The effect of unanticipated perioperative death on anesthesiologists

L'effet d'un décès périopératoire inattendu sur les anesthésiologistes

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Abstract

Purpose *Unanticipated perioperative death (UPD) is a significant event for the anesthesiologist that has not been widely studied. An anonymous questionnaire was used to obtain information about the frequency of UPD, anesthesiologists' most significant UPD, and their opinions regarding UPD.*

Methods *A questionnaire was mailed to all anesthesiologists who were registered with the College of Physicians and Surgeons of Alberta in 2005 (n = 285).*

Results *The study achieved a 63% response rate. Sixty-four percent of respondents had been in practice for more than ten years, and 53% of respondents had experienced at least one UPD. After the UPD, 46% of the respondents performed further elective cases the same day, although 62% of them indicated that this was not advisable. Personal consequences were reported. Twenty-five percent felt they were being blamed for the event, and 10% thought about the UPD on a daily basis for more than a year*

afterwards. Mortality and morbidity reviews were common, and disciplinary consequences occurred infrequently. Sixty-four percent of anesthesiologists' most significant UPDs were elective cases. The etiology of death was thought to be anesthesia-related in only 11% of the UPDs. Although most respondents agreed that supportive and educational activities in the aftermath were advisable, such activities occurred in a minority of cases.

Conclusions *Alberta anesthesiologists are likely to experience UPD during their careers, and the experience can be associated with important personal consequences. Support for the anesthesiologist is inconsistent, and many continued to perform elective cases immediately following UPD. These conditions were not supported by the majority of respondents.*

Résumé

Objectif *Le décès périopératoire inattendu (DPI) est un événement significatif pour l'anesthésiologiste et qui n'a que peu été étudié. Un questionnaire anonyme a été utilisé afin de récolter des informations concernant la fréquence des DPI, le DPI le plus important pour les anesthésiologistes, et leurs opinions concernant les DPI.*

Méthode *Un questionnaire a été envoyé à tous les anesthésiologistes inscrits auprès du Collège des médecins et chirurgiens de l'Alberta en 2005 (n = 285).*

Résultats *L'étude a eu un taux de réponse de 63 %. Soixante-quatre pour cent des répondants pratiquaient l'anesthésiologie depuis plus de dix ans, et 53 % des répondants avaient vécu au moins un DPI. Après le DPI, 46 % des répondants ont travaillé sur d'autres cas non urgents le même jour, bien que 62 % aient indiqué que cela n'était pas recommandé. Des conséquences sur le plan personnel ont été rapportées. Vingt-cinq pour cent des répondants ont ressenti qu'on les blâmait pour le décès, et*

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10 % ont repensé au DPI quotidiennement durant plus d'une année après l'événement. Les réunions sur la mortalité et de la morbidité étaient fréquentes, mais il n'y a pas eu beaucoup de mesures disciplinaires. Soixante-quatre pour cent des DPI les plus importants pour les anesthésiologistes ont eu lieu lors de cas non urgents. L'étiologie du décès a été déterminée comme liée à l'anesthésie dans seulement 11 % des DPI. Bien que la plupart des répondants estiment que des activités de soutien et de formation seraient recommandées à la suite d'un tel événement, de telles activités n'ont été organisées que dans de rares cas.

Conclusion *Il est probable que les anesthésiologistes de l'Alberta vivent un DPI pendant leurs carrières, et cette expérience peut avoir des répercussions importantes sur le plan personnel. Le soutien à la disposition de l'anesthésiologiste varie, et nombre d'anesthésiologistes ont continué à réaliser des cas non urgents à la suite d'un DPI. La majorité des répondants pensaient que ces conditions n'étaient pas idéales.*

It has been reported that as many as 92% of anesthesiologists experience the intraoperative death of a patient and that one-third of these deaths are unexpected.¹ The death of a patient on the table is potentially among the most stressful and consequential events that members of the operating room team will experience during their careers. Although anesthesiologists may be particularly predisposed to psychological stress, especially after the intraoperative death of an otherwise healthy patient, the impact of "death on the table" has not been extensively studied. In addition to natural reactions to death, such as grief and sadness, other factors may contribute to feelings of guilt and responsibility in the anesthesiologist, including the anesthesiologist's responsibility and skill in resuscitation and the tendency for the appropriateness of care to be negatively judged in the case of a severe outcome.² Professional and personal consequences may result that are potentially preventable.

The anesthesiologist may experience profound professional consequences, such as a lengthy leave of absence, early retirement, disciplinary action, and litigation. All of these consequences have been reported following adverse events in the operating room.^{3,4} However, the frequency with which professional consequences occur has not been examined.

Although little has been written about this aspect of anesthesiology, in an article published in 1990, Davies and Bacon suggested that inadequate support in the aftermath of an adverse event in the operating room could contribute to disabling personal consequences for the physician, such as constant internal repetition of events, dysfunctional behaviour, insomnia, substance abuse, early retirement,

and suicide. The authors recommended "a system for providing psychological support for the anesthesiologist, including mentoring, informal debriefing, and assistance with record keeping in the immediate aftermath of an adverse event".² Yet, at the time of our study, there were no specific standards or guidelines available for such a support system, either nationally or within the two academic anesthesia departments in Alberta. Additionally, no studies have been conducted regarding Canadian anesthesiologists' experiences with perioperative death or their opinions on aftermath management.

There has been a growing awareness in the medical community that a psychologically healthy approach to stressful events, such as adverse outcomes, patient complaints, and litigation, are important for both patient safety and physician career sustainability. This trend is highlighted by initiatives of the Alberta Medical Association's Physician and Family Support Program and other provincial doctors' associations that provide support following these events.⁵ Recommendations for dealing with the stress of adverse events have also been published by the Anesthesia Patient Safety Foundation⁶ and the Canadian Medical Protective Association.^A

The purpose of this survey was to determine the frequency of unanticipated perioperative death (UPD), to obtain information about anesthesiologists' most significant (or only) UPD, and to collect anesthesiologists' opinions about the aftermath management of UPD.

Methods

Approval was obtained from the Centre for Advancement of Health and the Conjoint Health Research Ethics Board of the University of Calgary. In October 2006, an eight-page anonymous questionnaire was sent by regular mail to every anesthesiologist registered with the College of Physicians and Surgeons of Alberta (CPSA) in 2005 (285 registered excluding the principle investigator) to the address on file with the CPSA.

We conducted the survey on our provincial population of anesthesiologists due to ensured access to portions of the CPSA database, availability of funding and other resources, and the anticipation of a high response rate from our provincial colleagues on a study of this nature.

Completed questionnaires were received from November 2006 through April 2007.

Unique numeric identifiers were used to ensure no unauthorized duplicates were returned and to ensure a

^A Williamson J. Dealing with stress during medico-legal difficulties. The Canadian Medical Protective Association Information Letter 2005; September 20(3).

reminder letter could be mailed only to the non-responders. A secretary, who was not permitted to see the completed questionnaire, removed each numeric identifier, and then the primary investigator received the anonymous completed questionnaires in batches and collated the data.

The survey instrument was developed directly from the specific research objectives and from a literature and website search conducted regarding perioperative death, adverse events, and post-traumatic stress. Earlier in 2006, the face validity of the instrument and the revisions to ensure clarity and neutrality were addressed using a pilot questionnaire and subsequent discussions conducted with the senior anesthesia residents at the University of Calgary. This group was chosen over practicing anesthesiologists so as to not reduce or bias the target population. All surveys were mailed with pre-addressed stamped envelopes, and one reminder was sent to non-responders by regular mail in January 2007. No incentives for participation were offered.

The questionnaire included multiple choice questions on demographics, features of the respondents' experiences with any UPD as well as their most significant UPD, and the events that occurred in the aftermath of UPD. Opinions regarding UPD were collected using a five-point Likert scale. Comments were solicited at the end of the questionnaire with a separate consent required for the use of any comments *verbatim* at publication.

Unanticipated perioperative death was defined as "the unforeseen death of a patient for whom you were the attending anesthesiologist, which occurred during the perioperative period (from arrival in the operating room to discharge from the post anesthesia care unit)". Specifically excluded were patients arriving in the operating room in moribund condition and not expected to survive surgery.

Questions that were asked in order to characterize the UPD and its aftermath were framed around the UPD that was most significant to the respondent. This was done to simplify the questionnaire so that respondents would not be required to answer the questions repeatedly for each of several incidents. If a respondent experienced one UPD, that event was defined as their most significant UPD.

Descriptive statistics were used for the multiple choice question responses. Quartile distributions were generated for Likert scale responses, with a response of "strongly agree" given a value of 5, and "strongly disagree" given a value of 1. For those responses, the percentage of respondents who agreed or strongly agreed was also calculated.

Results

One hundred ninety-three of the 285 distributed questionnaires were returned. Fourteen of the respondents declined, leaving 179 completed questionnaires (63% response rate).

Table 1 Anesthesiologists' demographic information at the time of the survey

	Number	%
Sex		
Male	141	78.8
Female	38	21.2
Age (yr)		
30 to 40	54	30.2
41 to 50	66	36.9
51 to 60	47	26.3
> 60	12	6.7
Years in practice		
< 5	26	14.6
5-10	39	21.9
11-15	26	14.6
16-20	35	19.7
21-25	27	15.2
> 25	25	14.0
Current practice		
Full-time	131	73.2
Part-time	39	21.8
Retired from anesthesia	8	4.5
Retired from medicine	1	0.6

Seventy-nine percent of respondents were male and 21% were female. Most respondents were practicing anesthesia full time when the survey was conducted. A broad range of ages and number of years in practice were represented (Table 1). In 2005, the provincial database of all licensed anesthesiologists showed a corresponding gender distribution; however, age distribution and other descriptors for this population were not available for comparison.

Overall, 53% of all respondents had experienced UPD, and 64% of those in practice for over ten years at the time of the survey had experienced UPD. Forty-six percent of respondents who had experienced UPD experienced only one, and 54% experienced two or more.

Following UPD, 46% (43/93) of respondents performed further elective cases the same day, with 30 of the 43 respondents citing there was "no one to take over the rest of the cases" as one of the reasons for continuing to work. Two of the 43 respondents felt they did not need time off; six felt the best way to cope was to keep working, and six felt pressure from the surgeon to continue.

Only 14% (13) of anesthesiologists participated in an immediate process, such as an operating room debriefing. Nineteen percent (20) were involved in a structured conference with the patient's family.

Thirty-four percent of respondents felt that they did not receive adequate support after UPD. Twenty-five percent of respondents felt they were being blamed for the event,

and 10% thought about the UPD on a daily basis, for more than 12 months after the event. Only 13% of those who reported feeling blame reported the presumed or known cause of death to be anesthesia-related.

In terms of professional outcomes resulting from UPD, the questions addressed both career outcomes and investigative-disciplinary activities. Career outcomes, including prolonged leave of absence, change of practice, and early retirement, were reported by only 2%. Forty-eight percent reported that a formal review of the death had occurred, most commonly a mortality and morbidity round. Twenty-one percent reported non-disciplinary investigations, and 2% reported disciplinary action. Subsequent litigation occurred for 5% of the respondents who had experienced UPD.

Based on information that respondents provided regarding their most significant (or only) UPD (Table 2), the most frequent *patient* characteristics included age over 35 (75%), ASA 3 physical status classification (47%), elective surgery (64%), and death occurring during the maintenance phase of anesthesia (63%). In the opinions of the respondents, surgical causes (41%) and patient comorbidity (29%) accounted for most of the deaths. Embolic causes (10%), anesthesia-related events (11%), and unknown causes (10%) were less frequent.

The anesthesiologists' levels of clinical experience varied when the UPDs occurred, but 65% experienced their only or their most significant UPD during their first decade of practice (Table 2). For each age group of respondents, Fig. 1 shows the number of UPDs reported according to the number of years the respondents had been in practice at the time of the UPD.

Opinions regarding the management of UPD are summarized in Table 3. The majority of respondents agreed that counselling (64%) and some time off (55%) were advisable following UPD. Sixty-two percent agreed that the anesthesiologist should not perform more cases on the same day after UPD. Most anesthesiologists agreed that the healthier the patient (97%) and the more unexpected the death (94%), the greater the impact the death would have. Forty-eight percent of respondents agreed that the anesthesiologist is ultimately responsible for the patient, regardless of the circumstances of the death. Only a third of the respondents agreed that it is a failure of the whole team when a patient dies perioperatively, not just the anesthesiologist. Few respondents (2%) agreed that all perioperative deaths are preventable. Most respondents agreed that both operating room debriefing (79%) and a formal strategy to deal with these events (81%) are advisable. Only a third agreed that participating in high-fidelity crisis simulation helps anesthesiologists cope with UPD.

Fifty percent of respondents provided recommendations and comments about UPD. Many included a half page or

Table 2 The respondents' most significant (or only) unanticipated perioperative death

	Number	%
Age of patient (yr)		
1-10	10	10.5
11-18	2	2.1
19-35	10	10.5
36-65	34	35.8
> 65	37	38.9
Cannot recall	2	2.1
ASA Status		
1	12	13.0
2	17	18.5
3	43	46.7
4	19	20.7
5	1	1.1
Emergency	34	36.2
Elective	60	63.8
Timing of death		
Induction	10	10.9
Maintenance	58	63.0
Emergence	3	3.3
Postanesthesia care unit	13	14.1
ICU	8	8.7
Presumed or known cause of death		
Surgical	42	40.1
Anesthesia-related	11	10.7
Comorbidity	30	29.1
Embolic	10	9.7
Unknown	10	9.7
Respondents' number of years in practice at the time of the unanticipated perioperative death		
< 5	39	41.5
5-10	22	23.4
11-15	16	17.0
16-20	6	6.4
21-25	5	5.3
> 25	6	6.4

ASA = American Society of Anesthesiologists

more of handwritten notes, often with detailed descriptions of the respondents' UPD(s). As this high volume of comments was not anticipated, resources were not available for a formal qualitative analysis. However, on informal qualitative review of the comments, the authors identified and tabulated a number of themes, including the recommendation that formal policies be developed for support of the entire operating room team following a patient's death. Several respondents urged that the support to the anesthesiologist be individualized according to his or her specific needs. It was also recommended by a number of

Fig. 1 Unanticipated perioperative deaths (UPD) reported according to number of years in practice at the time of the UPD (by age at the time of the survey)

respondents that information about UPD be included in residency program curricula.

Several respondents described feeling devastated following UPD, even after peer review found no evidence of error or anesthetic contribution. We were also reminded by several respondents that a perioperative death that is *not* unanticipated, a close call, and perioperative complications causing severe morbidity can be equally distressing. Many respondents noted a tendency to disabling rumination over what they might have done differently. Comments

frequently related to our professional identity and unique covenant with the patient. As one respondent alluded, the UPD left him feeling he had broken his promise to “keep safe those who sleep”.

Discussion

Our study found that 64% of Alberta anesthesiologists in practice for over ten years at the time of the survey had experienced at least one UPD, hence, the unanticipated death of a patient in the perioperative period is an event that many anesthesiologists can expect to encounter during their careers.

The suggestion that these events would have a personal impact on anesthesiologists is supported by our findings, and respondents confirmed that the unanticipated death of a healthy patient coming for elective surgery would have a more significant impact on them than the death of a moribund patient having emergency surgery. It has been proposed that perioperative death may elicit feelings of guilt and responsibility in the anesthesiologist, regardless of the etiology or inevitability of the death, due to the non-scientific association made between perioperative death and error.⁴ In this study, despite few reports that the etiology of the UPD was anesthesia-related and a minority of respondents agreeing that all UPD is preventable, 25% of

Table 3 Opinions on the management of unanticipated perioperative death (expressed as quartile Likert scores and % agreement) 5 = strongly agree; 1 = strongly disagree

	1 st quartile	2 nd quartile (median)	3 rd quartile	Agreed or strongly agreed (%)
Time off after an event is advisable.	3	4	4	55
Counselling after an event is advisable.	3	4	4	64
The more unexpected the death, the greater the effect it would have on me.	4	5	5	94
The healthier the patient, the greater the effect their perioperative death would have on me.	4	4	5	97
All perioperative deaths are preventable.	1	1	2	2
Every anesthesiologist will encounter a UPD during their career.	3	4	4	55
When a patient dies perioperatively, it is a failure of the whole team, not just the anesthesiologist.	2	3	4	34
The anesthesiologist is ultimately responsible for the patient.	2	3	4	48
Debriefing the operating room team immediately after a perioperative death is advisable.	4	4	4	79
A formal strategy to help anesthesiologists deal with the aftermath of perioperative deaths is advisable.	4	4	4	81
The anesthesiologist should not perform any more cases on the day of a perioperative death.	3	4	5	62
Participating in a high-fidelity crisis simulation helps anesthesiologists cope with unanticipated perioperative deaths.	3	3	4	30

UPD = unanticipated perioperative death

respondents still felt they were being blamed. Factors explaining these findings may include the anesthesiologist's responsibility as the team leader during intraoperative resuscitation, self-protective behaviours of other team members, and a poor understanding of the etiology and management of the crisis by other team members. Responsibility for resuscitation and self-blame are also suggested by the findings; 50% of the respondents agreed that the anesthesiologist is ultimately responsible for the patient in the case of UPD, and only a third agreed that UPD is a failure of the whole team, not just the anesthesiologist. As with a small number of other studies,¹⁻³ we have reported a variety of other personal consequences for the anesthesiologist following a perioperative death, particularly highlighted by the 10% of respondents who reported thinking about a UPD on a daily basis for more than a year.

Fear of disciplinary action and/or litigation has also been proposed as a contributing factor to the anesthesiologist's stress following UPD.³ As disciplinary action and litigation resulted for only 2% and 5%, respectively, for the incidents reported, stress resulting from a fear of such actions would have been ultimately unfounded.

In the opinions of our respondents, the degree of support provided to the anesthesiologists in this study was generally inadequate. While every anesthesiologist who encounters UPD will have unique experiences and needs, the results of this survey suggest that anesthesia departments should examine the procedures and policies that are in place to minimize stress and support the anesthesiologist after these events. Although the most effective means to achieve this objective requires further study, procedures may include operating team debriefing and a subsequent simulated re-enactment, including the anesthesiologist in the family conference, relieving the anesthesiologist from subsequent case assignments, and assisting with adherence to high standards of documentation for any subsequent investigation or medico-legal review that might occur.

Operating team debriefing facilitates a systems review of the case, allows team members to express their concerns openly, and facilitates a defusing of tensions. (The term "debriefing" is used in a non-specific manner here. That is, the term is not used to refer to the critical incident stress debriefing provided to victims for the purpose of preventing post-traumatic stress disorder, that has not proven effective).⁷ In our study, there was a low level of confidence in the ability of high-fidelity simulation to help anesthesiologists cope with UPD, although the questionnaire did not define how simulation might be used in this regard. It has been shown that exposure to anesthesia crises using high-fidelity patient simulation improves non-technical skills in that setting,^{8,9} but the relationship between having better non-technical skills during a crisis and an anesthesiologist's wellness following the event is not

known. It is also unknown whether repeated exposure to and practice with simulated UPD might reduce the personal consequences that occur after a real UPD, or on the other hand, if simulated UPD might introduce its own stressful consequences. The personal and professional risks and benefits of simulated re-enactment after UPD are also unknown.

Participation in the family conference is encouraged as it provides an opportunity for the anesthesiologist to express condolences to the family and ensure that the information relayed to them is factual and appropriate. Principles for family conferences have been described by Aitkenhead³ and include proceeding in a timely fashion and in a comfortable environment, being frank with the information that is known, and not speculating on the information that is not known. It is entirely acceptable to indicate to the family that an investigation will take place and that the medical examiner will be involved when this is the case.³

It is noteworthy that 46% (43/93) of respondents performed further elective cases the same day after UPD, with 30 respondents continuing because a colleague was unavailable to relieve them, and six continuing because they felt pressure from the surgeon. In contrast, 62% of our respondents felt that an anesthesiologist should not perform any further cases on the same day following UPD. Similarly, in their study of all types of intraoperative death, White and Akerele¹ found that 71% of respondents agreed that the anesthesiologist should not take part in further surgical procedures for 24 hours. Interestingly, in a study of orthopedic surgeons, 50% agreed that time off would be beneficial to the surgeon following an intraoperative death.¹⁰ In addition to concerns for the well-being of the physician, patient care may be suboptimal when an anesthesiologist continues to work immediately following UPD. Although there are no studies examining this directly in anesthesiologists, Goldstone examined the outcome of cardiac surgery patients operated on by surgeons who had experienced an intraoperative death within the preceding 48 hours.¹¹ Overall, although there was no increase in mortality in these patients, they had longer stays in both the intensive care unit and the hospital.

Although our findings require confirmation, they suggest that UPD may be more likely to occur in the earlier part of an anesthesiologist's career. We found that 65% had experienced their only UPD or their most significant UPD in the first decade of practice. In addition, there was a trend for reported UPDs to decline with number of years in practice at the time of the UPD. Although this may reflect an age-related or experience-related tendency to reduced UPD over the course of an anesthesiologist's career, instead, it may be due to a reduction in the overall incidence of UPD occurring over the past few decades as a consequence of new risk modifications, technologies, and safety standards.

The higher incidence of UPD reported during maintenance may simply be due to the greater length of the maintenance phase for many procedures, decreased vigilance, and the increased opportunity for life-threatening surgical and embolic events to occur during that time. The higher incidence of elective surgery reported may be a reflection of our definition of UPD, or it may be due to the higher proportion of elective cases in our respondents' practices.

Limitations of the study include the problems associated with retrospective self-reporting of events. While the passage of time may have lead to decreased memory for the more remote UPDs in this study, instead, the intensity of these events could result in exaggerated memories. Some respondents may have minimized their reporting of UPD for other reasons. It is impossible to state the overall effect of these competing influences, and no source for external validation of the reported events was available. Given that there may be regional variability in the practice of anesthesia, departmental policies, and physician support services, restricting the survey to a single province potentially limits the generalizability of the data to the rest of Canada and internationally. Within Canada, however, the Canadian Medical Association, Royal College of Physicians and Surgeons of Canada, and Canadian Anesthesiologists' Society contribute to some uniformity. The possibility of non-responder bias may also have affected the results. For example, non-responders may have found the subject matter to be either unimportant or overly sensitive, and this could have been due to either a lack of experience with UPD or a devastating experience with UPD. Again, this could result in an overestimation or underestimation of the consequences and reports of UPD in this study.

The high response rate to our survey, the large number of respondents who provided comments, and the nature of the comments suggest that this is a topic of importance to anesthesiologists. The high response rate may also be related to a hope or expectation among the respondents that the study will trigger an open discussion of this topic and improved policies. Apart from the recommendation that an anesthesiologist involved in a UPD be relieved for at least the remainder of the day, specific policy recommendations cannot be made based on this study alone. Rather, we

would advocate for further scholarly inquiry and dialogue at both local and national levels so that the issues raised can be addressed to the benefit of our specialty and ultimately our patients.

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