

## Characterizing Liability for Cranial Nerve Injuries: A Detailed Analysis of 209 Malpractice Trials

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**Objectives/Hypothesis:** The potential for adverse events with lasting functional effects makes cranial nerve (CN) injury a target for litigation. Our objective was to comprehensively examine records of malpractice trials and detail issues influencing outcomes.

**Study Design:** Retrospective analysis.

**Methods:** The Westlaw database (Thomson Reuters, New York, NY) was searched for jury verdict reports related to medical malpractice and CN injury. After excluding nonrelevant cases, we examined 209 trials for characteristics including nerve(s) injured, alleged causes of malpractice, demographic information, specialty, and outcome.

**Results:** The most commonly litigated CNs were VII (24.4%) and II (19.6%). Sixty-nine (33.0%) trials resulted in damages awarded. Outcomes varied, ranging from a 29.2% plaintiff success rate for CN XI injury to 48.4% for CN II injury. Plaintiffs had less success with increasing age. Average damages awarded were \$1.7 million. The most commonly named defendants were otolaryngologists and general surgeons. Individual considerations varied but commonly included alleged deficits in informed consent (25.4%), unnecessary procedures (14.8%), undergoing additional surgery (25.8%), and untimely recognition of complications (23.9%).

**Conclusions:** Malpractice trials were resolved in the defendant's favor the majority of the time. In cases where plaintiffs were successful, however, awards were considerable, averaging nearly \$2 million. Factors influencing case outcome included age, location, perceived deficits in informed consent, allegedly unnecessary surgery, requiring additional surgery to repair a complication, and untimely recognition of complications. Although specific factors should be taken into consideration with each procedure, providing detailed informed consent and communicating with patients regarding expectations may minimize liability.

**Key Words:** Liability, malpractice, cranial nerve, negligence, malpractice trial.

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### INTRODUCTION

Increasingly aggressive litigation strategies pursued by plaintiffs with adverse health-care outcomes have contributed to rising health-care costs in the previous three decades. Direct costs associated with malpractice litigation, including damages awarded, legal fees, and high malpractice insurance premiums, are estimated to be between \$6.5 and \$10 billion per year for health-care professionals.<sup>1–3</sup> Indirect consequences include an increase in physicians practicing defensive medicine and

ordering nonessential diagnostics, as well as compromised health-care access for indigent individuals.<sup>4,5</sup> All of these costs associated with the present-day medicolegal environment are ultimately passed down to health-care consumers.<sup>6</sup>

Outcomes in medical malpractice litigation have been studied in several contexts. A recent examination suggested only 15% of surgical malpractice litigation reaches the courtroom, with most other cases either settled out of court or dismissed before trial.<sup>7</sup> The importance of this statistic, however, is debatable. A study examining hospitals in New York found that the likelihood of physician defendants settling out of court had little association with the qualities of a particular malpractice claim, although other analyses have refuted this finding.<sup>8,9</sup>

Medicolegal analyses have been conducted for various topics, including hernia repair, endoscopic sinus surgery, skin cancer, and head and neck cancers.<sup>1,10–14</sup> In addition, liability issues have been examined for several cranial nerves (CNs), including CN VII and XI.<sup>15,16</sup> An analysis of litigation after iatrogenic spinal accessory nerve injury found that the overwhelming majority of cases occurred from lymph node biopsies.<sup>16</sup> A similar examination of facial nerve paralysis found that otologic,

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cosmetic, and parotid procedures were the most common procedures leading to CN VII injuries.<sup>15</sup> Another recent study focusing on malpractice stemming from thyroid surgery found that recurrent laryngeal nerve injury is a significant consideration, although there was no evidence that the use of nerve monitoring plays any role in litigation.<sup>17</sup>

After searching the medical literature, no analyses of litigation regarding CN I, II, III, IV, V, VI, VIII, IX, XII, or any associated branches were identified. The objectives of this analysis were to comprehensively examine federal and state court records of malpractice trials for all cases related to CN injury and characterize factors important in determining outcomes. Knowledge of these factors may allow physicians to pursue strategies that both decrease professional liability as well as minimize adverse medical outcomes.

## MATERIALS AND METHODS

The advanced search function on the Westlaw database (Thomson Reuters, New York, NY) was used to perform a search for jury verdict reports using the term “medical malpractice” in combination with the following terms: CN, olfactory nerve, optic nerve, oculomotor, trochlear nerve, trochlear palsy, rectus palsy, trigeminal nerve, ophthalmic division, ophthalmic nerve, maxillary division, maxillary nerve, mandibular division, mandibular nerve, abducens, facial nerve, facial paralysis, vestibulocochlear nerve, vestibular nerve, cochlear nerve, glossopharyngeal, vagus, laryngeal nerve, recurrent laryngeal nerve, spinal accessory, and hypoglossal. Attorneys voluntarily report outcome and award information in these cases to help characterize and predict factors that can be used in preparing future legal strategies.<sup>18</sup> This database has been validated through its use in describing the medicolegal environments of various topics of special importance to otolaryngologists, including those examining corticosteroid use, hearing loss, facial nerve injury, and sinonasal disorders.<sup>15,19,20</sup>

The initial search yielded 391 results, and cases were excluded for the following reasons: not iatrogenic (n=84), duplicate (n=53), cases settled out of court before resolution of trial (n=28), not CN injury (n=15), and not medical malpractice (n=2), leaving 209 trial outcomes in this analysis.

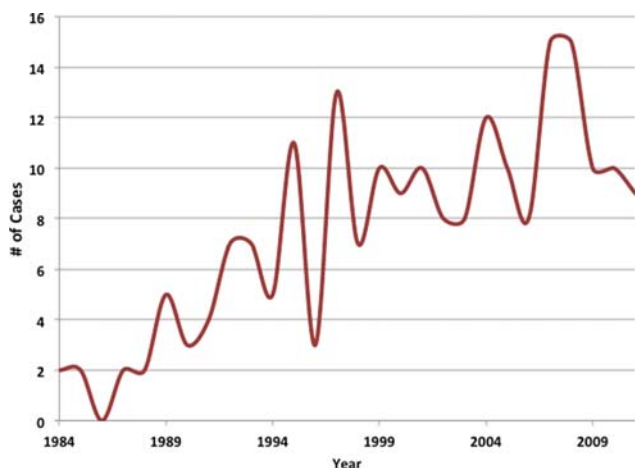


Fig. 1. Cranial nerve malpractice litigation from 1984 to 2011. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

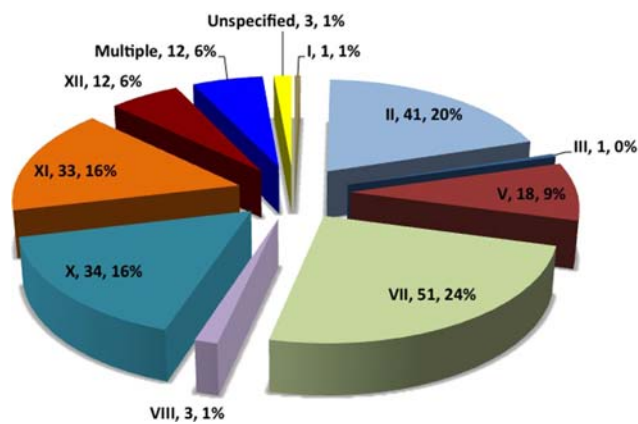


Fig. 2. Distribution of cranial nerve malpractice litigation. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Each case was comprehensively examined for characteristics including nerve(s) injured, alleged causes of malpractice, location, patient demographic information, procedure, defendant specialty, outcome, expert witness specialty, any mention of deficits in informed consent, allegations of an unnecessary procedure, failure to recognize a complication in a timely manner, and whether any additional surgical procedures were required as a result of alleged malpractice. The number of practicing surgeons in each state was obtained from the American Association of Medical Colleges for use in estimating relative incidences of trial by location.<sup>21</sup>

Out-of-court settlements were excluded from primary comparisons because many do not progress far enough to be included in state and federal court records. Nevertheless, the sample of 28 settlements was recorded for comparison to verdict awards. All data were collected in September 2012.

## Statistical Analysis

Nonparametric statistical analysis with Fischer exact tests for categorical comparison and Mann-Whitney *U* tests for continuous variables were calculated where appropriate (MedCalc Software, Mariakerke, Belgium).

## RESULTS

Out of the 209 trials included in this analysis, 150 reported age of the plaintiff. The average plaintiff age was 47.2 years (range, 1 month to 87 years). There were 115 (55.0%) female and 94 (45.0%) male plaintiffs. Trial year ranged from 1984 to 2011 (median year, 2002). There was a general trend of an increasing number of cases over this time period, although this varied from year to year (Fig. 1). The most commonly litigated CNs were the facial nerve (24.4%) and optic nerve (19.6%); there were no trials regarding injuries to CN IV, VI, and IX (Fig. 2). Thirty-one of 34 cases (96.9%) involving CN X regarded damages to the recurrent laryngeal nerve.

Cases were examined for the mention of technologies designed to monitor safety, such as facial or recurrent laryngeal nerve monitoring and stereotactic image guidance for endoscopic sinus surgery. There was no mention of the latter two modalities, and failure to use a facial nerve monitor was brought up in only one case, which was ultimately resolved with a defendant verdict.

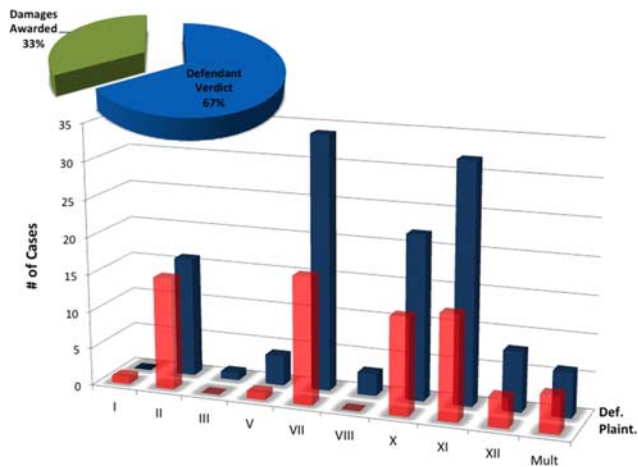


Fig. 3. Trial outcomes organized by cranial nerve (bar graph) and for all cases (pie chart). Def=defendant verdict; Plaintiff=plaintiff verdict. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

Sixty-nine (33.0%) trials resulted in damages awarded, with trial outcomes varying depending on which CN was involved; litigation involving spinal accessory nerve injury was resolved in the plaintiff's favor in 14 cases and in the defendant's favor in 32 cases (29.2% in favor of plaintiff). There were 15 cases with optic nerve involvement that went for the plaintiff versus 16 for the defendant (48.4% in favor of plaintiff) (Fig. 3). Common medical factors in these cases are noted in Table I.

Otolaryngologists were the most commonly named defendants (26.3%), followed by general surgeons (17.7%) (Fig. 4). Otolaryngologists were also the most common expert witnesses, testifying on behalf of plaintiffs and defendants in 58 (27.8%) and 35 (16.7%) cases, respectively (Fig. 5). Relative to number of practicing surgeons, the frequency with which CN medical malpractice cases were litigated was highest in Missouri (5.8 reported cases per 1,000 surgeons), followed by California (3.9 cases), Ohio (3.8 cases), Rhode Island (3.5 cases), and Alaska (3.5 cases) (Fig. 6). It should be noted that there was only one case from Alaska included in this analysis and that the small number of practicing surgeons (285) may be responsible for the high rate in this state. Jury awards related to optic nerve injury had the highest mean (\$3.1 million), although this trend did not reach statistical significance upon direct comparison with facial nerve and hypoglossal nerve awards (Mann-Whitney *U* tests,  $P=.49$ ,  $.59$ , respectively) (Fig. 7).

Lymph node excision, removal of tumors (extracranial), and dental procedures were the most common procedures resulting in litigation (Fig. 8). Trial outcomes varied by procedure, ranging from damages awarded in 80.0% and 64.7% of endoscopic sinus surgery and thyroidectomy/parathyroidectomy-related cases, respectively, to physicians being found not liable in all cases stemming from intubation injury and cataract surgery (Fig. 9).

Factors frequently present included alleged deficits in informed consent (25.4%), allegedly unnecessary pro-

cedures (14.8%), complications requiring operative management for repair (25.8%), and failure to recognize complications in a timely manner (23.9%). There were various differences seen between cases that resulted in awards and those that were decided for the defendant. Although 33.0% of all litigation resulted in a jury awarding damages (Fig. 3), cases involving allegedly unnecessary procedures, requiring additional surgery for repair, and a failure to recognize complications had a higher rate of plaintiff decisions (41.9%, 38.9%, and 36.0%, respectively). More importantly, the proportion of cases decided in the defendant's favor decreased when a greater number of these factors along with perceived deficits in informed consent were raised (Fig. 9A). Trial outcomes in which these issues were raised are shown in Figure 9B. The proportion of trials resulting in a defendant verdict trended upward with increasing plaintiff age, although the size of jury awards was not statistically significant among the various patient age groups (Mann-Whitney *U* tests,  $P>.05$ ) (Fig. 10).

Twenty-eight cases that progressed to trial and eventually were resolved with out-of-court settlements

TABLE I.  
Common Factors in Litigation Stemming From Cranial Nerve Injuries.

Injury	No. (%)
<i>Optic nerve (II)</i>	
Optic nerve ischemia	13 (30.2)
Cataract surgery	9 (20.9)
Alleged negligent anesthesia administration	5 (11.6)
<i>Trigeminal nerve (V)</i>	
Dental procedure	13 (68.4)
Paresthesia	13 (68.4)
Chronic pain	10 (52.6)
Mandibular division (V3)	10 (52.6)
Ophthalmic division (V1)	4 (21.0)
Maxillary division (V2)	2 (10.5)
<i>Facial nerve (VII)</i>	
Facial muscle paresis	50 (86.2)
Otologic procedure	14 (24.1)
Parotidectomy	9 (15.5)
Cosmetic procedure	8 (13.8)
<i>Vagus nerve (X)</i>	
Vocal cord dysfunction	35 (92.1)
Thyroidectomy/parathyroidectomy	18 (47.4)
Respiratory sequelae	12 (31.6)
Gastrointestinal sequelae	6 (15.8)
Intubation	4 (10.5)
<i>Spinal accessory nerve (XI)</i>	
Decreased upper extremity range of motion	27 (77.1)
Lymph node excision	24 (68.6)
<i>Hypoglossal nerve (XII)</i>	
Carotid endarterectomy	10 (66.7)
Speech affected	8 (53.3)
Dysphagia	8 (53.3)



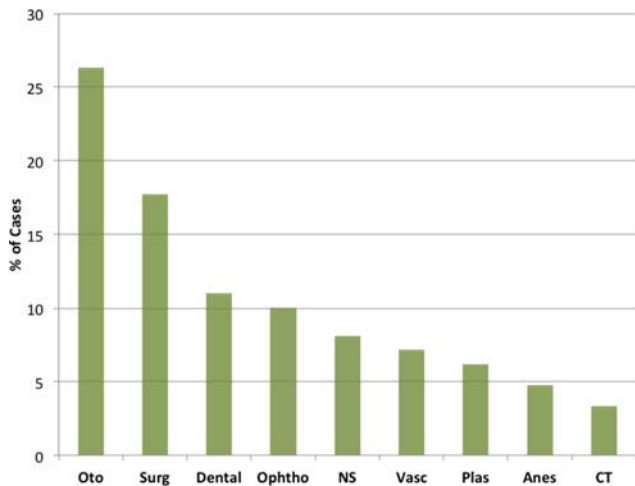


Fig. 4. Defendant specialty. Oto=otolaryngology; Surg=general surgery; Dental=dentist or oral surgeon; Ophtho=ophthalmology; NS=neurosurgery; Vasc=vascular surgery; Plas=plastic surgery; Anes=anesthesiology; CT=cardiothoracic surgery. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

were excluded from this analysis, as this was an examination of trial outcomes. There are likely many settlements that did not progress far enough to be included in state and federal court records, meaning out-of-court settlements are generally underrepresented in this national database. However, the mean settlement amount for these 28 cases was calculated and compared to verdict awards; the mean verdict award (\$1,759,734) trended higher than this small sample of out-of-court settlements (\$800,589), with this result bordering on statistical significance (Mann-Whitney *U* test,  $P=.053$ ) (Fig. 11).

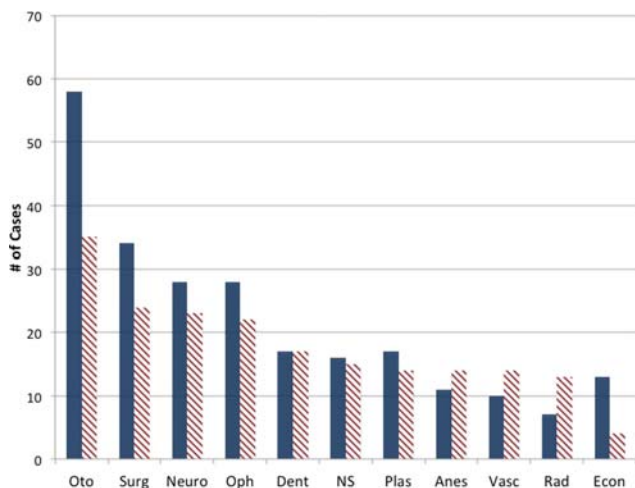


Fig. 5. Expert witnesses. Left bars (solid) represent plaintiff expert witnesses, right (striped) represents defendant expert witnesses. Oto=otolaryngologist; Surg=general surgeon; Neuro=neurologist; Oph=ophthalmologist; Dent=dentist/oral surgeon; NS=neurosurgery; Plas=plastic surgeon; Anes=anesthesiologist; Vasc=vascular surgeon; Rad=radiologist; Econ=economist. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

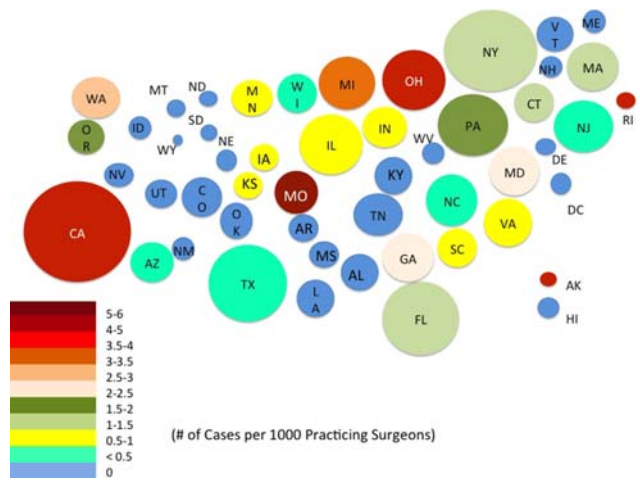


Fig. 6. Dorling cartogram of case location expressed as rate per practicing surgeons. Area of circles proportional to number of practicing surgeons in each particular state in 2010, and shading (key shown) represents number of reported cases per 1,000 practicing surgeons in each particular state. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

## DISCUSSION

Acknowledging an adverse outcome occurred as a result of a physician's actions is not sufficient for awarding damages. Four conditions must be met in order to consider a finding of malpractice and award subsequent payment. The presence of a duty to act, a breach of this duty (i.e., not meeting standard of care), harm experienced by the patient, and evidence of direct causation are all required for consideration of payment.<sup>22</sup> Consequently, many cases progressing to trial were resolved in the physician's favor (Fig. 2).

The most frequently litigated nerves were CN VII, II, X, and XI, respectively (Fig. 2). The trial outcome profiles differed among these nerves, however, as 49.4%

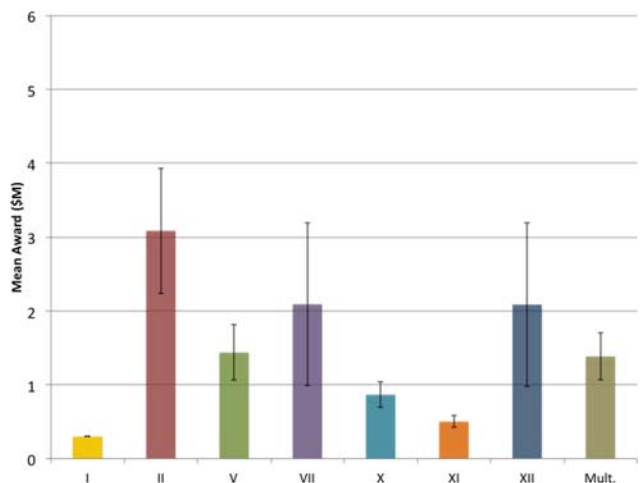


Fig. 7. Damages awarded by cranial nerve. Error bars represent standard error of means. Mult=cases involving multiple cranial nerve injuries. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

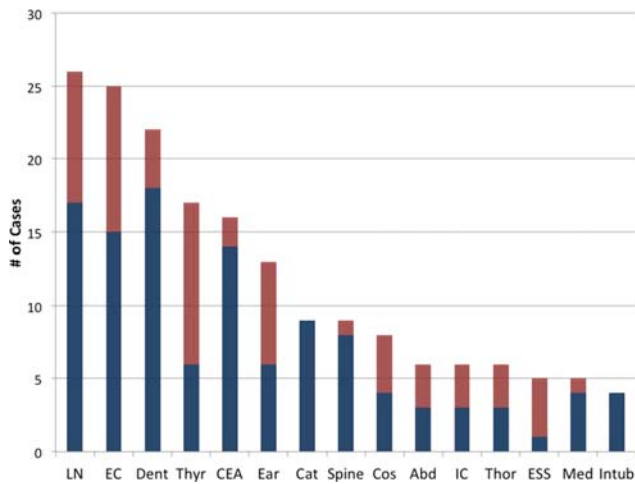


Fig. 8. Most common procedures resulting in cranial nerve litigation. Dark blue (lower portion of each bar) represents cases resulting in decision in favor of defendant, red (upper portions) represents plaintiff verdicts. LN=lymph node biopsy; EC=removal of extracranial tumor; Dent=dental procedure; Thyr=thyroidectomy/parathyroidectomy; CEA=carotid endarterectomy; Ear=otologic procedure; Cat=cataract surgery; Cos=cosmetic procedure; Abd=abdominal surgery; IC=intracranial procedure; Thor=thoracic procedure; ESS=endoscopic sinus surgery; Med=medication-caused injury; Intub=Intubation. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

of CN II injuries resulted in damages awarded, compare to 33.3%, 37.1%, and 30.4% for CN VII, X, and XI, respectively (Fig. 3). The increased damages recovery rate for plaintiffs with optic nerve injuries is partly due to the paucity of reparative options available to patients experiencing blindness, relative to the nerve repair and vocal cord procedures available to treat facial nerve, recurrent laryngeal nerve, and spinal accessory nerve deficits. Among included trials, only 14.6% of plaintiffs litigating optic nerve injuries underwent additional sur-

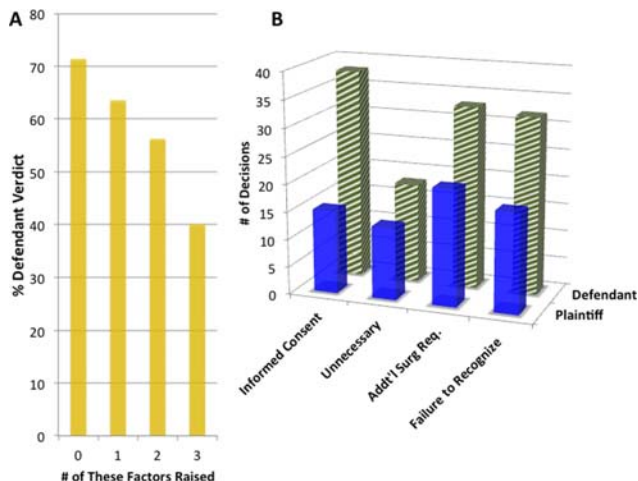


Fig. 9. The role of perceived deficits in informed consent, allegedly unnecessary surgery, requirement of additional surgery, and failure to recognize complications in a timely manner on trial outcomes. (A) Proportion of verdicts in the defendant's favor when these factors were raised at trial. (B) Outcome profile of cases involving each of these individual issues. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

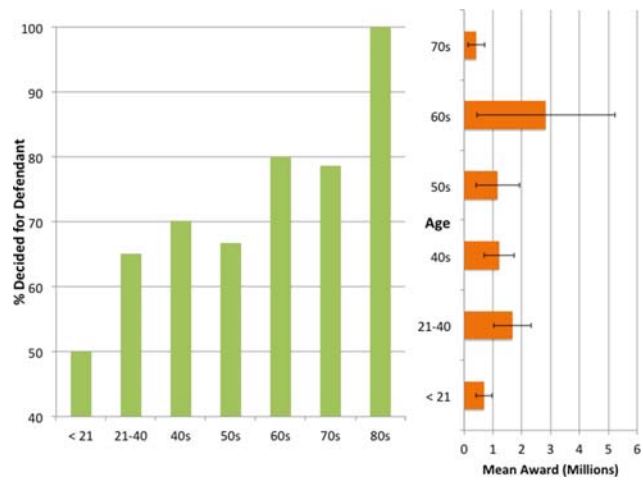


Fig. 10. Role of plaintiff age in cranial nerve malpractice trials. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

gery intended for the purpose of repair, contrasted with 40.0%, 25.7%, and 21.2% of patients with injuries to CN VII, X, and XI, respectively. Consistent with these above findings, damages awarded for optic nerve injuries were higher than all other CNs (\$3.1 million±\$850,000 [standard error of the mean]), although this difference did not reach statistical significance upon comparison with patients who had CN VII and CN XII lesions (Mann-Whitney *U* tests,  $P>.05$  for both) (Fig. 7).

Otolaryngologists were the most commonly named defendants (26.3%), followed by general surgeons (17.7%), dentists and oral surgeons (11.0%), and ophthalmologists (10.0%) (Fig. 4). Otolaryngologists and general surgeons were involved in litigation related to nearly all CNs. In contrast, the majority of cases with dentist or ophthalmologist defendants were restricted to CN V and CN II, respectively. Twelve of 23 cases (52.2%) involving

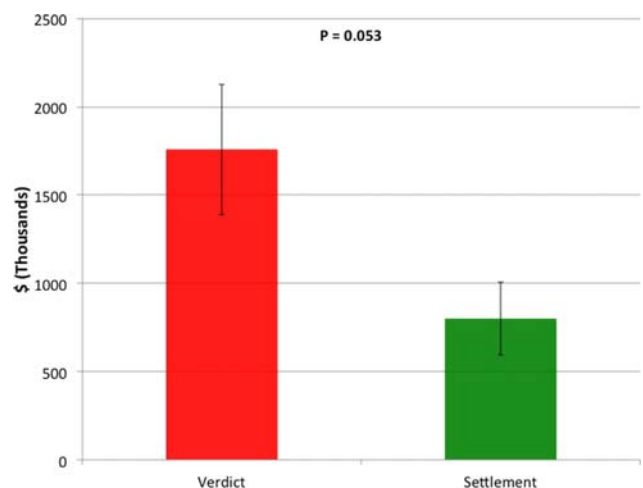


Fig. 11. Comparison of damages awarded by juries with a sample of available settlements. Error bars represent standard error of means; *P* value derived from Mann-Whitney *U* test. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

dental and oral surgeons included injury to the trigeminal (V) nerve, with all but one affecting the mandibular (V3) branch. For trials with ophthalmologist defendants, all but one case (95.2%) involved CN II. The converse, however, was not the case; out of 42 trials with plaintiffs reporting optic nerve injuries, only 19 (45.2%) had an ophthalmologist as a defendant. Out of cases involving optic nerve injury with nonophthalmologist defendants, frequent alleged causes of negligence included perioperative blood loss, embolism, or medication administration causing optic nerve ischemia (7 cases), as well as direct damage during intracranial and endoscopic sinus procedures (5 cases).

Damage to the hypoglossal nerve was another well-represented injury that has not been previously examined from a medicolegal perspective. CN XII was injured alone in 12 cases and with other nerves in three additional trials (Fig. 2). Out of these 15 cases, 12 (80.0%) stemmed from carotid endarterectomies. The mean awarded damages in the four cases decided in the plaintiff's favor was \$2.1 million, with all four of these patients experiencing permanent speech and swallowing difficulties. Alleged deficits in informed consent and unnecessary surgery were present in one case, emphasizing that functional adverse outcomes were the important driver behind litigation regarding hypoglossal nerve injury.

The number of reported cases relative to practicing surgeons differed among various states. Missouri led all states with 5.84 trials per 1,000 active surgeons; California, Ohio, and Rhode Island were the next most litigious states (Fig. 6). In contrast, other states with large numbers of practicing surgeons, such as New York, Florida, Illinois, and Texas had  $\leq 1.5$  cases per 1,000 practicing surgeons.

Alleged factors present in a considerable proportion of litigation included the plaintiff requiring and undergoing additional surgery as a result of a complication (25.8%), failure to provide informed consent (25.3%), failure to recognize the complication in a timely manner (23.9%), and unnecessary procedures (14.8%). There was a stepwise decrease in defendant verdicts with each additional factor involved in a particular case (Fig. 9A). These factors emphasize the need for a physician to have clear communication with his or her patients regarding potential complications and realistic expectations. The issue in most cases with informed consent in particular was not that the physician failed to discuss the possibility of adverse outcomes but that the specific complications noted were not explicitly stated as a possibility. By noting specific factors pertinent to whichever procedure the patient is undergoing, including those listed in Table I, a physician can substantially limit liability and potentially decrease chances of a negative judgment in cases that progress to trial. In addition, outcomes that may not be seen by health-care providers as adverse but may leave patients unhappy, such as cosmetic deformities, can result in litigation. With all procedures, especially elective and cosmetic cases, there should be an open discussion of specific expectations of both the patient as well as his or her surgeon. Another factor influencing outcome was the age of the plaintiff

(Fig. 10). Although there were no statistical differences in the size of damages awarded by age of plaintiff, a higher proportion of cases were resolved in the defendant's favor with increasing age.

Out-of-court settlements were excluded, as the objectives of this analysis were to focus on outcomes and factors of cases that progressed to trial. There are likely settlements that did not progress far enough to make it into state and federal court records other than the 28 excluded on the initial search. The award totals of this settlement sample, however, were examined for comparison with damages awarded by juries (Fig. 11). Verdict awards ( $\$1,759,734 \pm \$369,574$ ) were higher than these settlements ( $\$800,589 \pm \$205,737$ ), a result that bordered on statistical significance (Mann-Whitney *U* test,  $P=.053$ ). This illustrates that in cases in which factors suggesting an increased chance of judgment in favor of the plaintiff (Fig. 9) are present, the defendant may wish to consider out-of-court settlement rather than progressing to trial. Other factors such as plaintiff's age may need to be considered.

Containing comprehensive detailed jury reports, Westlaw is a previously validated database for conducting a medicolegal examination of particular injuries.<sup>15,18-20</sup> This resource, however, is not without its limitations. There was considerable variability in the level and types of details among these cases. In addition, some reporting vendors (which vary by jurisdiction) providing information to Westlaw rely on records that are voluntarily submitted by attorneys, although with the explicit purpose of disseminating information about outcomes and other factors.<sup>18,20</sup> Westlaw research support was contacted by the authors and indicated that some vendors, although not all, rely on voluntarily submitted information. The majority of cases, however, are obtained from federal and state court records, with parties in cases not voluntarily submitted labeled as "anonymous."

## CONCLUSION

Considering the close proximity of critical neurovascular structures in the complicated anatomy of the head and neck, iatrogenic injury of CNs is of particular concern to practitioners in numerous specialties, including but not limited to otolaryngologists, ophthalmologists, general and vascular surgeons, orthopedists, oral surgeons, neurosurgeons, and anesthesiologists. Although many cases likely do not progress to trial, malpractice trials involving plaintiffs who experienced CN injuries are resolved in the defendant's favor in the majority of cases. In cases where plaintiffs are successful, however, damages awarded may be considerable, averaging nearly \$2 million. Factors influencing case outcome may include perceived deficits in informed consent, allegedly unnecessary surgery, the requirement for additional surgery to repair a complication, and untimely recognition of any complications. Geographic variation also may affect litigation, and the age of the plaintiff may play a role in trial outcome, with older plaintiffs less successful than their younger counterparts. Although specific

factors should be taken into consideration depending on the particular surgery, there are several strategies that may minimize liability and improve patient outcomes. These include providing a detailed informed consent process that explicitly states risks and discusses benefits and alternatives as well as having an open dialogue with patients regarding expectations of their procedure.

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