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Data-driven practice improvement: The AANA Foundation Closed Malpractice Claims Study

Research in anesthesia risk management has focused primarily on adverse patient outcomes. Most risk management studies have evaluated the practices of the physician anesthesiologist, while minimal research has been conducted to examine anesthesia care provided by Certified Registered Nurse Anesthetists (CRNAs). For this reason, the American Association of Nurse Anesthetists Foundation supported an examination of closed malpractice claim files from St Paul Fire and Marine Insurance Company that involved insured CRNAs. A team of 8 CRNA researchers investigated 223 closed claim files that involved incidents from 1989 to 1997.

The results indicated that preoperative physical status, patient age, surgical procedure, type of anesthetic, age of anesthesia provider, and the type of anesthesia providers, (eg, CRNA alone vs CRNA and anesthesiologist working together) did not have a statistically significant relationship with adverse anesthetic outcomes. However, providing appropriate care, being vigilant, encountering a less severe adverse outcome, and not being able to prevent the outcome were associated with smaller monetary awards. The findings of this study support those of similar studies.

Key words: **Adverse outcomes, anesthesia risk, closed claims, damaging events, malpractice.**

"The only real mistake is the one from which we learn nothing."—John Powell

Introduction

Anesthetic morbidity and mortality have been studied since the 19th century using a variety of methods often limited by inadequate sample size or lack of structure.[1-6] Nonreporting or under-reporting of adverse anesthetic outcomes diminished the generalizability of these earlier studies. Conclusions from this research showed that provider judgment and drug-related errors were the most important factors that led to respiratory insufficiency, gastric aspiration, and drug overdosage, historically the major causes of anesthetic mortality.[1-4]

Groundbreaking research was conducted in 1974 by the National Association of Insurance Commissioners (NAIC) on closed malpractice claims. This unique endeavor involved collaboration between the medical malpractice insurance industry and healthcare providers. Implicit in this collaboration was an assumption that the analysis of closed claims data could provide strategies to manage risks in the provision of healthcare.

Based on its closed claims analysis, the NAIC identified anesthesia as a high-risk specialty for medical liability.[7] Since the 1974 NAIC study, significant strides have been made in anesthesia to improve patient care including improvements in technology and provider education, as well as safer anesthetic agents and adjuvant drugs.

To date, the most recognized studies of anesthesia risk have been conducted by the Professional Liability Committee of the American Society of Anesthesiologists (ASA).[5,8,9]

The ASA closed claims study continues with a recently reported database of more than 4,000 cases representing some 35 professional liability insurance carriers.[9] The most frequently occurring adverse outcomes reported by Caplan[5] were death (35% of the claims studied), nerve damage (16%) and brain damage (13%). Thirty percent of the damaging events leading to these adverse outcomes were respiratory-related, such as inadequate ventilation, difficult tracheal intubation, and undetected esophageal intubation.[5]

Previous studies of closed claims primarily revolved around the practice of anesthesiologists. However, the American Association of Nurse Anesthetists (AANA) leadership recognized a need to examine adverse outcomes of anesthesia care provided by Certified Registered Nurse Anesthetists (CRNAs). The study of CRNA-related anesthesia events reported here provides information for improving anesthesia care and patient safety and comparing outcomes with various provider mixes.

This research involved an agreement between the AANA Foundation (AANA-F) closed claims research team and the St Paul Fire and Marine Insurance Company. There are inherent problems related to the retrospective nature of this type of research, such as limitations on the conclusions that may be drawn. In particular, the nature of closed claims data does not allow establishment of a denominator for adverse anesthesia outcomes since not every such outcome results in a closed claim. Closed claims data are only one source of information, albeit one of great value, to assess adverse anesthetic outcomes.

Researchers assumed that analysis of anesthetic management and adverse patient outcomes could improve

patient safety. Closed claims analyses are useful to assess current practices and to suggest changes in clinical practices or for nurse anesthesia educational program curricula.

Methods

A claim is a demand for financial compensation for an injury resulting from medical care. Closed claims are malpractice actions against a practitioner and the practitioner's insurance company in which all actions, legal or otherwise, have ceased. A closed claim is filed because of an adverse outcome. Damaging events, such as undetected esophageal intubation, lead to adverse outcomes, such as brain damage or death.

Eight CRNAs were selected as the closed claims research team by the AANA-F Board of Directors based on clinical experience, educational background, research goals, and a committed interest in studying adverse outcomes of anesthesia. Selection criteria for team members emphasized the need to include CRNAs with diverse clinical and educational backgrounds.

The 8 CRNAs on the research team reviewed the anesthesia literature and other materials before reviewing the closed claim files. The files were then reviewed using a data collection instrument designed and modified by team members. The data collected with the tool included data points garnered from a review of anesthesia records representing a cross-section of anesthesia practices, the A+ Risk Management Data Collection Tool, and the Scope and Standards for Nurse Anesthesia Practice found in the *Professional Practice Manual for the Certified Registered Nurse Anesthetist.*[10] The Severity of Injury Scale (SIS) was used to rank the severity of the adverse outcome experienced by the patient.[7] The information extracted from the closed claim files using the AANA-F Closed Claim research tool provided the means to evaluate the anesthesia care.

Face validity of the instrument was established by a panel of experts. To provide a standardized method of data collection, an instruction manual with key definitions was developed as a guide to completing the data collection tool (Table 1), which includes more than 150 data points. The tool includes nominal and ordinal scaled data and a narrative portion for data entry. The Figure represents the major areas identified in the data collection tool. Sources of bias in closed claims studies can influence the reviewer's analysis. Such bias may be due to the background of reviewer, disposition of the claim or lawsuit (dismissal by court or settlement, trial, arbitration, mediation, or dropped by claimant or plaintiff), the nature and extent of the injury to the claimant or plaintiff, the status of medical records, and patient outcomes. To decrease bias among researchers and increase interrater reliability, the researchers collaboratively developed the data collection tool and instruction manual to provide consistency.

Table 1. Definition of terms

Appropriateness of care–Anesthesia care that is reasonable, prudent, and consistent with Scope and Standards for Nurse Anesthesia Practice in force at the time of the incident.
Closed claim–Malpractice claim filed with an insurance company in which all action, legal or otherwise, has ceased, rendering the claim closed.
CRNA-related closed claim–Claim in which a CRNA was named in the claim and judged to possibly have contributed in the adverse patient outcome.
Non–CRNA-related closed claim–Claim in which a CRNA was named in the claim and was judged to not have contributed in the adverse patient outcome.
Respiratory incident–An adverse outcome that was initiated by respiratory system involvement.
Vigilance–State or quality of being watchful to detect any occurrences that may lead to harm to the patient during an anesthetic.
Lawsuit–A civil or criminal case before a court.

Following a review of a claim that was difficult to assess, at least 2 members of the research team discussed the claim until consensus was reached regarding the issues of concern. For each case, a 1-page narrative summary at the end of the research tool provided an overview of the events surrounding the claim.

A computerized data search conducted at St Paul Fire and Marine Insurance Company identified all medical liability claims closed from 1995 to 1997 filed against insured CRNAs. Although the claims were closed in 1995 to 1997, due to the "long tail" nature of malpractice claims, they included incidents that occurred from 1989 to 1997. All claims involving St Paul-insured CRNAs yielded a total of 223 nondental claims.

Inclusion criteria for selection of closed claim files were: availability of complete anesthesia records, an indemnity payment of more than $1,000, and exclusion of dental claims. Of the 223 nondental claims, 151 (68%) were CRNA-related, and 72 (32%) were non–CRNA-related, despite the fact that a claim was brought against the CRNA. A CRNA-related claim is one in which a CRNA was named in the claim and was judged to possibly have contributed to the adverse patient outcome. A non–CRNA-related claim

Figure. Sample of data collection tool: Patient information

Date of anesthesia _____/_____/_____

Date claim reported _____

Date claim closed _____

Did the CRNA's actions in any way contribute to the adverse outcome?

____Yes ____ No If *NO,* explain: _____

ASA physical status:

	On chart	Reviewer
I	_____	_____
II	_____	_____
III	_____	_____
IV	_____	_____
V	_____	_____
E*	_____	_____
N/R*	_____	

Anesthesia providers:

_____ CRNA

_____ Anesthesiologist

_____ Student nurse anesthetist

_____ Anesthesiology resident

_____ Multiple providers

_____ Other

Those present during the event named in the lawsuit:

_____ CRNA ____2nd CRNA

_____ Anesthesiologist

_____ Student nurse anesthetist

_____ Anesthesiologist resident

_____ Surgeon

_____ Registered nurse

_____ Other

Event named in lawsuit took place in:

_____ Intra-anesthesia (induction to emergence)

_____ Emergency room

_____ Intensive care unit

_____ In transit

_____ PACU*

_____ Preoperative holding area

_____ Nursing unit

_____ After discharge from facility

_____ Other _____

Was the anesthesia treatment by the CRNA?

_____ Appropriate

_____ Inappropriate

_____ Impossible to judge

Could the basis for the lawsuit have been prevented by the CRNA?

_____ Yes

_____ No

_____ Cannot be determined

Did a lack of CRNA vigilance contribute to the basis for the lawsuit?

_____ Yes

_____ No

_____ Cannot be determined

Could anyone have prevented the events that led to the lawsuit?

_____ Yes
Explain _____

_____ No

_____ Cannot be determined

Adverse patient outcome:

_____ Death

_____ Brain injury

_____ Nerve injury

_____ Eye injury

_____ Burns

_____ Other (describe)

Preinduction activities:
Were inadequate preinduction anesthesia activities the basis for the lawsuit?

_____ Yes

_____ No

_____ Unknown

Patient monitoring:

Used	Values Recorded	
_____	_____	Electrocardiogram
_____	_____	Blood pressure
_____	_____	Pulse oximetry
_____	_____	Temperature
_____	_____	Anesthesia machine check
_____	_____	o_2 analyzer-alarms on
_____	_____	End-tidal analyzer
_____	_____	~__co_2__N_2__N_2O
_____	_____	Agent analyzer
_____	_____	Inspired- __co_2/o_2
_____	_____	Circuit disconnect
_____	_____	Peak inspiratory pressure
_____	_____	Peripheral nerve stimulator
_____	_____	Arterial pressure
_____	_____	Central venous pressure
_____	_____	Pulmonary artery pressures
_____	_____	PCW* pressures
_____	_____	Cardiac output
_____	_____	Cardiac index
_____	_____	Peripheral vascular resistance
_____	_____	Mixed venous o_2 saturation
_____	_____	Intracranial pressure

Indicate the documents reviewed:

_____ Anesthesia record

_____ Surgeon's operative note

_____ PACU* record

_____ X-rays, laboratory test, toxicology reports

_____ Discharge summary

_____ Follow-up evaluation

_____ Deposition transcripts

_____ Narrative: involved parties

_____ Autopsy report

_____ Photographs

_____ Expert or peer reviews

_____ Claims manager evaluation

_____ Attorney evaluation

_____ Economic analysis

*E indicates emergency; N/R indicates not recorded; PCW indicates pulmonary capillary wedge; and PACU indicates postanesthesia care unit.

involved naming a CRNA where the actions of the CRNA were evaluated as not contributing to the adverse patient outcome. An example of a non-CRNA claim is one in which a CRNA is named in a claim where patient death was due to exsanguination after an iatrogenic injury, such as inadvertent transection of a major vessel.

Closed malpractice claims files include: anesthesia records, medical records, reviews by expert witnesses, narrative statements, correspondence between legal counsel and claims managers, cost settlement or jury awards, and court decisions. Both quantitative items and qualitative narrative information from the relevant clinical events were used in the analysis of each case file.

SPSS for Windows (SPSS, Inc, Chicago, Ill) was used to maintain the closed claims database and for data analysis. The Mann-Whitney and Kruskal-Wallis nonparametric tests were used to compare groups for variables that were at least ordinal, as these variables had statistically nonnormal distributions. The chi-square test of association was conducted to compare groups with respect to nominal variables. Linear association between variables that were at least ordinal was assessed with the nonparametric Spearman correlation coefficient. A .05 significance level was used throughout for statistical tests.

Results

The data collection tool was tested for reliability and validity. The interrater reliability of reviewers also was assessed. Three claim files were selected randomly to examine psychometric properties of the research tool as well as interrater reliability. These files represented a variety of outcomes and settlements. The research team used the data collection tool and instruction manual to independently review the same 3 claims. Interrater reliability was assessed on 4 items from the AANA-F data collection tool that required subjective clinical judgments:

1. Could the CRNA have prevented the basis for the lawsuit?
2. Did a lack of CRNA vigilance contribute to the basis for the lawsuit?
3. Was the anesthesia treatment appropriate?
4. Were the summaries of the event congruent?

Data analysis revealed 72% overall interrater reliability among the closed claim reviewers. This finding compared favorably with those of Posner et al,[11] who found 62% interrater reliability for 30 anesthesiologists who reviewed identical closed claim files where the research focus was a single subjective item, appropriateness of anesthesia care.

Interrater reliability was evaluated for specific questions in the data collection tool. There was a 75% agreement among reviewers for the question that asked whether the anesthesia care provided was appropriate. "Appropriate" care was defined as anesthesia care that was reasonable, prudent, and consistent with Scope and Standards for Nurse Anesthesia Practice[10] in force at the time of the incident. "Inappropriate" care was defined as anesthesia care that was unreasonable or imprudent or failed to meet the Scope and Standards for Nurse Anesthesia Practice[10] in force at the time of the incident. It is important to note that in no instance did one reviewer deem care appropriate while another reviewer found the same care to be inappropriate. Such disagreements can occur whenever reviewers are asked to judge the appropriateness of care based solely on evaluation of medical records and legal documents.[12]

Perhaps the involvement of the entire research team in development and revision of the data collection instrument and its instruction manual accounted for the overall agreement on appropriateness of care.

The analyzed information reported in the summary demonstrated 90% reviewer agreement. Reviewers found that CRNA lack of vigilance contributed to 79% of damaging events and adverse outcomes and that in 62% of the incidents, the CRNA could have taken action to prevent harm to the patient. *Vigilance* was defined as state or quality of being watchful to detect any occurrences that might harm a patient during an anesthetic. The case narrative reported by AANA-F researchers on the data collection tool provided information about provider vigilance. In some cases, depositions described frank inattention of the involved clinicians that was categorized as lack of vigilance. The research team acknowledges that vigilance is a difficult construct to measure. The foregoing results demonstrate that the data collection tool used in this study provided a high level of interrater reliability even for subjective data such as evaluation of CRNA performance.

Results of the 223 closed claim files were analyzed based on patient outcomes (Table 2). Of 151 CRNA-related claims, 66 (44%) involved death, brain injury, or both. Brain injury without death was the basis for 18 (12%) of CRNA-related claims. There was no statistically significant difference between CRNA-related claims and non–CRNA-related claims with respect to type of outcome (n=223).

The amount paid for the CRNA, expenses, and total amount paid (amount paid for the CRNA plus expenses) are summarized in Table 3. The CRNA payout ($P<.0005$) and the total payout ($P<.0005$) were

Table 2. Patient outcome for CRNA-related and non–CRNA-related non-newborn claims

Outcome	CRNA-related (n=151) Number	(%)	Non–CRNA-related (n=72) Number	(%)
All patients				
Death	48	(32)	27	(38)
Brain injury without death	18	(12)	13	(18)
Nerve Injury	18	(12)	13	(18)
Eye Injury	15	(10)	2	(3)
Burns	6	(4)	3	(4)
Other	46	(30)	14	(19)
Adult patients, including maternal claims				
Death	41	(31)	16	(32)
Brain Injury without death	12	(9)	5	(10)
Nerve injury	17	(13)	12	(24)
Eye injury	14	(11)	2	(4)
Burns	6	(5)	3	(6)
Other	42	32)	12	(24)
Pedatric patients, nonmaternal claims only				
Death	5	((42)	1	(20)
Brain injury without death	4	(33)	3	(60)
Nerve injury	0	(0)	0	(0)
Eye injury	1	(8)	0	(0)
Burns	0	(0)	0	(0)
Other	2	(17)	1	(20)

Table 3. Comparison of CRNA-related and non–CRNA-related claims with respect to CRNA payout, expenses, and total payout

Payout ($)	CRNA-related claims (n=141)	Non–CRNA-related claims (n=70)	*P* value
CRNA payout			
Mean ± SD	127,275 ± 250,420	18,442 ± 66,049	< .0005
Median	5,250	0	
Range	0 1,025,000	0 350,000	
Expenses			
Mean ± SD	26,083 ± 37,175	17,650 ± 28,102	.13
Median	11,303	5,613	
Range	0 265,748	29 147,411	
Total payout			
Mean ± SD	155,124 ± 269,062	36,092 ± 83,774	< .0005
Median	26,973	5,910	
Range	5 1,105,504	29 478,527	

higher for CRNA-related claims than for non–CRNA-related claims. No statistically significant difference was found between CRNA-related claims and non–CRNA-related claims with respect to expenses. Only 44% (65/148) of CRNA-related claims had no CRNA payout, compared with 83% (58/70) of non–CRNA-related claims ($P < .0005$).

The severity of the injuries related in the claims was classified according to a standardized system known as the Severity of Injury Scale.[7] The "emotional injury only" CRNA-related claims were excluded from the analysis to obtain *P* values, since this category could not be ranked in an ordinal manner relative to the other severity categories. The emotional injury only claims were included in the database when calculating the percentage of claims in each severity category. No statistically significant difference was found between CRNA-related claims and non–CRNA-related claims with respect to the injury severity rating, the percentage of claims concerning death, the percentage of claims concerning death and/or brain injury, or the percentage of claims concerning nerve injury.

A statistically significant positive Spearman correlation (0.30, $P < .0005$; n = 140) existed between the injury severity rating and the amount paid for the CRNA. The more severe the injury, the greater the amount that was paid on behalf of the CRNA. Claims with CRNA payouts of $200,000 or more had higher injury severity ratings than claims with CRNA payouts of less than $200,000 ($P < .0005$).

No statistically significant difference was found with respect to the percentage of claims that concerned death (n = 47) and CRNA payout amounts. However, of the claims with CRNA payouts of $200,000 or more, 85% (22/26) concerned death and/or brain injury.

CRNAs provided care with an anesthesiologist in 39% (59/151) of CRNA-related claims, compared with 33% (24/72) of non–CRNA-related claims. There were no statistically significant differences between claims for which the CRNA provided care with an anesthesiologist and claims where the CRNA did not provide care with an anesthesiologist with respect to injury severity (n = 141) or the percentage of claims concerning death, death and/or brain injury, or nerve injury (n = 151).

In one outcome category, eye injury, 3% (2/59) of claims where the CRNA provided care with an anesthesiologist concerned eye injuries. The rate of eye injuries was 14% (13/92) of claims when the CRNA did not provide care with an anesthesiologist ($P = .031$).

No statistically significant differences were found between claims for which the CRNA provided care with an anesthesiologist or without an anesthesiologist with respect to the percentage of claims with: (1) no CRNA payout or the percentage of claims with CRNA payouts of $200,000 or more (n = 148); (2) inappropriate CRNA anesthesia care (n = 124); (3) inadequate preinduction anesthesia activities (n = 137); (4) lack of CRNA vigilance (n = 127); (5) claims that could have been prevented by the CRNA (n = 101), or the percentage that could have been prevented by someone (n = 100); (6) the use of pulse oximetry or the use of inspired oxygen monitoring (n = 144). Twenty-four percent (14/58) of the claims where the CRNA provided care with an anesthesiologist were judged to be preventable by better technical monitoring, compared with only 8% (7/86) of the claims for which the CRNA did not provide care with an anesthesiologist ($P = .008$).

The types of surgery or procedures represented in the claims are shown in Table 4. Surgery or procedure types with at least 3 CRNA-related claims (orthopedic, general surgery, gynecologic, obstetric, otolaryngology [ENT], ophthalmology, cosmetic, endoscopy, and vascular) were compared with respect to the injury severity rating (n = 134) and the CRNA payout (n = 131). No statistically significant differences were found.

Surgery or procedure types with at least 10 claims (orthopedic, general surgery, gynecologic, obstetric, otolaryngology [ENT], and ophthalmology) were compared with respect to the percentage of claims concerning death, the percentage of claims concerning death and/or brain injury, and the percentage of claims concerning nerve injury (n = 127). There were no statistically significant differences among surgery or procedure types with respect to the percentage of claims concerning death.

Statistically significant differences were found between surgery or procedure types with respect to the percentage of claims concerning death and/or brain injury (overall $P = .031$). There were no deaths or brain injuries reported for claims involving ophthalmology. However, death and brain injury resulted in other types of surgery or procedures, such as otolaryngology (ENT), general surgery, gynecology, obstetrics, and orthopedics.

Care was deemed inappropriate for about one half of the CRNA-related claims, or 52% (78/151), appropriate for 30% (46/151), and impossible to judge for 18% (27/151). Table 5 shows that claims with inappropriate CRNA anesthesia care had higher injury severity ratings than claims with appropriate CRNA anesthesia care ($P = .020$).

CRNA payout was greater if the CRNA anesthesia

Table 4. Surgery/procedure type for CRNA-related and non–CRNA-related claims*

Surgery/procedure	CRNA-related (n = 149)	Non–CRNA-related (n = 72)
Orthopedic	32 (21)	11 (15)
General surgery	30 (20)	12 (17)
Gynecologic	23 (15)	2 (3)
Obstetric	20 (13)	21 (29)
Otolaryngology	12 (8)	2 (3)
Ophthalmic	10 (7)	2 (3)
Cosmetic	8 (5)	6 (8)
Endoscopy	3 (2)	0 (0)
Vascular	3 (2)	2 (3)
Airway management	2 (1)	3 (4)
Dental/oral surgery	2 (1)	2 (3)
Pain management	2 (1)	3 (4)
Cardio/thoracic	1 (1)	1 (1)
Catheter placement	1 (1)	1 (1)
Neurologic	0 (0)	2 (3)
Urologic	0 (0)	2 (3)

*Data are presented as number (percentage).

Table 5. Appropriateness of CRNA anesthesia care and injury severity*

Severity	Appropriate care (n = 46)	Inappropriate care (n = 78)
Temporary insignificant	1 (2)	4 (5)
Temporary minor	12 (26)	7 (9)
Temporary major	2 (4)	9 (12)
Permanent minor	10 (22)	1 (1)
Permanent significant	4 (9)	10 (13)
Permanent major	3 (7)	5 (6)
Permanent grave	0 (0)	7 (9)
Death	12 (26)	32 (41)
Emotional only	2 (4)	3 (4)

*Data are presented as number (percentage).

care was inappropriate compared with cases where the care was appropriate ($P < .0005$; Table 6). When the CRNA anesthesia care was inappropriate, 30% (23/77) of the claims had no CRNA payout, compared with 67% (30/45) of the claims with appropriate CRNA anesthesia care ($P < .0005$). Moreover, 25% (19/77) of the claims with inappropriate CRNA anesthesia care had CRNA payouts of $200,000 or more, compared with only 4% (2/45) of the claims with appropriate CRNA anesthesia care ($P = .004$).

Lack of CRNA vigilance contributed to the claim for 28% (43/151) of the claims; lack of CRNA vigilance did not contribute to the injury in 56% (84/151), and the degree of vigilance could not be determined in 16% (24/151) of claims reviewed. Claims for which a lack of CRNA vigilance was a factor had higher injury severity ratings than did claims where a lack of CRNA vigilance was not a factor ($P < .0005$) (Table 7).

Of the 151 claims, 26 (17%) involved inadequate preinduction anesthesia activities. Preinduction activities were defined as preanesthetic assessment, including documented physical examination findings and the results of chart reviews for laboratory findings and other retrievable clinical data. Inadequate preinduction activities did not contribute to 74% (111/151) of the claims reviewed, and in 9% (14/151) of claims reviewed it was unknown whether lack of preinduction activities contributed to the claim. There was no statistically significant difference between claims for which inadequate preinduction anesthesia activities were a factor and claims in which inadequate preinduction anesthesia activities were not a factor with respect to the injury severity rating (n = 129).

Almost one half (45%) of the claims were deemed to have been preventable by the CRNA. However, there was no statistically significant difference between claims that could have been prevented by the CRNA and the claims that could not have been prevented by the CRNA with respect to the injury severity rating (n = 96). Of the claims (68/151) that could have been prevented, 51% (35/68) concerned death or brain injury. No statistically significant difference was found between claims that could have been prevented by the CRNA and claims that could not have been prevented by the CRNA with respect to the percentage of claims concerning death or brain injury (n = 101).

Claims that could have been prevented by the CRNA had greater CRNA payouts than claims that could not have been prevented by the CRNA ($P < .0005$). Only 28% (19/67) of the claims that could have been prevented by the CRNA had no CRNA payout, compared with 69% (22/32) of the claims that could not have been prevented by the CRNA ($P < .0005$). In addition, 28% (19/67) of the claims that could have been prevented by

Table 6. Comparison of CRNA payout for appropriate and inappropriate CRNA anesthesia care

CRNA payout ($)	Appropriate care (n = 45)	Inappropriate care (n = 77)	*P* value
Mean ± SD	36,516 ± 99,137	175,603 ± 281,657	< .0005
Median	0	50,000	
Range	0 600,000	0 1,025,000	

Table 7. CRNA vigilance and injury severity (n [percentage of CRNA vigilance category])

Severity	No lack of CRNA vigilance (n = 84)	Lack of CRNA vigilance (n = 43)
Temporary insignificant	5 (6)	0 (0)
Temporary minor	16 (19)	2 (5)
Temporary major	9 (11)	1 (2)
Permanent minor	11 (13)	1 (2)
Permanent significant	10 (12)	5 (12)
Permanent major	4 (5)	4 (9)
Permanent grave	3 (4)	5 (12)
Death	21 (25)	23 (53)
Emotional only	5 (6)	2 (5)

the CRNA had CRNA payouts of $200,000 or more, compared with only 3% (1/32) of the claims that could not have been prevented by the CRNA (*P* = .003).

Of the claims that could have been prevented by the CRNA, 31% (19/62) involved inadequate preinduction anesthesia activities that contributed to the basis for the claim, compared with 7% (2/30) of the claims that were judged not preventable by the CRNA (*P* = .010). Twenty-four percent (16/67) could have been prevented by better technical monitoring, compared with 3% (1/32) of the claims that could not have been prevented by the CRNA (*P* = .010). Thirty-seven percent (25/68) involved CRNA care with an anesthesiologist, compared with 48% (16/33) of the claims that could not have been prevented by the CRNA, which is not a statistically significant difference. Due to the retrospective nature of this study, reviewers made judgments based on the available documents in closed claims files, which did not capture the level of data that would be available with prospective data collection.

More than one half (57% [86/151]) of the claims could have been prevented by someone (the CRNA or someone other than the CRNA), were not preventable by anyone (9% [14/151]), or were impossible to judge with respect to preventability (34% [51/151]). Of the claims that were thought to be preventable, 79% (68/86) could have been prevented by the CRNA, while 10% (9/86) could not have been prevented by the CRNA. There were 4 claims in which it was possible to clearly determine whether a specific person other than the CRNA could have prevented the claim, 3 claims that could have been prevented by the anesthesiologist, and 1 claim that could have been prevented by a nonanesthesiologist, nonsurgeon physician.

Claims that could have been prevented by someone had higher injury severity ratings than claims that could not have been prevented by anyone (*P* = .029). Of the claims that could have been prevented, 28% (22/79) involved inadequate preinduction anesthesia activities, 24% (20/83) could have been prevented by better technical monitoring, and 41% (35/86) included CRNA care with an anesthesiologist. Better technical monitoring could have prevented 14% of the claims. Claims that could have been prevented by better technical monitoring had higher injury severity ratings than claims that could not have been prevented by better technical monitoring (*P* < .0005).

Almost three fourths (7) of the 142 CRNA-related claims for which the reviewer could determine the ASA physical status (PS) class were in the PS I or II classes. There was better correspondence between the reviewer PS and the chart PS, with a Spearman correlation of 0.84 (*P* < .005; n = 108). There were a total of 20 claims (19% of 108) with discrepancies between the chart and reviewer PS class. In no case did the reviewer and chart PS class differ by more than 1 class. The reviewer PS class was worse than the chart PS class for 14 claims and better for 6 claims, which was not statistically significant.

A statistically significant, weak, positive Spearman correlation was obtained between reviewer PS class and injury severity rating (Spearman correlation coefficient = 0.26, *P* = .003; n = 135). Claims that concerned death had higher acuity reviewer PS classifications than claims that did not involve death (*P* = .006; n = 142). However, 87% (40/46) of the deaths involved

reviewer PS of I, II, or III, compared with 98% (94/96) of the claims in which death did not occur. No statistically significant difference was found between claims that involved CRNA care with an anesthesiologist and claims that did not involve CRNA care with an anesthesiologist with respect to reviewer PS class.

Of the 131 CRNA-related claims that concerned either general or local/spinal/epidural anesthesia and not a combination of these types of anesthesia, the actual anesthetic used was general for 73% (95/131) of these claims and local/spinal/epidural for 27% (36/131). No statistically significant differences between general anesthesia claims and local/spinal/epidural claims were found with respect to injury severity rating (n=124) or the percentage of claims concerning death, death or brain injury, or nerve injury (n=131).

There were no statistically significant Spearman correlations between the injury severity rating and CRNA age (n=63) or certification year (n=81). Similarly, no statistically significant differences were found with respect to CRNA age (n=67) or certification year (n=87) between claims that did or did not concern death, did or did not concern death or brain injury, and did or did not concern nerve injury.

Forty-eight percent of the claims concerned inpatients, 33% concerned outpatients, and 19% concerned outpatients/planned admissions. Analyses of patient weight and body mass index (BMI) were done with only adult patients (age 18 and older). No statistically significant difference was found regarding weight (n=110) or BMI (n=60) with respect to claims for an airway or respiratory problem that may have contributed to a damaging event. No statistically significant Spearman correlations were found between the injury severity rating and weight (n=103) or BMI (n=57). There were no statistically significant differences with respect to weight (n=110) or BMI (n=60) regarding claims that did or did not concern death, death or brain injury, or nerve injury.

The analysis of age distribution revealed 89% (132/149) of CRNA-related claims concerned adults (age 18 or older), 3% (5/149) concerned newborns, and 8% (12/149) concerned non-newborn pediatric cases (younger than 18 years). Of 144 CRNA-related non-newborn claims, 12 (8%) concerned pediatric patients. Only 15% (22/150) of the claims were maternal/newborn claims. No statistically significant Spearman correlations were found between the injury severity rating and age (n=122) or patient outcome.

The "respiratory problem or incident" and "airway incident" categories were combined and analyzed as a single category (claims for which a respiratory problem or incident, an airway incident, or both may have contributed to the claim). In 39% (59/151) of CRNA-related claims, a respiratory or airway problem or incident may have contributed to the claim.

CRNA-related claims where a respiratory or airway problem or incident may have contributed had higher injury severity ratings than other claims ($P<.0005$). Sixty-eight percent of the claims where a respiratory or airway problem or incident may have contributed involved permanent, grave injury or death, compared with 12% of claims for which a respiratory or /airway problem or incident did not contribute.

Almost 40% of CRNA-related claims involved a respiratory incident as the primary damaging event to the adverse patient outcome. No statistically significant difference was found between claims in which the CRNA provided care with an anesthesiologist and claims in which the CRNA did not provide care with an anesthesiologist regarding the percentage that had a respiratory or airway problem or incident as a factor (n=59).

A lawsuit was filed, resulting in a claim against malpractice coverage, for 79% of the CRNA-related claims captured in the St Paul Company closed claims files. Claims for which a lawsuit was filed had higher injury severity ratings than claims in which litigation was not initiated ($P=.007$) (Table 8). No statistically significant relationship was found between surgery or procedure type and whether a lawsuit was filed when surgery or procedure types with at least 10 claims (orthopedic, general surgery, gynecologic, obstetric, otolaryngology [ENT], and ophthalmology) were considered (n=125). The CRNA payout was greater when a lawsuit was filed than when a lawsuit was not filed ($P<.0005$). When a lawsuit was filed, only 37% (43/116) of the claims had no CRNA payout, compared with 69% (22/32) of the claims for which a lawsuit was not filed ($P=.001$). Moreover, of the claims that involved lawsuits, 22% (26/116) had CRNA payouts of $200,000 or more, compared with none of the 32 claims in which a lawsuit was not filed ($P=.003$). There were no statistically significant differences between claims for which a lawsuit was filed and claims in which a lawsuit was not filed regarding adult patient weight (n=108) or BMI (n=58), patient sex (n=145), or adult patient age (n=102).

Discussion

Research findings reported here show that preoperative physical status, patient age, type of surgery or procedure, type of anesthetic, and age of anesthesia provider did not have statistically significant associations with adverse anesthetic outcomes. However, several key areas with implications for practicing CRNAs emerged from these data.

Table 8. Lawsuit and injury severity (n [% of lawsuit category])

Severity	Lawsuit not filed (n = 32)	Lawsuit filed (n = 117)
Temporary insignificant	4 (13)	1 (1)
Temporary minor	8 (25)	13 (11)
Temporary major	3 (9)	8 (7)
Permanent minor	5 (16)	9 (8)
Permanent significant	0 (0)	22 (19)
Permanent major	0 (0)	11 (9)
Permanent grave	1 (3)	9 (8)
Death	9 (28)	38 (32)
Emotional only	2 (6)	6 (5)

Anesthetists need to be aware that patients of lower acuity, PS I and II, are at risk for damaging events and adverse outcomes. Almost 75% of the CRNA-related claims were patients with a PS I or II. Therefore, cases with relatively healthy patients are still at risk for having an adverse outcome.

Anesthesia safety as it related to CRNA practice settings was analyzed in this study. There were no statistically significant differences between claims in which the CRNA provided care with an anesthesiologist and claims in which the CRNA did not provide care with an anesthesiologist with respect to injury severity, percentage of claims concerning death, death and/or brain injury, or nerve injury. No statistically significant differences were found between claims in which the CRNA provided care with an anesthesiologist or without an anesthesiologist with respect to the percentage of claims with: no CRNA payout, inappropriate CRNA anesthesia care, inadequate preinduction anesthesia activities, lack of CRNA vigilance, claims that could have been prevented by the CRNA or someone else, and technical monitoring.

However, there was a statistically significant relationship between 1 outcome, eye injury, and whether the CRNA provided care with an anesthesiologist. The small number of eye injury cases may not be reflective of practice trends. Analysis of additional cases as the closed claims database grows will allow further study of eye injuries and the other damaging events and adverse outcomes described in this article.

On the basis of the Scope and Standards for Nurse Anesthesia Practice,[10] reviewers found the anesthetic care provided in this sample inappropriate in 52% (78/151) of the claims. These results indicate that filing a claim does not necessarily imply that substandard or inappropriate anesthesia care was provided. However, to ensure appropriate anesthesia care is provided, CRNAs should know and use the Scope and Standards for Nurse Anesthesia Practice,[10] and make certain that their clinical practice patterns are congruent with the standards. Findings reported here are similar to those of ASA studies,[5,8] which have demonstrated no statistically significant difference between general and regional anesthetic techniques with respect to adverse outcomes. Based on research findings related to the reviewed claims, regional anesthesia may be recommended for reasons other than greater safety relative to general anesthesia, eg, with the rationale that some regional techniques may provide specific advantages such as superior postoperative analgesia. CRNAs should consider how to frame regional anesthesia as an option when interviewing patients and describing the potential risks and benefits of proposed anesthetic techniques.

If care was judged as appropriate, there were no statistically significant differences between claims that concerned death and claims that did not concern death with respect to the total amount paid, expenses, or the amount paid for the CRNA. Therefore, the monetary awards were not vastly different if care was appropriate and the patient died. However, if the care was deemed inappropriate, total payouts for the claim tended to be greater if the patient died.

It is vital that CRNAs practice within the nationally promulgated standards of anesthesia care. The process of care and decisions made by CRNAs account for more adverse outcomes than patient acuity and procedure complexity. CRNAs should be in compliance with published standards of care and clearly document their actions, cogently documenting untoward events when they occur.

Conclusion

Evaluating the practice of CRNAs using closed claim files offers new insights to the practice of nurse anesthesia. Closed claims studies are limited by the reliance on records generated by those participating in the adverse event. Analyses of the closed claims data reflected a nonrandom sample with limited information based on information intended for insurance companies with potentially incomplete clinical data regarding an adverse outcome. The existence of confounding variables, the low incidence of adverse outcomes, and an inability to identify a denominator limit the generalizability of these research findings. Hindsight bias, the feeling that an outcome could

have been anticipated and prevented, is another potential limitation of this type of research. The closed claims research team was meticulous in its analysis of cases, always attempting to evaluate documents in the files objectively.

Since claims from only one insurance carrier, albeit a large malpractice insurance carrier for CRNAs, were studied, the authors acknowledge this is not an exhaustive analysis of malpractice claims filed against CRNAs.

The review of the literature related to the issue of anesthesia malpractice demonstrates an encouraging evolution in our understanding of this phenomenon. The potentially biased mortality studies of old, which are devoid of comprehensive documentation and suffer methodological shortcomings, are being replaced with in-depth analyses that incorporate both qualitative and quantitative methods resulting in greater understanding of why damaging events and adverse outcomes occur.

The study of anesthesia-related adverse outcomes and complications is just evolving for CRNAs. By enriching the current data set with additional cases and insurance carriers, a more comprehensive focus of adverse outcomes can be studied. Even with the limited data set, the findings of this study reflect findings similar to those of Cheney[9] who has studied more than 4,000 malpractice claims. The expanded database will offer more data for further exploration of human error, decision-making models, and critical incident theory and accident models that may help explain why anesthesia malpractice occurs.

CRNAs can and must have a role in the development of this knowledge. The AANA Foundation and AANA Insurance Services support the Closed Claims Research Project representing such a commitment. This article contributes to the growing body of knowledge related to anesthesia malpractice and patient safety.

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