This article is published simultaneously in *Anaesthesia* and the *British Journal of Anaesthesia*.

R. P. Mahajan
Editor-in-Chief
British Journal of Anaesthesia
S. M. Yentis
Editor-in-Chief
Anaesthesia

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doi:10.1111/anae.12216

Editorial

The incidence of intra-operative awareness in the UK: under the rate or under the radar?

Accidental awareness during intended general anaesthesia with postoperative explicit recall (AWR) can be a devastating experience for patients, frequently leading to post-traumatic stress disorder [1]. In studies conducted outside of the UK, AWR has been estimated to affect 1 to 2 per thousand surgical patients [2–4]. If this incidence is extrapolated to the UK, it would suggest that thousands of surgical patients a year could be experiencing this complication. As such, AWR is an important adverse event for patients that requires the attention of healthcare practitioners and policy makers. In a joint publication in *British Journal of Anaesthesia* and *Anaesthesia* [5, 6], Pandit and colleagues report the results of the first phase of the 5th National Audit Project (NAP5) of the Royal College of Anaesthetists in collaboration with the Association of Anaesthetists of Great Britain and Ireland. The findings of the first phase of NAP5 prompt a reconsideration of the detection and incidence of AWR.

The difficulty in detecting awareness during an intended general anaesthetic is manifest. Conscious experience is inherently subjective, the neurobiology of consciousness has yet to be elucidated, and as such there is currently no gold standard test for identifying awareness. Despite the limitations, studies that have sought to detect awareness with evoked responsiveness as the outcome measure (e.g. asking a patient at regular intervals to squeeze an object and ensuring that the hand holding the object is not pharmacologically paralysed) have found that about a third of patients experience episodes of awareness during intended general anaesthesia [7]. Fortunately, there is a low probability that these episodes result in explicit memory formation. Whether awareness without explicit recall has any clinical relevance is a matter of debate. It is therefore appropriate that NAP5 focused on AWR, a complication that clearly precipitates patient distress and has demonstrable clinical sequelae.

The National Audit Projects seek to shed light on issues that are important to patients and anaesthetists alike. The overarching aim of

NAP5 is to ascertain, over one full year (1st June 2012 to 31st May 2013), how many patients in the UK (and The Republic of Ireland, where the audit will be running in parallel) spontaneously report AWR, and to elucidate relevant risk factors for AWR (http://www.nationalauditprojects.org.uk/NAP5_Publications). The first or preliminary phase of the NAP5 endeavour, which is reported by Pandit and colleagues [5, 6], is a survey in which anaesthetists around the UK were asked about their practices regarding the prevention of AWR and their recollections of any AWR reports that were brought to their attention during 2011. This phase 1 NAP5 survey is impressive in its scope and accomplishments; 100% of contacted centres (329 hospitals) participated, and a remarkable 82% of senior anaesthetists (7125) responded to the survey. Based on cases of awareness that became known to anaesthetists during 2011, the survey suggests that the current incidence of AWR in the UK is about 1 in 15 000. This is much lower than the 1 to 2 per 1000 incidence that has been found in several prospective studies that have assessed AWR [2–4].

This is not the first time the field of anaesthesia has been confronted with an investigation reporting an incidence of AWR one order of magnitude lower than that found in prospective studies. In 2007, Pollard and colleagues described a study of AWR in a regional medical system in the US and found an incidence of approximately 1 in 15 000, which is commensurate with the findings of the NAP5 survey [8]. This dramatically lower incidence was attributed either to differences in anaesthetic technique or to the method of assessing awareness. It will be beneficial to consider the results of the NAP5 survey in light of these potential explanations. First, the incidence of AWR could be much lower in the UK than has been reported previously in other countries (i.e. 'under the rate'). Second, the NAP5 survey substantially underestimated the incidence of AWR (i.e. 'under the radar'). Third, both explanations may be partially correct. It is unclear, based on the design of NAP5, whether we can adjudicate definitively among these options.

If the incidence of AWR is indeed lower in the UK than previously reported elsewhere, it is important to consider why this might be in order to reinforce good anaesthetic techniques, and to inform practitioners in other countries. The first and most compelling explanation could simply be that, unlike previous studies, the NAP5 survey is both national and comprehensive. As such, all general anaesthetics in all settings are potentially captured, of which most are probably low-risk outpatient surgical procedures. A second reason might be that the laryngeal mask airway and other supraglottic devices have commonly been used during general anaesthesia in the UK for many years. When a supraglottic device is used, neuromuscular blocking drugs are typically not administered, and this would probably mitigate both the incidence and the severity of AWR 2, 9]. Surprisingly, however, Sandin and colleagues found an AWR incidence of 1 in 1000 even when neuromuscular blocking drugs were not administered [2]. A third factor might be that the favourable staffing ratio and extensive training of anaesthetists in the UK are associated with increased vigilance and decreased AWR. A fourth possibility is that practitioners have changed clinical behavior following studies suggesting that AWR can be decreased with protocols incorporating electroencephalogram (EEG)-based monitors or end-tidal anesthetic concentration (ETAC) alerts [10–12]. The low utilization of EEG-based monitors (only 1.8% routine use) among participant anaesthetists partially argues against the EEG approach, but practitioners might have set alerts based on low ETAC thresholds. A fifth contributor might be an avoidance of total intravenous anaesthesia (TIVA); the risk of AWR is higher with TIVA than with volatile-based anaesthesia [13–15]. However, it is likely that TIVA is more popular in the UK than in the US. Therefore, low utilisation of TIVA probably does not explain the low practitioner-reported incidence of AWR found in the NAP5 survey, although the widespread use of target-controlled infusion pumps in the UK might increase the safety of TIVA (in relation to propofol underdosing).

In contrast to the hypothesised reasons for a uniquely low incidence of AWR in the UK, past studies suggest that phase 1 of the NAP5 project substantially underdetected the true incidence of AWR in the UK. It is important to consider possible explanations for this discrepancy in order to assist interpretation of phase 2 of the NAP5 project, which is designed to

determine prospectively how many patients report AWR in the UK. The most important limitation of NAP5 phase 1 is that AWR was detected through intermediates (i.e. senior anaesthetists) based on patient self-reports rather than through direct patient interviews. It has been demonstrated that patients are unlikely to report spontaneously an AWR event to an anaesthetist [16], perhaps because of the brief interaction and limited relationship. Based on data from a single hospital complex in the US, a retrospective audit of spontaneous patient reports revealed a six-fold lower incidence of AWR [17] than a study in which patients were questioned directly [4]. Any study that relies on spontaneous patient reports of AWR rather than proactive questioning of all patients is likely to underestimate considerably the incidence of AWR. Furthermore, in the phase 1 NAP5 practitioner survey, as patients were not questioned directly, it is self-evident that patients were not asked specifically if they remembered anything during the period of intended general anaesthetic, which is one of the questions in the modified Brice interview [18]. Based on discrepant findings between studies that have asked this question [2, 3] and those that haven't [8], this targeted query appears to be important. This argument is made even more compelling by a study that compared the detected incidence of awareness in a single patient population through two different methods: routine postoperative interviews vs structured questionnaires (i.e. modified Brice interviews) that explicitly asked patients whether they remembered anything during the period in which they were intended to be anaesthetised [19]. In this study, the detected incidence was five times higher when the explicit question was asked [19]. As such, any study that does not ask patients explicitly about AWR is likely to underestimate considerably the incidence of AWR. Lastly, studies suggest that patients might not remember or might not choose to report that they were aware immediately after their surgery [2, 3, 12, 16]. One notable case report described a patient who chose not to disclose an AWR event during two structured and explicit interviews within a month of surgery, but mentioned it spontaneously during a one-year follow-up interview not related to detection of AWR [20]. Patients should be interviewed for AWR at least one to four weeks after their surgery [2, 3, 12], recognising that even this approach will probably not capture all AWR experiences.

In addition to the interesting findings on AWR reports, the phase 1 NAP5 survey found a low use of EEG-based monitors and a general lack of policies to prevent and manage AWR [5]. It is therefore appropriate and encouraging that organisations representing anaesthetists in the UK as well as the National Institute for Health and Clinical Excellence (NICE) are currently in the process of addressing this policy vacuum. Various quality improvement measures or protocols are under consideration for effectiveness and efficiency, in addition to measures that have previously been recommended, such as the avoidance or restricted administration of neuromuscular blocking drugs [9, 21, 22]. Evidence has accumulated over the past few years that might be helpful in framing clinical decision pathways [23]. Practitioners should be encouraged to set alerts for a threshold low ETAC when using a volatile-based anaesthetic, as this practice probably decreases AWR [4, 12, 24]. If neuromuscular blocking drugs are deemed necessary, deliberation should be given to using a volatile-based technique, as TIVA is associated with a higher incidence of AWR [12–14]. If TIVA is indicated or chosen (and neuromuscular blocking drugs are administered), a proprietary or non-proprietary EEG-based monitor should be used in order to decrease the likelihood of AWR [11, 15]. The recent NICE guidelines, issued in November 2012, endorse the recommendation that an EEG-based monitor should be considered for patients receiving TIVA. In addition, the NICE guidelines recommend that such monitors should be considered for patients: i) assessed to be at higher risk of AWR; ii) who are liable to experience haemodynamic instability at typical anaesthetic doses; or iii) for whom there is a hypothetical concern, owing to their perceived vulnerability, that typical anaesthetic doses could be injurious (http://publications.nice.org.uk/depth-of-anaesthesia-monitors-bispectral-index-bis-e-entropy-and-narcotrend-compact-m-dg6). It is worth noting that a non-proprietary EEG can be used inexpensively. Information from the EEG and from non-proprietary processed EEG

indices might yield comparable information to commercially available devices [25–28].

Policy makers and practitioners should not curtail their systematic efforts to eradicate AWR based on the first-phase NAP5 results, which could be interpreted as pointing to the rarity of AWR in the UK. As noted by Pandit and colleagues, the methodology of the NAP5 survey renders it vulnerable to under-detection of AWR [5, 6]. Although both phases of NAP5 might ultimately provide substantial underestimates of the true incidence of AWR in the UK owing to their reliance on spontaneous patient reports, we nonetheless eagerly anticipate the next phase of NAP5, which will provide a rich source of valuable data as the first national and comprehensive prospective assessment of AWR.

Competing interests

No external funding and no competing interests declared.

This article is published simultaneously in *Anaesthesia* and the *British Journal of Anaesthesia*.

M. S. Avidan
Professor, Division of Cardiothoracic Anesthesiology
Department of Anesthesiology
Washington University School of Medicine
Saint Louis
Missouri, USA
Email: avidanm@anest.wustl.edu
G. A. Mashour
Assistant Professor
Department of Anesthesiology
University of Michigan
Ann Arbor
Michigan, USA

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doi:10.1111/anae.12215

Editorial

Charting change on the labour ward

In this issue of *Anaesthesia*, Carle et al. [1] have created a statistically based template that they have used to create an internally validated warning score for the obstetric setting. This marks the belated start to a process that may produce a scientifically derived universal obstetric early warning score (EWS). If successful, it will bring the obstetric patient up to speed with the general adult population.

I read the NEWS today

In 2007, the Royal College of Physicians (RCP) issued the report *Acute Medical Care: the Right Person, in the Right Setting – First Time* [2]. This noted that a lack of standardisation resulted in a variation of methodology, approach and familiarity with EWS, leading to a lack of consistency in the response to acute illness. In reaction, the RCP commissioned the National Early Warning Score Development and Implementation Group (NEWSDIG) in 2009. This body met to review the available evidence, consider the existing models and devise an observation chart, scoring system and escalation pathway. This has now been completed and in 2012, the National Early Warning Score NEWS [3] was implemented.

There has been no consensus regarding the utility of EWS. Indeed, a 2009 Cochrane review [4] on outreach and EWS found only two reliable randomised controlled trials worldwide. One showed an improvement for in-hospital mortality but the other reported no statistical change at all. The review concluded that "*the lack of evidence on outreach requires further multisite RCTs to determine potential effectiveness*". Given that there is no overwhelming evidence for their efficacy, one would expect a degree of reluctance from the medical fraternity. However the uptake of EWS continued, perhaps as a sticking plaster for the reduction in nursing contact with patients. As a result, the use of EWS has been inconsistently adopted throughout developed healthcare systems. Consequently, there are also many different models of the scoring system, using many different observations and many different parameters. This makes it problematic to ascertain exactly which aspects of the scores are valuable. The fact that NEWSDIG has homogenised EWS charts to produce this system is credit-worthy in itself.

NEWSDIG reviewed all existing published literature and elected to use an aggregate-weighted system. These systems assign each observation with a score (usually 0–3). The sum of all scores is taken and the magnitude of this determines the strength of the intervention required. NEWSDIG devised its score by utilising a review paper by Smith et al. [5], that examined 33 different EWS systems already in use. In addition, NEWSDIG suggested that an extreme variation in a single parameter should also trigger a response and has thus incor-

