



Patient Safety in Neurosurgical Practice: Physician and Patient Factors that Contribute to Patient Injury

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■ **BACKGROUND:** Recommendations that may help reduce adverse events outside the perioperative period are uncommon. We identified the primary factors that contributed to patient injury in neurosurgical practice both within the perioperative period and outside the perioperative period.

■ **METHODS:** Medical malpractice claims ($n = 355$) from The Doctors Company that were closed over 7 years were reviewed by neurosurgical medical experts. Objective neurosurgical expert analysis of the cases identified patient injuries and the primary factor that contributed to the patient injury.

■ **RESULTS:** Continued pain, nerve damage, and need for additional surgery were the most common injuries. In 145 cases (40.8%), the primary factor that contributed to patient injury occurred outside the perioperative period: assessment (evaluation and diagnosis), selection and management of therapy, and communication between the physician and patient/family. In 138 (38.9%) cases, the primary factor that contributed to patient injury occurred within the perioperative period. Surgical complication (a known risk of the procedure) was the primary factor in 99 cases (27.9%), and technical performance of surgery was the primary factor in only 39 cases (11.0%).

■ **CONCLUSIONS:** In addition to excellent surgical technique, checklists, teamwork, outcomes measurement, and regionalization of subspecialty care, improving patient safety in neurosurgical practice requires careful attention to care provided outside the perioperative period. Differential diagnosis, consideration of all relevant clinical data, active pursuit of good physician—patient relationships, and

adequate monitoring of patients receiving nonsurgical treatment may also help improve patient safety in neurosurgical practice.

INTRODUCTION

Patient safety is important. Widely publicized studies have identified a surprisingly high incidence of harm caused to patients by medical treatment, or the lack thereof.^{1,2} Minimizing the risk of these adverse events is especially important in neurosurgery because many of the diseases that we treat already threaten significant disability, and all of the treatments that we use carry some risk of complication.

The number of studies on patient safety in neurosurgery is substantial, and several comprehensive reviews have been performed. However, these studies primarily focus only on injuries that occur within the operating room. Wong et al.³ identified the most common neurosurgical adverse events from existing studies and categorized them by likely contributing factors, aside from patient condition. The categories that were identified were all related to the perioperative period. For example, the sole potential communication error identified in tumor surgery was wrong-site surgery. Another group who reviewed patient safety stated that “Adverse events in neurosurgery can be defined as both the unexpected perioperative complications as well as the anticipated neurologic or general deterioration related to surgical approach or other known causative factors.”⁴ Adverse events occurring outside the perioperative period were not explicitly included in the definition. Patient care in neurosurgical practice outside the perioperative period occurs before surgery or other invasive treatment, after surgery or other invasive treatment, or during medical management. Recommendations that may help reduce adverse events outside the perioperative period are sparse

Key words

- Adverse events
- Complications
- Liability
- Medical error
- Neurosurgery
- Patient safety

Abbreviations and Acronyms

QOD: Quality Outcomes Database

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but include outcomes monitoring and regionalization of subspecialty care.^{3,5}

However, neurosurgical practice is not limited to the operating room. In some cases, the severity of injury from an inadequate differential diagnosis may match that caused by poor surgical technique. A recent study of litigation⁶ showed that nonsurgical treatment is a common, and perhaps underrecognized, source of liability in neurosurgical practice. In the current study, we considered patient safety broadly and sought to identify all aspects of neurosurgical practice that contributed to patient injury.

METHODS

Medical malpractice claims from The Doctors Company in which a neurosurgeon was named as the primary defendant and that were closed between 1 January 2007 and 31 December 2013 were included in the study. Closed claims are lawsuits that have been given up by the plaintiff, settled, or have completed trial. Cases with insufficient or missing data for analysis were excluded. Neurosurgical procedures were categorized according to the classification scheme used in the American Association of Neurological Surgeons National Neurosurgical Procedural Statistics 2012 Survey Based on 2011 Data.⁷ Cases were designated medical management when a neurosurgical procedure was not performed or when the neurosurgical procedure was unrelated to the primary allegation and patient injury.

For each case, all available information, including medical records, imaging, and depositions, was reviewed by a neurosurgical medical expert. Neurosurgical experts were generally chosen by the defense attorney and approved by The Doctors Company. All neurosurgical expert reviewers were certified by the American Board of Neurological Surgery and were practicing independently at the time of their review. Most claims have more than 1 allegation and some patients claimed more than 1 injury. The primary allegation and patient injury or injuries were determined from the claim by the reviewer.

The reviewers were asked to provide objective analysis of each case. Identification of patient injuries, the primary factor that contributed to the patient injury, and patient comorbid factors that were directly related to the injury were determined by the expert reviewer assigned to the case. For example, diabetes mellitus with proper management does not necessarily contribute to patient injury in neurosurgical patients. However, in a patient with wound infection and poor blood sugar control before surgery, diabetes mellitus was identified as a patient comorbid factor that contributed to patient injury. The Doctors Company started capturing comorbidities in 2010. Therefore, the analysis of patient comorbid factors that contributed to patient injury is based on a subset of the entire cohort.

Because the study data are based on the date that the claim closed and not the date that the incident occurred, it is impossible to determine the number of neurosurgeons insured and the number of years of practice that generated these claims. To protect anonymity, demographic data of patients and neurosurgeons are not provided. Furthermore, The Doctors Company does not collect exposure data; therefore, it is impossible to determine the incidence of claim by procedure. The Doctors Company is the largest physician-owned medical practice insurer in the United States,

providing medical malpractice coverage to more than 77,000 physicians and surgeons nationwide.

RESULTS

Between 1 January 2007 and 31 December 2013, The Doctors Company closed 15,636 claims for all medical specialties. During this period, The Doctors Company closed 361 claims (2.31%) in which a neurosurgeon was the primary physician defendant. Six cases had insufficient or missing data for analysis and were excluded from the study, leaving 355 cases for analysis of associated procedures, primary allegations, patient injuries, and primary factors that contributed to patient injuries. Case type by neurosurgical procedure is shown in **Table 1**. Spine procedures were the most common, occurring in 185 cases (52.1%). Nonsurgical management was second most common, occurring in 104 cases (29.3%).

The top 7 allegations represent 86% of the claims made and are shown in **Table 2**. Improper performance of surgery was the most common allegation by plaintiff, occurring in 193 cases (54.4%). All other allegations were each made in 5 or fewer cases (1.4% or less). “Improper performance of surgery”, “improper management of surgical patient,” and “improper management of treatment plan” are plaintiff allegations that the treating neurosurgeon did not exercise the degree of skill and expertise normally possessed and exercised by a reasonable and prudent practitioner with the same level of training in similar circumstances. That is, the patient argues that the neurosurgeon failed to meet standard of care. Patient injuries as determined by the neurosurgical expert reviewer are shown in **Table 3**. For all claims, continued pain (23.9%), nerve damage (23.1%), and need for additional surgery (18.0%) were the most common injuries. The total adds to more than 100% because some patients sustained more than 1 injury.

The primary factors that contributed to patient injury as determined by the neurosurgical expert reviewer are shown in **Table 4**. Assessment (evaluation and diagnosis), selection and management of therapy, and communication between the physician and patient/family (all factors that are controlled primarily by the neurosurgeon and occur primarily outside the operating room) were the primary factors that contributed to

Table 1. Case Type by Neurosurgical Procedure Associated with Patient Claims

	Number (%)
Spine	185 (52.1)
Cranial	30 (8.5)
Cerebrospinal fluid shunting	7 (2.0)
Peripheral nerve	12 (3.4)
Functional/pain/interventional	10 (2.8)
Endovascular/catheter/percutaneous	7 (2.0)
Extracranial cerebrovascular	0
Medical management	104 (29.3)

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