment?id=328e86a6-8980-69d2-b500-ff0000d74aa7> (accessed 31 December 2015).
3. Moppett I. External review of National Audit Projects 3&4. Available from <http://www.nationalauditprojects.org.uk/Moppett-Review#pt> (accessed 31 Dec 2015).
4. Cook TM, Bl L, Mihai R, et al. Litigation related to anaesthesia: an analysis of claims against the NHS in England 1995-2007. *Anaesthesia* 2009;64: 706–18.
5. Agency National Patient Safety. A Risk Matrix for Risk Managers. London: NPSA; 2008.
6. Henriksen K, Kaplan H. Hindsight bias: outcome knowledge and adaptive learning. *Quality, Safety and Health Care* 2003; 122(supp 2): ii 46–50.
7. Caplan RA, et al. Effect of outcome on physician judgements of appropriateness of care. *Journal of the American Medical Association* 1991;265: 1957–60.
8. Crosby E. Medical malpractice and anesthesiology: literature review and role of the expert witness. *Canadian Journal of Anaesthesia* 2007;54: 227–41.
9. Whyte WH. "Groupthink". *Fortune* magazine. 1952, March. Pages 114–117.
10. Janis IL. *Victims of Groupthink: a Psychological Study of Foreign-Policy Decisions and Fiascoes*. Boston, MA: Houghton Mifflin; 1972 ISBN 0-395-14002-1.
11. Guidelines for the Provision of Anaesthetic Services (GPAS). Royal College of Anaesthetists 2015 <https://www.rcoa.ac.uk/document-store/guidelines-the-provision-of-anaesthetic-services-gpas-2015> (accessed 31 December 2015).
12. Anaesthesia Clinical Services Accreditation <https://www.rcoa.ac.uk/acsa/acsa-standards> (accessed 31 December 2015).
13. Cook TM, Mihai R, Wildsmith A. A census of UK neuraxial blockade: results of the snapshot phase of the 3rd National Anaesthesia Project. *Anaesthesia* 2008;63: 143–6.
14. Cook TM, Counsell D, Wildsmith JAW. On behalf of the Royal College of Anaesthetists Third National Audit Project. Major complications of central neuraxial block: report on the 3rd National Audit Project of the Royal College of Anaesthetists. *British Journal of Anaesthesia* 2009;102: 179–90.
15. Woodall N, Cook TM. A national census of airway management techniques employed during anaesthesia in the UK: results of the first phase of the 4th National Audit Project at the Royal College of Anaesthetists. *British Journal of Anaesthesia* 2011;106: 266–71.
16. Cook TM, Woodall N, Frerk C. Major complications of airway management in the UK: results of the 4th National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 1 Anaesthesia. *British Journal of Anaesthesia* 2011;106: 617–31.
17. Cook TM, Woodall N, Harper J, et al. Major complications of airway management in the UK: results of the 4th National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 2 Intensive Care and Emergency Department. *British Journal of Anaesthesia* 2011;106: 632–42.
18. Pandit JJ, Cook TM, Jonker W, et al. Incidence of accidental awareness during general anaesthesia, as known to anaesthetists: Baseline Survey results of the 5th National Audit Project of the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. *Anaesthesia* 2013;68: 343–53.
19. Pandit JJ, Cook TM, Jonker W, et al. Incidence of accidental awareness during general anaesthesia, as known to anaesthetists: Baseline Survey results of the 5th National Audit Project of the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. *British Journal of Anaesthesia* 2013;110: 501–9.
20. Jonker WR, Hanumanthiah D, Ryan T, et al. On behalf of the NAP5 Steering Panel. Who operates when, where and on whom? A survey of anaesthetic-surgical activity in Ireland as denominator of NAP5. *Anaesthesia* 2014; 69: 961–8.
21. Jonker WR, Hanumanthiah D, O'Sullivan EP, et al. On behalf of the 5th National Audit Project (NAP5) of the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland, and the College of Anaesthetists of Ireland. A national survey (NAP5-Ireland baseline) to estimate an annual incidence of accidental awareness during general anaesthesia in Ireland. *Anaesthesia* 2014;69: 969–76.
22. Pandit JJ, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: protocol, methods, and analysis of data. *British Journal of Anaesthesia* 2014;113: 540–8.
23. Pandit JJ, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. The 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: protocol, methods and analysis of data. *Anaesthesia* 2014;69: 1078–88.
24. Pandit JJ, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: summary of main findings and risk factors. *British Journal of Anaesthesia* 2014;113: 549–59.
25. Pandit JJ, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. The 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: summary of main findings and risk factors. *Anaesthesia* 2014;69: 1089–101.
26. Cook TM, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: patient experiences, human factors, sedation, consent, and medicolegal issues. *British Journal of Anaesthesia* 2014;113: 560–74.
27. Cook TM, Andrade J, Bogod DG, et al. Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland. The 5th National Audit Project (NAP5) on accidental awareness during general anaesthesia: patient experiences, human factors, sedation, consent and medicolegal issues. *Anaesthesia* 2014;69: 1102–16.

28. Sury MJR, Palmer JHMacG, Cook TM, et al. The state of UK anaesthesia: a survey of National Health Service Activity in 2013. *British Journal of Anaesthesia* 2014;113: 575–84.
29. Third National Audit project of the Royal College of Anaesthetists. Major Complications of Central Neuraxial Block in the United Kingdom. Report and Findings. Editors Cook TM, JA Wildsmith, D Counsell. Royal College of Anaesthetists, London. January 2009.
30. Fourth National Audit Project of the Royal College of Anaesthetists and Difficult Airway Society. Major Complications of Airway management in the United Kingdom. Report and Findings. Editors Cook TM, Woodall N, Frerk C. March 2011. ISBN 978-1-9000936-03-3 Royal College of Anaesthetists. London (<http://www.rcoa.ac.uk/document-store/nap4-full-report>)
31. Fifth National Audit Project of the Royal College of Anaesthetists and Association of Anaesthetists of Great Britain and Ireland: *Accidental awareness during general anaesthesia in the UK and Ireland*. Editors Pandit JJ, Cook TM, Sept 2014. Royal College of Anaesthetists. London ISBN 978-1-900936-11-8
32. Morris ZS, Wooding S, Grant J. The answer is 17 years, what is the question: understanding time lags in translational research. *J R Soc Med*. 2011;104: 510–20.
33. Most cited articles: *British Journal of Anaesthesia* <http://bjaoxfordjournals.org/content/early/2011/03/25/bja.aer058.full.pdf+html>
34. The use of capnography outside the operating theatre. AAGBI Safety Statement. London: Association of Anaesthetists of Great Britain & Ireland, 2011. http://www.aagbi.org/sites/default/files/Capnographyaagbi090711AJH%5B1%5D_1.pdf (accessed 31 December 2015)
35. Thomas AN, Harvey DJR, Hurst T. Capnography guidelines. The Intensive Care Society. Available from http://www.ics.ac.uk/education/capnography_guidelines (accessed October 2012, subsequently revised).
36. European Section and Board of Anaesthesiology UEMS. EBA Recommendation for the Use of Capnography. <http://www.eba-uems.eu/resources/PDFS/EBA-UEMS-recommendation-for-use-of-Capnography.pdf> (accessed 31 December 2015).
37. Frerk C, Mitchell VS, McNarry AF, et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *British Journal of Anaesthesia* 2015;115: 827–48.
38. Checketts MR, Alladi R, Ferguson K, et al. Recommendations for standards of monitoring during anaesthesia and recovery 2015: Association of Anaesthetists of Great Britain and Ireland. *Anaesthesia* 2016;71: 85–93.
39. Cook TM, Woodall N, Frerk C, et al. The College Department Airway Lead and NAP4 follow-up surveys: an announcement. *Bulletin of the Royal College of Anaesthetists* 2012;76: 37–8.
40. Cook TM, Payne S, Anns J. One year on from NAP3: dissemination and clinical changes after the Third National Audit Project of the Royal College of Anaesthetists. *British Journal of Anaesthesia* 2011;107: 978–82.
41. Pandit JJ, Cook TM. Updates to NAP5: Anaesthesia Awareness Support pack. *Bulletin of the Royal College of Anaesthetists* 2015; 92: 23-4. Available from <http://www.nationalauditprojects.org.uk/NAP5-Anaesthesia-Awareness-Pathway#pt> (Accessed 31 December 2015)

Received: 03-01-2016 Accepted: 05-02-2016