CHAPTER
26

NAP5 Baseline Survey in the UK


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HEADLINE

26.1 We issued a questionnaire to every Consultant and Staff/Associate Specialist anaesthetist in the United Kingdom. The survey was designed to ascertain the number of new cases of accidental awareness which became known to them in 2011, for patients under their direct or supervised care, and also to estimate how many cases they had experienced during their careers. The survey also asked about use of monitoring designed to measure the depth of anaesthesia. All Local Co-ordinators responsible for each of 329 hospitals in the UK responded, as did 7125 anaesthetists (82%). There were 153 new cases of accidental awareness notified to respondents in 2011; an estimated incidence of 1:15,414, lower than the 1-2:1,000 previously reported in prospective clinical trials. Almost half the cases (72, 47%) occurred at or after induction of anaesthesia but before surgery, with 46 (30%) occurring during surgery and 35 (23%) after surgery before full recovery. Awareness during surgery appeared to lead more frequently to pain or distress (62% vs 28% and 23% for experiences at induction and emergence, respectively). Depth of anaesthesia monitors were available in 164 (62%) of centres, but routinely used by only 132 (1.8%) of anaesthetists.

The contents of this chapter have been published as Pandit JJ, Cook TM, Jonker WR, O'Sullivan E. A national survey of anaesthetists (NAP5 Baseline) to estimate an annual incidence of accidental awareness during general anaesthesia in the UK. *Anaesthesia* 2013;**68**:343–53 and as Pandit JJ, Cook TM, Jonker WR, O'Sullivan E. A national survey of anaesthetists (NAP5 Baseline) to estimate an annual incidence of accidental awareness during general anaesthesia in the UK. *British Journal of Anaesthesia* 2013;**110**:501–509. This chapter should be referenced as such. All figures in this chapter are reproduced with permission, and any portions of text reproduced with permission of the NAP5 Publications and Dissemination Panel, which includes the editors-in-chief of the respective journals, the *British Journal of Anaesthesia* and *Anaesthesia*.

BACKGROUND

26.2 As a prelude to the prospective NAP5 study, we administered a baseline survey to all consultant and career grade (Staff and Associate Specialist, SAS) anaesthetists working in NHS hospitals. The focus of our interest was to assess how many cases of AAGA had come to the knowledge of the senior UK anaesthetic community during the preceding calendar year. These data were essential to the design of the prospective phase of NAP5. Additionally, we wished to estimate the historical experience of AAGA cases during respondents' anaesthetic careers and also to ascertain some demographic data about years of senior practice. Finally, we wished to know about the availability and use of depth of anaesthesia monitors.

METHODS

26.3 Each of the 329 identified centres in the UK volunteered a Local Co-ordinator (LC) who distributed a data collection form (Figure 26.1) to all consultant and SAS anaesthetists in their institution. LCs then collated responses and populated a data summary form (Figure 26.2), which was returned to the NAP5 team. LCs could contact the NAP5 clinical lead for further advice (which was also provided via the NAP5 website), and in turn, the clinical lead could contact the LCs for clarification of data entries. Questions asked included: the department's total number of consultants and SAS staff and their years of experience as seniors; the number of new cases of AAGA (under their direct or supervised care) of which they were notified during 2011; availability and use of depth of anaesthesia monitoring; and whether the hospital had policies for prevention or management of AAGA.

26.4 Since there was no hypothesis test, there were no statistical comparisons, but continuous data were described as median, interquartile range and categorical data with 95% confidence limits for binomial or Poisson distributions, as appropriate. Poisson and binomial distributions were almost identical so only the Poisson is included. Where illustrative, the goodness of fit of the data to a Poisson distribution was estimated by the least squares regression of actual vs modelled data.

Figure 26.1. Abridged version of Form 1 as sent to individual anaesthetists. The consultant returned this form to their Local Co-ordinator for collation. AAGA was defined as any instance of recall of intra-operative events during general anaesthesia, induction or emergence that occurred with administration of anaesthesia.

1. During 2011, how many new instances of accidental awareness during anaesthesia have you personally had to deal with for patients under your care or care of someone you were supervising?

a) What was the approximate age range of these instances?

Approx age	0-15	16-24	25-44	45-64	>65
Number					

b) How many of these were reports volunteered by the patient vs ascertained only on questioning?

Approx age	0-15	16-24	25-44	45-64	>65
Number volunteered					
Ascertained on questioning					

c) How many of these were brief periods of awareness before surgery (e.g. due to difficult intubation, syringe swaps, drugs given in wrong order, etc), awareness of intra-operative events, or awareness of events on emergence?

Approx age	0-15	16-24	25-44	45-64	>65
Recall of events during induction and before surgery					
Recall of events during surgery					
Aware after surgery and before full emergence					

d) How many of these cases of awareness also involved physical pain or psychological hurt?

Approx age	0-15	16-24	25-44	45-64	>65
Number					

e) How many of these reports led or is leading to a formal complaint to the hospital or litigation?

Approx age	0-15	16-24	25-44	45-64	>65
Formal complaint					
Litigation					

2. Do you use any depth of anaesthesia monitors and if so, which?

	BIS	Evoked potential	Entropy	Narcotrend	Isolated forearm	Other
Routinely						
Selected cases						
Never						

3. Approximately how many cases of accidental awareness occurring directly under your care (including supervising a trainee) as consultant/career grade during your career in UK practice have you experienced?

Yrs of anaesthesia practice (as consultant, including locum or as non-consultant career grade)	Yrs
Total no. of cases of accidental awareness	N =

Figure 26.2. Abridged version of Form 2 as completed by Local Co-ordinators using individuals Form 1 returns, and submitted to NAP5.

Question 1:

- How many consultant anaesthetists (incl. locums) are there in your department?
- How many have responded to the individual questionnaires?
- How many SAS doctors are there in your dept?
- How many have responded to the individual questionnaires?
- Over this last year 2011, how many instances of accidental awareness during anaesthesia have been reported by (i) consultants/ SAS alone or supervising trainees (ii) unsupervised trainees

Question 2: What was the approx age of the patient in these reports?

Approx age	0-15	16-24	25-44	45-64	>65
Number					

How many of these were reports volunteered by the patient vs ascertained only on questioning?

Approx age	0-15	16-24	25-44	45-64	>65
Number volunteered					
Ascertained on questioning					

How many of these were brief periods of awareness before surgery (e.g. due to difficult intubation, syringe swaps, drugs given in wrong order, etc), awareness of intra-operative events, or awareness of events on emergence?

Approx age	0-15	16-24	25-44	45-64	>65
Recall of events during induction and before surgery					
Recall of events during surgery					
Aware after surgery and before full emergence					

How many of these cases of awareness also involved, physical pain or psychological hurt?

Approx age	0-15	16-24	25-44	45-64	>65
Number					

How many of these reports led or is leading to a formal complaint to the hospital or litigation?

Approx age	0-15	16-24	25-44	45-64	>65
Formal complaint					
Litigation					

Question 3: Do you have any depth of anaesthesia monitors available for use in your hospital?: If yes, how many (n) consultants and career grades use the following?

	BIS	Evoked potential	Entropy	Narcotrend	Isolated forearm	Other
Routinely						
Selected cases						
Never						

Question 4: Consultant/career grade anaesthetic experience of those who have responded to Form 1:

	Sum of yrs experience	Mean (sum divided by n responding)	Range of experience (min yrs – max yrs)
Years of experience			

Question 5: How many consultants/SAS doctors in your department have ever personally identified or witnessed a case of accidental awareness during anaesthesia, under their care, during their consultant/career grade careers in UK practice?

	0 cases	1 case	2 cases	3 cases	4 cases	5 cases	6 cases	7 cases	>7 cases
No. of respondents									

Question 6: Trust/Board Policies – please provide copies if 'yes':

To **prevent** awareness (e.g. identify high risk patients, use of monitors or specific drugs?	Yes/No
To **manage** awareness if reported?	Yes/No

NAP5 RESULTS AND NUMERICAL ANALYSIS

26.5 All LCs replied on behalf of their centre, and collected data from a total of 7125 (82%) anaesthetists (Table 26.1).

26.6 Figure 26.3 shows the demography of staffing across centres: in 12 of 265 (5%) of centres, the number of SAS doctors was equal to or greater than consultant anaesthetists.

26.7 There was a variety of experience in terms of years worked by respondents (Figure 26.4); the crude sum of years' experience was 81 147 years.

26.8 A total of 153 new cases of AAGA were reported in the year 2011 to the anaesthetists who responded to this survey. Most patients experiencing AAGA were young or middle-aged adults (Figure 26.5A); the details of more than twice as many cases were volunteered to anaesthetists by patients (114, 75%), compared to those established by direct questioning (39, 25%, Figure 26.5B). Most cases related to experiences of AAGA at or soon after induction of anaesthesia but before surgery commenced (72, 47%: Figure 26.5C), followed by experiences of AAGA during surgery (46, 30%) and lastly, by reports of awareness after completion of surgery but before full emergence (35, 23%). Indeed, the combined total for experiences during induction and emergence (i.e. the 'dynamic phases' of anaesthesia) was twice as high (107, 70% of cases) as for experiences during surgery (the 'static phase'; 46, 30%). A minority (58, 38%) of cases of AAGA suffered pain or distress as part of their experience, and even smaller proportions went on formally to complain (29, 19%) or begin legal proceedings (6, 4%; Figure 26.5D).

Figure 26.3. Demography of staffing in UK hospitals.Top panel: histogram of number of SAS, consultant and total anaesthetists across hospitals (trusts); middle panel: SAS anaesthetists as % of consultants across hospitals (trusts); bottom panel: absolute number of SAS vs consultant anaesthetists across hospitals (trusts)

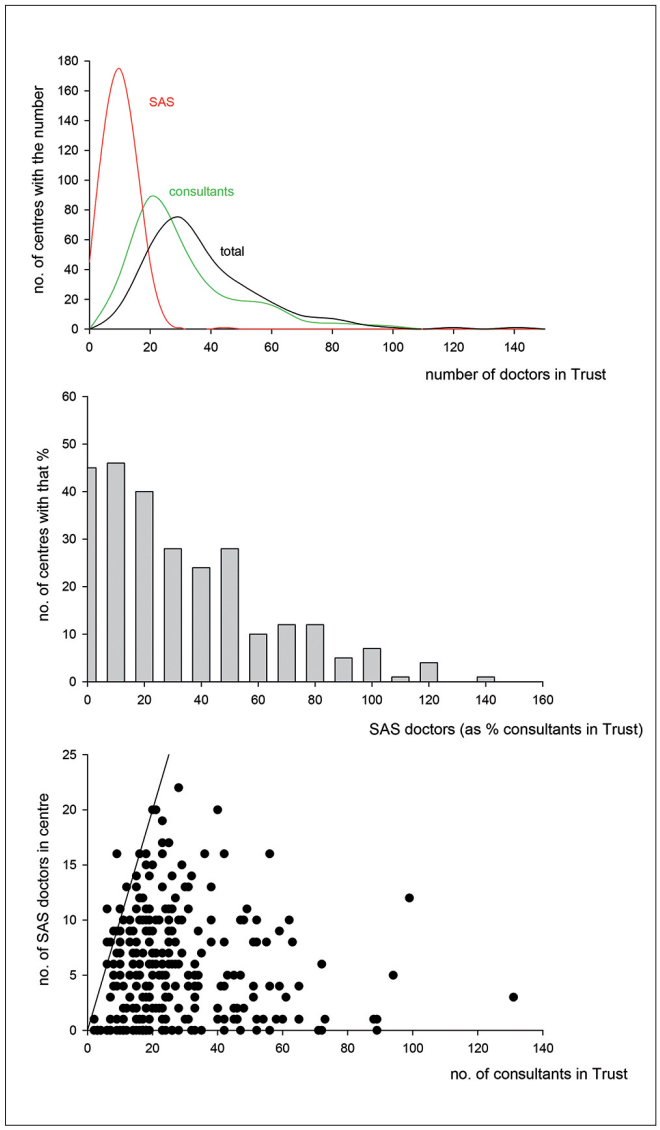
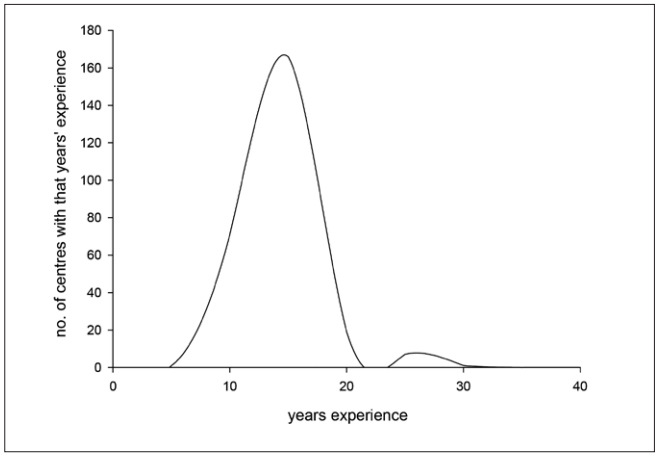


Table 26.1 Response rates from 265 Local Co-ordinators (responsible for 329 UK hospitals; 100% response rate). All centres had consultant staff, so the data for consultants use 265 as denominator; *45 centres had no Staff and Associate Specialist (SAS) anaesthetists, so the denominator used here is 220. Values are median (IQR [range])

	Consultants		SAS*		Total senior staff	
Totals	Total (n = 7,140)	Responding (n = 5,951; 83%)	Total (n = 1,532)	Responding (n = 1,174; 77%)	Total (n = 8,672)	Responding (n = 7,125; 82%)
Staff response/ centre*; n	22 (15-33 [2-131])	19 (13-28 [2-101])	5 (1-9 [0 - 22]	4 (1-7 [0 - 20])	28 (20-42 [2-134])	25 (16-34 [2-103])
Response rate/ centre*; %		94 (78-100 [18-100])		91 (60-100 [0-100)]		92 (76-100 [17-100])

Figure 26.4. Distribution of mean years' experience of senior staff



26.9 Proportions of patients volunteering their experience compared to those responding to direct questioning were broadly similar across the age groups (Figure 26.6A). The distribution of awareness experienced by phase of anaesthesia/surgery was also similar across the age groups (Figure 26.6B), and there were no striking age-dependent influences upon the degree of pain or distress or the likelihood of formal complaint (Figure 26.6C).

Figure 26.5. (a) Distribution of AAGA reports by age. (b) Proportions where reports were volunteered by the patient vs established by direct questioning. (c) Distribution of reported experiences by phases during anaesthesia and surgery. (d) Patients' experiences that included pain or distress, resulting in a formal complaint or in legal proceedings (as a proportion of total cases of AAGA)

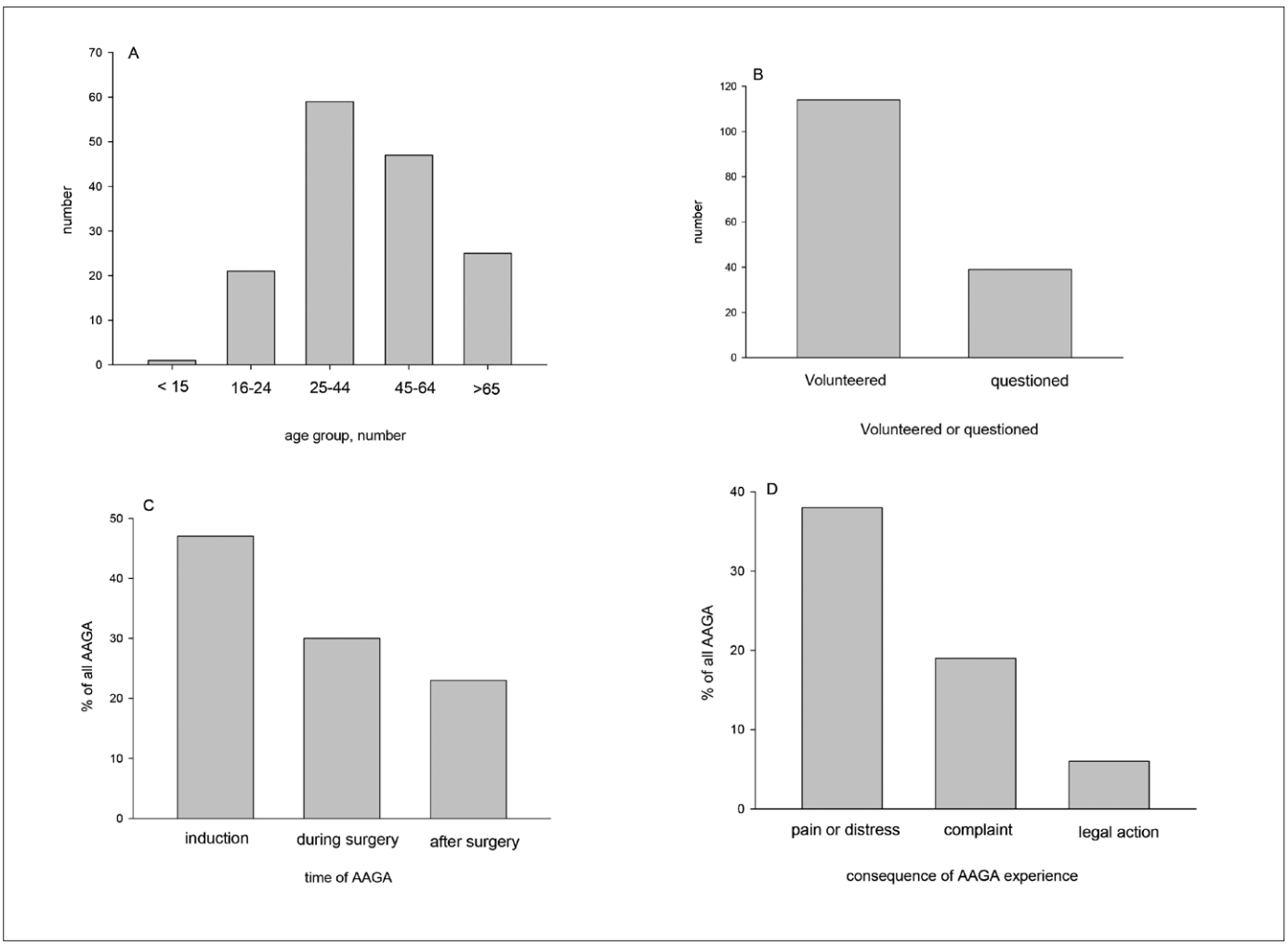
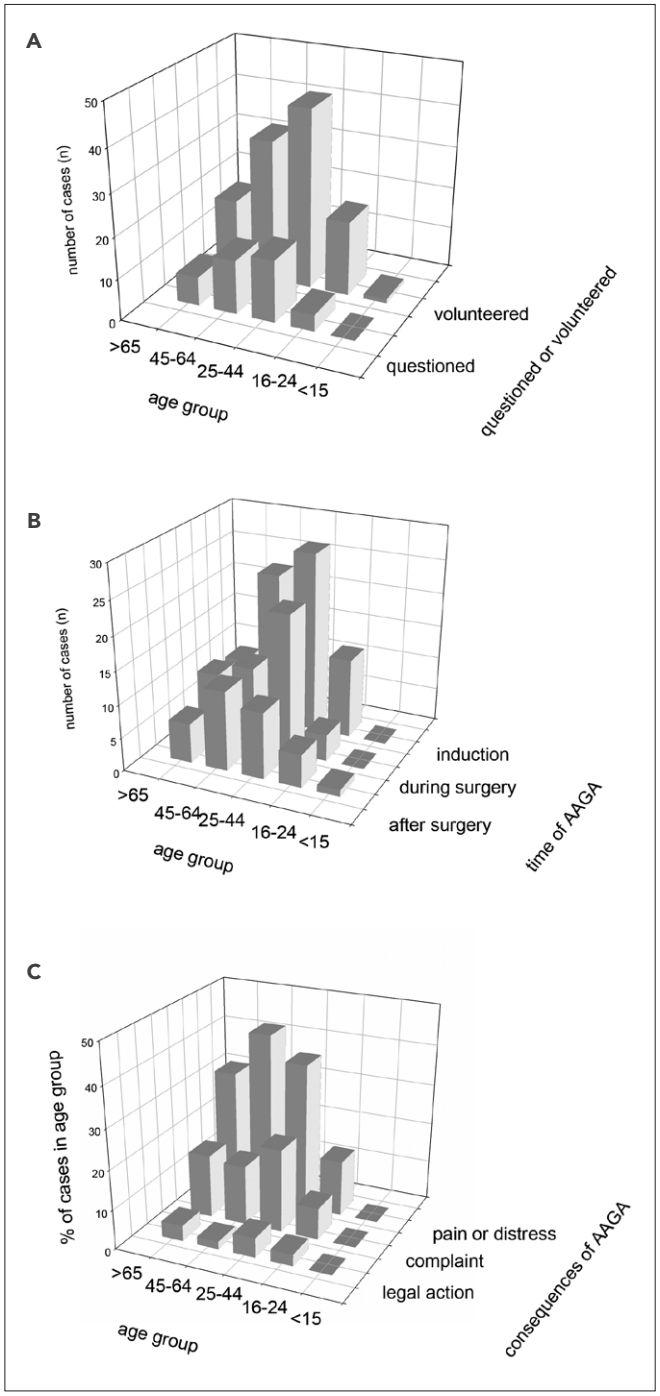
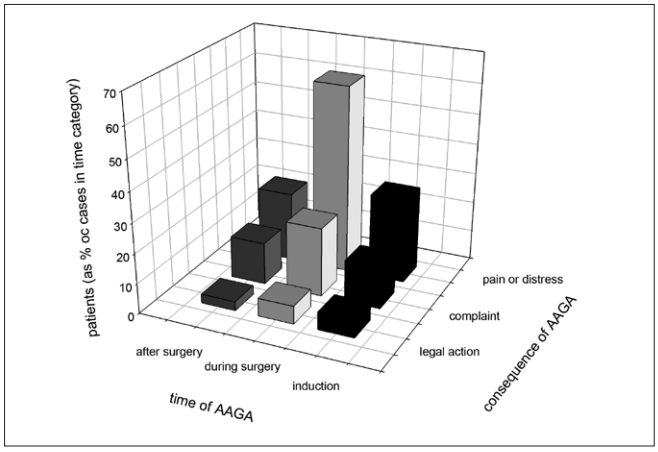


Figure 26.6. (a) Distribution of volunteered reports vs those established by questioning by age. (b) Lack of influence of age on when AAGA was experienced (c) Lack of influence of age on pain or distress, or issuing a complaint or legal proceedings



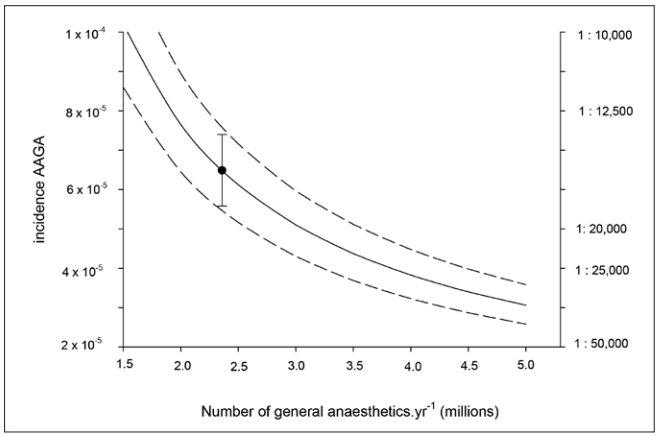
26.10 However, AAGA experienced during surgery appeared more likely to result in pain or distress than did that experienced in the dynamic phases (induction and emergence) of anaesthesia (Figure 26.7).

Figure 26.7. Influence of when during anaesthesia/surgery accidental awareness during general anaesthesia was experienced on whether pain or distress resulted, or if a complaint or legal proceedings were issued



26.11 Using a denominator for the number of general anaesthetics administered in the UK (obtained from the 4th National Audit Project (Woodall & Cook 2011) and adjusting this figure by the number of respondents, we estimated the incidence of AAGA known to anaesthetists in the year 2011 to be approximately one case for every 15,414 general anaesthetics (Table 26.2). As the denominator value may have changed since NAP4 (which we consider to be unlikely given the relatively short time interval involved), the calculated incidence may vary depending on the actual denominator (Figure 26.8). The effect of relatively large changes in the denominator (plus or minus one million) can be seen to be relatively small, leading to a range of 1:12,500 to 1:20,000. Subsequently, we undertook the Activity Survey which confirmed the accuracy of the denominator.

Figure 26.8. The influence of denominator value (number of general anaesthetics administered annually) on the estimated mean incidence (solid line) of AAGA (± 95% Poisson CI, dotted lines), given our data of 153 instances of AAGA in one year. The incidences are shown as absolute values (left y-axis) and as ratios (right y-axis). The point represents the value assuming the NAP4 estimate of denominator is correct (adjusting for non-responders in this survey) ± 95% Poisson CI



26.12 These data imply that just one senior anaesthetist out of around 47 will know of a new case of AAGA each year (Table 26.3). The median (IQR [range]) number of new cases per centre was 0 (0–1 [0–4] (Figure 26.9). Over the course of an anaesthetic career, we estimate that a senior anaesthetist will have personal experience of one case of AAGA every 36 years (Table 26.2). The vast majority of anaesthetists reported never having had direct experience of a case of AAGA (Figure 26.10).

Figure 26.9. Distribution of AAGA cases by centre. The data could be fitted by a Poisson distribution with a covariance r2 > 0.997

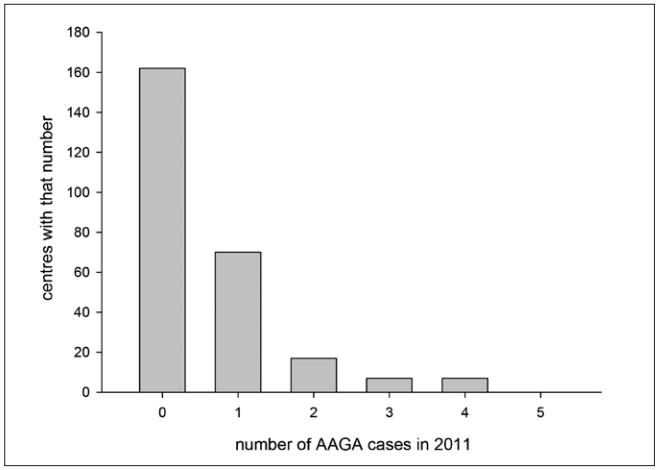
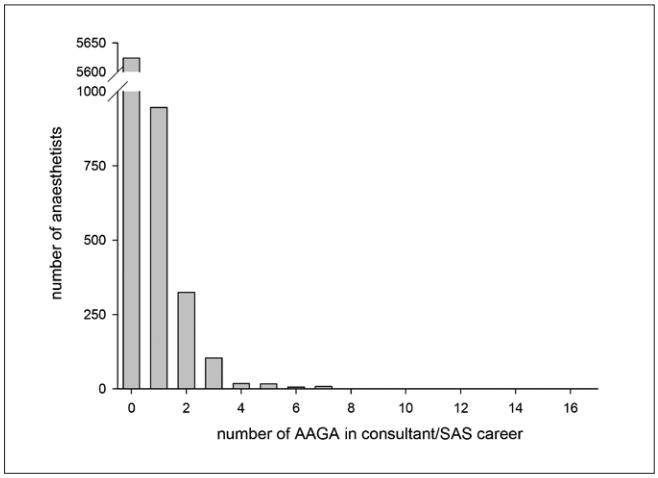


Table 26.2. Number of cases of AAGA known to senior anaesthetic staff over their careers and incidence (total yrs of service 81 147). The binomial and Poisson estimates are almost identical; the binomial are presented

Descriptor	Incidence
Cases; n	2280 (2190 – 2353)
Incidence; cases/senior staff/yr	0.028 (0.027 – 0.029)
Cases: yrs of senior practice	1:35.6 (1:34.5 – 1:37.0)

Figure 26.10. Distribution of the number of cases of AAGA experienced by senior staff in their careers. The spread of values is 0 (0–0 [0–16]), and the data can be fitted by a Poisson distribution with covariance r2 > 0.997. The x-axis extends to 17 as there was one respondent who had personal experience of 16 cases in his/her career (the data point cannot be seen due to the size of the y-axis scale)



26.13 Approximately two-thirds of centres reported the immediate availability of depth of anaesthesia monitors (Table 26.3), with their routine use practiced by 132 (1.8%) respondents.

26.14 Twelve centres (4.5%) reported the existence of a policy to prevent or manage awareness. Two of these used their general critical incident policy, with no specific reference to AAGA. The policies ranged from very general, brief or mini-reviews of AAGA to somewhat more comprehensive suggestions (see Appendix).

Table 26.3. Access to and use of depth of anaesthesia (DOA) monitoring in the 7,125 senior staff who responded. Values are number (proportion). BIS, bispectral index; EP, evoked potential monitoring; IFT, isolated forearm technique; 'other' included mention of the Vigileo flotrac as a haemodynamic monitor of awareness, the Cerebral Function Analysing Monitor (CFAM), or a targeted end-tidal volatile agent algorithm, or was not specified

Centres with DOA	Anaesthetists using DOA in selected cases only	Anaesthetists using DOA routinely	Type of DOA used (as % of those using DOA) n=1904					
			BIS	Entropy	EP	Narcotrend	IFT	Other
163/263 (62%)	1,772 (25%)	132 (1.8%)	1,442 (76%)	332 (17%)	90 (4.7%)	6 (0.3%)	14 (0.7%)	20 (1%)

DISCUSSION

26.15 The striking finding of this survey is that the incidence of new cases of AAGA as notified to anaesthetists in the year 2011 of approximately 1:15,000 is much lower than the incidence previously published, which was ascertained through direct patient questioning, of approximately 1–2:1,000. If both sets of data are valid, then it means that for approximately every 15,000 general anaesthetics administered, the anaesthetist may learn of just one case of AAGA, while up to around 30 other patients will experience AAGA but not report it. Interestingly, the incidences in Table 26.2 are very similar to those described by Pollard et al. (2007) who reported (also by direct questioning) an incidence of 1:14,500.

26.16 Full reasons for the discrepancy have been discussed elsewhere (Pandit et al., 2013a and b; Avidan & Mashour, 2013a and b) and in earlier chapters of this report. The possible reasons for disparity are summarised in Table 26.4. Nevertheless, it is notable that the incidence anticipated by the survey is borne out by the prospective NAP5 study (see Chapter 6, Results).

26.17 Also presaged by this Survey were the findings that adverse consequences for the patients who experienced AAGA seemed more modest than perhaps others have reported. In two-thirds of the AAGA cases reported, patients felt no pain or distress (compare with Chapter 7, Patient Experience), and only a fraction resorted to complaint or legal action (compare with Chapter 22, Medicolegal).

Table 26.4. Possible reasons for disparity between our reported incidence and any hypothetical 'true' incidence of AAGA

Reasons for disparity

- Anaesthetists forgot the number of cases of AAGA they were involved with.
- Unlike surgeons, anaesthetists generally do not routinely see post-operative patients at an interval after surgery in a clinic. As some patients only become aware of their experience of AAGA after a time interval, they have no direct opportunity to communicate this to their anaesthetist.
- Governance and reporting systems in hospitals may not be conducive to patient reporting of their complications; patients may be reporting their experience to surgeons (or other medical staff) but this is then not passed on to the anaesthetic department staff.
- The majority of patients consider their experience to be too trivial to report and are not harmed or affected by it, consistent with our finding that two-thirds of those experiencing AAGA did not find it distressing or painful (Figure 26.D). However, this interpretation is at odds with some findings that in fact, a high proportion of patients in prospective studies experience psychological symptoms, including post-traumatic stress after AAGA.
- AAGA patients may exhibit anxiety-fuelled avoidance and frank phobic reactions to hospitals and doctors arising as a direct result of the AAGA trauma. The most adversely affected patients experiencing AAGA are less likely to volunteer their experiences, which would bias the reported cases towards those of lesser psychological impact.
- Since patients may delay reporting AAGA for some time after their surgery and as we conducted this survey in March–April 2012 (asking about knowledge of reports made in 2011), we may have missed a large cohort of cases. Balanced against this is the likelihood that some cases first presenting to anaesthetists in 2011 underwent anaesthesia before 2011, including in some cases many years previously.
- Trainees did not complete a questionnaire (see text for fuller discussion).
- 'Over-reporting' if false memories or dreaming by patients were erroneously classified as AAGA by doctors, or if cases were reported twice or from private sector (see text for fuller discussion).

Why our reported incidence may be accurately reflect a 'true incidence'

- Some previous suggestions of a high incidence may themselves be flawed: study consent processes may make it more likely that patients respond affirmatively to a direct question. While most studies employing the Brice protocol seek to confirm that a report of AAGA is verifiable against the medical case notes, this is not universal.
- The UK population, which might be more susceptible to hypnotic effects of anaesthetic agents, or more resilient in their psychological response to an experience of AAGA (see text for fuller discussion).
- UK clinical practice differs to an extent that makes AAGA less common, e.g. (a) greater use of supraglottic airways, with avoidance of neuromuscular blockade (the laryngeal mask airway being a British invention that was standard practice in the UK long before other countries; or (b) in the UK, anaesthesia is a purely medical specialty and further, in recent years has been an increasingly consultant-delivered service.

26.18 Also, two-thirds of AAGA reports in this Survey described experiences during the 'dynamic' phases of anaesthesia (especially at or immediately after induction), anticipating the findings reported in Chapters 8 (Induction) and 10 (Emergence).

26.19 With regards to the use of depth of anaesthesia (DOA) monitoring, the survey anticipated the low use of DOAs as confirmed in the Activity Survey. In this survey, we found that almost three-quarters of senior anaesthetists never used a DOA monitor, despite two-thirds of centres possessing such equipment. Thus even in those centres with equipment available to them, only a minority of practitioners employ it even for selected cases. We did not ask how many monitors were available in each centre, so it is possible that there is not enough equipment to service each operating theatre or, that consumable costs are constraints. However, some comments written on survey returns suggest otherwise (e.g. "the monitor is locked in a cupboard and nobody uses it" or "we have a monitor, but it has stopped working and nobody has serviced it"). In this respect, our survey results differ from those of Lau et al. (2006), who found 85% of anaesthetists would use a depth of anaesthesia monitor if it were available (21% would use it routinely). Being a much smaller study with a lower response-rate, the respondents to Lau et al.'s study may have been enthusiasts of DOA monitoring, or may have been those more likely to have experienced a case of AAGA. This last is certainly possible, as they reported 33% of anaesthetists had experienced a case of AAGA; whereas our data suggests only 21% have ever done so. Or, as Lau's study was conducted in 2005, perhaps the passage of time has since made anaesthetists more (rather than less) sceptical of the benefits of existing DOA monitors.

26.20 Our finding that so few centres have developed any protocols for either the specific prevention or management of AAGA is notable, and is now specifically addressed by the NAP5 Awareness Support Pathway presented in Chapter 7, (Patient Experience).

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Excerpts from policies for managing AAGA

Below are listed extracts of policies from the few centres that had a policy to manage AAGA, highlighting some comments that are of interest, or may require further discussion. Taken from different centres, some of the comments are contradictory. They are used to illustrate the limitations of many of the policies in existence.

"The defence organisations (unfortunately) say that failure on the part of the anaesthetist is the most common cause of awareness."

"Virtually all of cases of light anaesthesia will be detected, long before awareness occurs, by the usual signs of tachycardia, rising blood pressure, sweating, dilated pupils etc. Sadly there have been a very few cases where awareness has occurred without any of these signs occurring."

"Awareness" is a "NEVER" event, i.e. one which should NEVER occur."

"Minimum Alveolar Contractions [sic] (MAC) requirements to prevent awareness have been delineated."

"In the unstimulated patient 0.45 MAC is sufficient. 0.75 MAC is probably adequate to prevent intra-operative awareness. The administration of 1.3 MAC in non-paralysed patients is likely to prevent movement and awareness."

"MAC 0.8 or more should be sufficient for majority of patients requiring muscle relaxation."

"Lower MAC than 0.8 might be tolerated under depth of anaesthesia guidance and in certain circumstances."

"The Isolated Forearm Technique (IFT) is the only method available to directly detect intra-operative wakefulness."

"It is very unusual for claims of awareness to be entirely fabricated."

"A handwritten record, not backed up with a printout, is of minimal medicolegal value since the anaesthetist may have recorded what s/he things [sic] is being given rather than what is actually being given."

"Some studies quote as high as 1:1000 (but there is a much lower incidence locally)."

"After a patient report of awareness, the anaesthetist should be relieved from clinical duties in view of the stress of the situation and need to care for the patient. Obviously the list must cease until another anaesthetist or machine can be found."

"ASA 3-5 patients are twice as likely to have awareness than ASA 1-2."

"The monitors such as Bispectral Index (BIS) were initially criticised because of manufacturers' claims that by titrating the anaesthetic to a certain monitored level of EEG, less agent could be used, and the patient woke up quicker. How could this then be used to prevent awareness if in fact less anaesthetic was being given?"