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A survey of anesthetists' experience and perspectives of perioperative anaphylaxis at an Australian tertiary hospital

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Abstract : *Background :* Anaphylaxis is a life-threatening emergency that requires prompt recognition and institution of life-saving therapy. Perioperative Anaphylaxis Management Guidelines have been developed by the Australian and New Zealand College of Anaesthetists and Australian and New Zealand Anaesthetic Allergy Group and anesthetic societies worldwide to facilitate diagnosis and management of this rare, but severe complication.
Objectives : To perform a cross-sectional survey of the anesthetists' experience of perioperative anaphylaxis at a single centre and its effect on their practice.
Design : Survey questionnaire constructed in Survey Monkey® and sent via e-mail link to all anesthetists. This questionnaire included qualitative and quantitative questions.
Setting : Royal Brisbane and Women's Hospital, a tertiary referral hospital in Queensland.
Methods : Anesthetic specialists and provisional fellows at The Royal Brisbane and Women's Hospital were surveyed using an online platform regarding their experiences of managing anaphylaxis, referral for testing, formal incident reporting and knowledge of existing departmental protocol. We also asked if their experience of anaphylaxis modified their clinical practice.
Results : Forty-five out of 102 *(*44%) of the specialists and provisional fellows surveyed responded. Of these, 17 (38%) had been involved as primary anesthetist and 20 (44.5%) indirectly in at least one suspected case of perioperative anaphylaxis in the past 12-months. Most anesthetists were aware of the resources available in this crisis and appropriate referral for testing had occurred. There was poor local and national reporting of anaphylaxis as a critical incident.
Conclusion : A large percentage of the anesthetists surveyed had seen a case of perioperative anaphylaxis in the past year. Managing this life-threatening event has led to practice change for many anesthetists. There is a requirement for further education around incident reporting.

Key words : Anaphylaxis ; perioperative ; allergy ; adverse reaction ; anesthetic.

Introduction

Anaphylaxis is a potentially life threatening, severe allergic reaction as defined by the Australasian Society for Clinical Immunology and Allergy. Definitions vary in their wording, but worldwide, authorities agree that anaphylactic reactions represent severe and unexpected allergic reactions. Allergies are the fastest growing chronic disease in Australia and perhaps many other areas of the world. These include food, insect and drug allergies (including life threatening anaphylactic reactions) as well as atopic conditions such as asthma, eczema and allergic rhinitis. Within Australia alone, approximately 4 million people (20% of the population) have at least one allergic disease (1). It is predicted that by 2050 the number of patients affected by allergic diseases in Australia will increase by 70% to 7.7 million (1).

The incidence of allergic reactions during anesthesia varies by country, representing between 9 to 19% of reported anesthesia complications. In Australia these occur between 1 in 10,000 to 1 in 20,000 (2) anesthetics. In the 10th triennial anesthesia mortality report for Australia and New Zealand for the period of 2012-14, 7 of the 23 direct

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anesthesia related deaths were due to anaphylaxis (3). The mortality rate related to anaphylaxis under anesthesia is believed to be up to 9% (4-8). However, data from Western Australia show a much lower perioperative anaphylaxis mortality (0-1.4%) than quoted elsewhere (9). In 2016, Perioperative Anaphylaxis Management Guidelines were published by the Australian and New Zealand College of Anaesthetists (ANZCA) and Australian and New Zealand Anaesthetic Allergy Group (ANZAAG) to facilitate diagnosis and recommend strategies for anaphylaxis management (10). Gibbs et al. state that the lower mortality, though similar perioperative anaphylaxis rate reported by Western Australia maybe present in other developed countries, reflecting newer data with the overall decrease in perioperative mortality. Improved education, guidelines, anaphylaxis management being a professional development education activity compulsory for anesthetists in Australia and use of simulation for training in management of anesthetic crises could also contribute to improved outcomes.

Agents most likely to cause anaphylaxis vary between countries, according to variation in drug usage (8, 11, 12). For instance there is a higher proportion of anaphylactic reactions attributed to neuromuscular blocking agents (NMBAs) in France, Australia and New Zealand (6, 13-15) compared with Sweden, Denmark, and USA (16-18). Different patterns of antibiotic use influenced by institutional or national surgical prophylaxis guidelines also influence intraoperative anaphylaxis rates. Teicoplanin is recommended in surgical antibiotic prophylaxis guidelines in the United Kingdom and is the most common antibiotic cause of anaphylaxis in that region. Conversely, cephalosporins are widely used in France and are the most common antibiotic culprit in that country (13). Regional differences in experience of anaphylaxis and the culprit agents point to the benefit of epidemiological surveys (8). Worldwide collaboration would facilitate education and improve patient care both via preventive and treatment strategies.

Knowledge of anaphylaxis, experiences and practice preferences have been studied in several physician groups including allergy and immunology specialists, emergency physicians, family practitioners and pediatricians. Recently, the Royal College of Anaesthetists, UK published the 6th National Audit Project on Perioperative Anaphylaxis (NAP6) (19). This included a baseline survey of over 11,000 anesthetists from 341 hospitals in the UK exploring their experience, perspectives and knowledge regarding the management of perioperative anaphylaxis (20). No similar survey has been undertaken in Australia.

Our survey of anesthetists from a single tertiary institution in Australia, aimed to assess their experiences of managing anaphylaxis, referral for testing, formal incident reporting and knowledge of existing departmental protocol. We also asked if their experience of anaphylaxis modified their clinical practice.

Materials and Methods

This survey was undertaken at the Royal Brisbane and Women's Hospital (RBWH), a tertiary referral hospital in Queensland with close to 1000 beds. Ethics approval was obtained from the Royal Brisbane and Women's Hospital Ethics Committee (chaired by Dr G McGurk) on 7th November 2018 (LNR/2018/QRBW/47057). The survey was carried out over the period of December 2018 to January 2019. The survey questionnaire was constructed in Survey Monkey® and then sent via e-mail to all the anesthetists including anesthesia specialists and provisional fellows (fifth year of the five-year anesthetic training program) in the Department of Anesthesia and Perioperative Medicine at the RBWH. The department provides perioperative allergy testing and receives referrals from the hospitals in the Metro North Health Service, Queensland. There is a designated lead anesthetist for anaphylaxis and "Anaphylaxis Boxes" are provided in the operating theatre complex, consistent with ANZAAG Guidelines (10). The department runs educational activities and training sessions in the management of anaphylaxis.

Consent was implied by completion of the survey. The questionnaire was based on the NAP 6 baseline survey (Appendix 1) and consisted of three sections. The first section related to personal experience of anaphylaxis. This included the number of cases seen by the anesthetist over the last 12 months as the primary or principal anesthetist and cases which they assisted in the care of. This number was not used to infer the total number of cases seen, in case of duplication, but used to gather information about the experience alone. Participants were asked about referral for investigation and reporting of the event at the local level (RiskMan and PRIME hospital incident reporting) as well as in the Australian and New Zealand Tripartite Anaesthetic Data Committee web-based anesthetic incident recording system (WebAIRS). They were also asked about the probable and confirmed (if any) cause of anaphylactic reaction. The data for referral

and reporting were interpreted using the numbers for primary anesthetists' alone. The second section of the questionnaire related to participants' knowledge of local resources for the management and follow-up of patients with suspected anaphylaxis. This included the presence of anaphylaxis boxes in the operating theatre and awareness of the departmental lead anesthetist for anaphylaxis. The last section of the questionnaire included questions to determine whether the participants' experience of anaphylaxis had influenced their clinical practice. Participants were asked to answer by free-text response if they avoided any particular drug(s) in their clinical practice and to give reasons for avoidance. Responses were transcribed verbatim. Unanswered questions were not included in the calculations for the responses i.e. data were interpreted with the appropriate number of responses as baseline rather than discarding the entire response or using imputation.

Statistical analysis

This was a sample of convenience, with the population consisting of all anesthesia specialists and provisional fellows within the Department of Anesthesia and Perioperative Medicine. Data were analyzed using descriptive statistics. Survey responses were presented using number (percent). Free text responses were presented unedited.

Results

The survey was sent to 102 anesthetists and 45 (44%) responded. The population sampled included 92 (90%) anesthesia specialists and 10 (10%) provisional fellows. The duration of experience ranged from less than 6 months to more than 30 years.

Twenty-five (56%) respondents had been present during an episode of perioperative anaphylaxis in the past 12 months. Table I shows the involvement of the anesthetist as the primary (20 episodes, 17 anesthetists) or assisting anesthetist in cases of anaphylaxis.

The agents suspected at the time of the reaction included antibiotics, muscle relaxants, patent blue dye, ranitidine and blood products. A total of 20 incidents of suspected perioperative anaphylaxis were identified. Patients from 19 (95%) out of 20 episodes (as reported by primary anesthetist) had been referred for allergy testing. The primary anesthetist was aware of the confirmed agent in 14 (74%) of the 19 cases referred for allergy testing.

Table 1

Personal experience of case(s) of perioperative anaphylaxis in past 12-month period

As primary anesthetist:		As supporting anesthetist:	
1 case	14	1 case	11
2 cases	3	2 cases	7
>2 cases	0	>2 cases	2

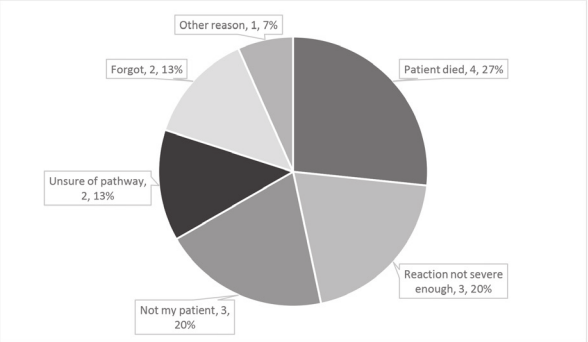

Fig. 1. – Reasons for lack of referring (15 responses)-possible barriers to referring and reporting.

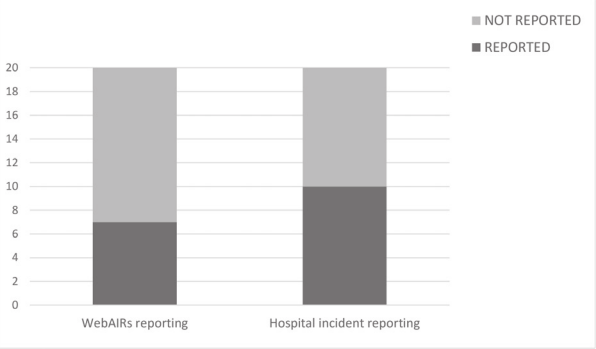

Fig. 2. – Reporting of cases of anaphylaxis (20 cases in total) at hospital level and via web-based anesthetic incident recording system (WebAIRS).

Figure 1 shows the reasons given (if any) for lack of reporting of the incident.

Figure 2 shows the numbers of cases reported on webAIRs and the hospital incident reporting system.

Forty-four (97%) out of 45 anesthetists were aware of anaphylaxis management guidelines and 43 (95%) of the labelled anaphylaxis boxes available in the theatre complex. Thirty-five anesthetists (78%) were aware of the departmental lead for perioperative anaphylaxis.

Fourteen (31%) anesthetists reported avoiding certain drugs or substances in their clinical practice due to the perceived high risk of anaphylaxis. These include neuromuscular blockers and teicoplanin.

The reasons given by anesthetists for avoiding certain drugs are shown in Table II as free text comments. Twenty-seven (60%) anesthetists perceived neuromuscular blockers to have the highest rate of perioperative anaphylaxis, while 17 (38%) believed this to be antibiotics and 1 (2%) patent blue dye. Five (11%) routinely administered a test dose of antibiotics and 1 (2%) used a test dose based on patient history.

Discussion

Despite intraoperative anaphylaxis being considered a rare event, over one half of the respondents to our survey had witnessed a case of perioperative anaphylaxis in the preceding 12 months. Suspected cases were appropriately referred for investigation i.e. allergy testing and follow up. There was inconsistent formal incident reporting to webAIRs and the hospital incident reporting system. The reasons for failing to report were consistent with reported institutional and process barriers (21-24). The awareness of the guidelines and local arrangements among our survey population were excellent. Witnessing an episode of anaphylaxis, case reports in journals or presentations at morbidity and mortality meetings were among the factors that have modified the practice of anesthetists. These are listed in table II. Few anesthetists reported using a test dose prior to administration of antibiotics.

When compared with the results of NAP6 (19), our population demonstrated higher awareness of and access to management guidelines and anaphylaxis packs. The percentage of patients referred for investigation were higher at our hospital, which may reflect the availability of on-site expertise and allergy testing. As clinicians we shape our actions based on our own and others' experiences, evidence in peer-reviewed journals and guidelines from national and international specialty associations. Among anesthetists from both countries, neuromuscular blockers and antibiotics were the most common drugs avoided by clinicians who had experienced perioperative anaphylaxis. Similar beliefs existed among both populations, regarding the most common causes of anaphylaxis.

Nearly one-third of UK anesthetists (32%) reported routinely using a test dose when administering intravenous antibiotics which is much higher than in our population. There is little scientific evidence to support the administration of a test dose and it would seem that the routine use of a test dose is likely to be influenced by institutional or national practices though a lot of individual variation exists. In practice, a typical 'test dose' given in the context of perioperative prophylaxis would be 1-2mls of the antibiotic preparation which is far in excess of doses used in the setting of allergy testing or desensitization. In fact NAP6 (6) reported that test doses were responsible for anaphylactic reactions as well and there was no reduction in severity noted with lower doses. One of the recommendations from Harper et al was the administration of antibiotics several minutes prior to induction of anesthesia to increase safety by confirmation of allergy status, decreased physiological derangement and clear indication of the causative agent (6).

Table II

Reasons for avoiding certain drugs: Comments from 13 anesthetists who responded "Yes" to the question: "Do you generally try to avoid any particular drug/substance as a result of perceived high risk of anaphylaxis?" (1 missing)

Heard of several cases (2 respondents)
Death, severe anaphylaxis associated
To reduce risk (of anaphylaxis)
High incidence based on journal articles
Published anaphylaxis rates compared to other effective agents
High institutional rate
Personal experience
Morbidity and mortality meetings
I try to limit use of suxamethonium to genuine needs-based use due to a higher rate of anaphylaxis
The less we do, the less potential problems we cause. I only paralyse when there is a surgical indication or for example the patient had rocuronium before. I perceive that as a good strategy to reduce the risk of anaphylaxis and traumatic recall. Intubation does not require paralysis
Suxamethonium / Rocuronium- higher risk. Avoid muscle relaxants if possible.

Limitations

This survey was limited by the fact that it was conducted at a single centre, the population surveyed was small and the response rate less than 50%. The RBWH is a tertiary institution and the resources and services may vary from those in regional hospitals within Queensland and those in other states in Australia. Selection bias may have occurred, with participating anesthetists interested in sharing their experience following a case of anaphylaxis. This may account for the high proportion of anesthetists who had witnessed a case in the previous 12-month period.

Conclusion

Our survey identified appropriate knowledge among anesthetists and consistent referral of patients

for skin testing. However, there was poor local and national reporting of anaphylaxis as a critical incident, an area which can be improved. This survey does not reflect the practice of anesthetists Australia-wide and a national survey could guide dissemination of knowledge and resources. A larger survey would take into account regional and institutional differences including resources and facilities for training of anesthetists and the availability of allergy testing. Likewise, surveys done in institutions worldwide could guide the training of anesthetists to deal with perioperative anaphylaxis and help standardize resources and protocols to improve patient care.

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Appendix 1.

Questionnaire:

Personal experience of perioperative anaphylaxis

1. In the last 12 months, how many cases of suspected perioperative anaphylaxis have you:
a. seen in patients directly under your care, i.e., where you anesthetized or sedated the patient?
b. assisted in the management of?

2. Of these cases (those you saw directly PLUS those you assisted with, i.e., combining answers to Q1 and Q2): what were the causes of each anaphylactic reaction? (Write "Don't know" if unknown)

3. How many cases did you (or someone from the primary anesthetic team):
a) Refer for investigation
b) Report via webAIRS?
c) Report via your hospital incident-reporting system?

4. If patients were not referred, it was because:
a) Patient died
b) Reaction not severe enough
c) Unsure about pathway
d) Forgot
e) Not my patient
f) Other

5. In how many cases was the diagnosis of anaphylaxis confirmed by subsequent investigation?

Local arrangements - if your next patient has a suspected anaphylactic reaction:

6. Please reply with "Yes/ No". Do you have:
a) immediate access to anaphylaxis guidelines in your theatre/ theatre complex?
b) a specific, labelled anaphylaxis pack (distinct from the usual emergency drug box) in your theatre or nearby?

7. Do you know the departmental lead anesthetist for perioperative anaphylaxis?

Personal attitudes to the risk of perioperative anaphylaxis

8. Personal practice:
a) Do you generally try to avoid any particular drug/substance as a result of perceived high risk of anaphylaxis?
b) If you answered yes to the question above, please explain the reasons why? (For example, personal experience, heard of several cases, information published in journals, etc.)

9. In your perception, which current perioperative drug (or other substance) has the highest rate of anaphylaxis associated with it? i.e., reactions per 1,000 doses.

10. Do you routinely administer a test dose of antibiotics?