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Surgical Fires and Operative Burns: Lessons Learned From a 33-Year Review of Medical Litigation

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ABSTRACT

Objective: We aimed to understand the setting and litigation outcomes of surgical fires and operative burns.**Methods:** Westlaw, an online legal research data-set, was utilized. Data were collected on patient, procedure, and case characteristics.**Results:** One hundred thirty-nine cases were identified; 114 (82%) operative burns and 25 (18%) surgical fires. Median plaintiff (patient) age was 46 (IQR:28–59). Most common site of operative burn was the face (26% [n = 36]). Most common source of injury was a high energy device (43% [n = 52]). Death was reported in 2 (1.4%) cases. Plaintiff age <18 vs age 18–50 and mention of a non-surgical physician as a defendant both were shown to be independently associated with an award payout (OR = 4.90 [95% CI, 1.23–25.45]; p = .02) and (OR = 4.50 [95% CI, 1.63–13.63]; p = .003) respectively. Plaintiff award payment (settlement or plaintiff verdict) was reported in 83 (60%) cases; median award payout was \$215,000 (IQR: \$82,000–\$518,000).**Conclusion:** High energy devices remain as the most common cause of injury. Understanding and addressing pitfalls in operative care may mitigate errors and potentially lessen future liability.**Level of evidence:** III.

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1. Introduction

Despite modern advances in surgical practice which have immensely improved patient safety in operating rooms, rare sentinel events such as surgical fires and operative burns continue to occur. The Emergency Care Research Institute estimates that 550 to 600 surgical fires occur each year throughout the United States.¹ Given that half of all states in the US are not required to report these sentinel events, these numbers may exceed current estimates.² As a result, our knowledge about the impact of operative burns and surgical fires in clinical practice is sparse.^{2–4} Injuries stemming from these events can cause short term morbidity, including superficial and deep skin burns; however there have been reports of permanent harm and even death in cases where severe burns have compromised patient airways.² Such events detract from the trust patients place in their providers, and as a result, patients may seek

legal redress.⁵

During the past two decades, malpractice lawsuits have become more common.⁵ Today, physicians practicing in high legal risk specialties (ie, surgical specialties) are at greatest risk of facing a malpractice claim.⁵ Although surgical sentinel events are rare, their occurrence is a potential source of liability for hospitals and medical staff.^{2,3,6} Our objective was to use a malpractice claims dataset to better understand the settings in which surgical fires and operative burns occurred. In addition, we intended to understand the legal repercussions associated with such events. We anticipate by reporting on characteristics which have led to operating room fires and burns, physicians and hospital staff can enact changes in surgical care which may improve patient safety and mitigate potential litigation.

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2. Methods

2.1. Westlaw

We conducted a retrospective review of closed malpractice claims reported in Westlaw (Thompson Reuters, New York, NY), an online subscription-based legal research engine. Westlaw contains information on more than 40,000 databases of statutes, case law, and public records. Cases reported in Westlaw are written opinions of appellate court judges with stated reasons of alleged negligence. Cases differ in the amount of information available, such as detailed patient and procedural characteristics that affect patient care. Much of the information presented in each case is that which is relevant to legal research. Nevertheless, malpractice cases in Westlaw have been extensively studied to understand reasons for litigation in surgical and non-surgical specialties.⁷

2.2. Search Strategy

We searched all jury verdicts and settlements for the terms, “medical malpractice”, “burn”, “fire” and “surgery”. Exclusion criteria included duplicate cases reported in the dataset, cases with litigation related to dermatologic procedures (eg, chemical face peels or laser skin procedures) and ophthalmologic procedures, which included use of a laser such as LASIX or laser eye surgery. Only cases in which the primary reason for litigation was determined to be the surgical fire or operative burn were included in the final analysis.

2.3. Outcome Measures

Each case was reviewed for relevant patient and procedural characteristics, including surgical site, site of injury, source of fire/burn, reason for fire/burn, highest degree of burn injury reported, fire risk assessment score, and case outcome. Cases dates and trends overtime were studied based on dividing the total case years reported (1982–2015) into three time periods: 1982–1994, 1995–2004, and 2005–2015.

In each case, a fire risk assessment score was calculated based off the Christiana Care Health System fire assessment protocol.⁸ The fire risk assessment score is used to assess the likelihood of a fire occurring during an operation and is based on 3 parameters: presence of an open oxygen source, ignition source, and an operation site at or above the xiphoid process. Operations are scored from 0–3, with a higher score indicating a greater chance of a fire occurring. Furthermore, each case was analyzed to determine the highest severity of injury based on the National Association of Insurance Commissioner’s (NAIC) classification of injury scale and degree of burn injury, where the information was present.⁷ Typically, burn injuries result in a minimum NAIC grade 4 (temporary major) to grade 9 (death) injury. The alleged reason for the fire/burn was identified in cases from 2 abstractors (A.J.C. and N.N.H.). In case of any discrepancies, a third reviewer (M.D.Z.) was approached to identify the reason for the fire/burn.

2.4. Definitions

The defendant in cases was identified as the individual or hospital/institution against whom the claim was brought in the court of law. Defendants were broadly classified based on specialty as surgical vs. non-surgical (eg, medical, anesthesiology). Furthermore, surgical specialties were further subclassified (eg, general surgery, urology, orthopedic surgery, obstetrics and gynecology, ophthalmology, oral maxillofacial surgery, neurosurgery). Additional staff members (eg, surgical nurses, nurse anesthetists, and

physician assistants) if named in cases were identified separately. The plaintiff was identified as the individual or party who instituted the malpractice claim. Award payouts were adjusted to 2015 US dollars using the United States Department of Labor-Consumer Price Index calculator.

2.5. Data Analysis

All continuous data are presented as a median with an interquartile range (IQR), as deemed appropriate. Categorical data are presented as frequencies and percentages. The Wilcoxon rank-sum test was used to compare median award payouts between settlements and plaintiff verdicts. Categorical data such as case characteristics and cases outcomes were compared using the Fisher’s exact and Pearson’s chi-square tests where appropriate. Univariate and multivariable logistic analyses were performed to determine characteristics independently associated with an award payout. Only features found to be statistically significant on univariate analyses were included in the multivariate model. A *p*-value of <.05 was noted as statistically significant and all tests were two-sided. The analysis was performed using JMP Pro version 10.0 (SAS Institute Inc., Cary, NC, USA).

3. Results

3.1. Patient Characteristics

The search criteria yielded 721 initial case results. After a thorough review, 582 cases were excluded for not meeting study criteria and 139 cases were included in the final analysis. Median patient age (data available in 91 cases) was 46 (IQR: 28–59). Female sex was reported in 92 (66%) cases. Twenty-one (15%) cases involved a minor (<18 years of age); the remaining cases (*n* = 118 [85%]) involved adult patients (plaintiffs).

3.2. Time Period and State Characteristics

Case dates ranged from 1982 to 2015. Twenty-seven cases (19%) were reported from 1982 to 1994; the majority of cases were reported from 1995 to 2004 (*n* = 57 [41%]); 53 cases (39%) were reported from 2005 to 2015. Cases were noted from a total of 35 US states; no federal cases were identified. The 3 states with the highest number of cases included California (*n* = 27 [19%]), Florida (*n* = 10 [8%]) and Massachusetts (*n* = 10 [8%]).

3.3. Case Outcomes

A total of 56 cases (40%) had a verdict in favor of the defendant; in 3 (2%) and 26 (19%) cases respectively, a decision through arbitration or settlement was reached. Fifty-four cases (38%) had a verdict in favor of the plaintiff. Overall the median award in cases with an award payout for the plaintiff was \$215,000 (IQR: \$82,000–\$518,100). Median award payout in cases with a plaintiff verdict was \$249,020 (IQR: \$144,097–\$519,925) vs median payout of cases with a settlement/arbitration outcome: \$148,200 (range: \$66,975–\$453,387). Award payouts between the 2 groups (plaintiff vs. settlement/arbitration) were not found to be significantly different, *p* = .27.

3.4. Defendant Specialty

The most common surgical subspecialty of defendants identified in cases was general surgery (*n* = 40 [28%]). The most common nonsurgical subspecialty identified was anesthesiology (*n* = 19 [14%]). Case outcomes based on defendant medical specialties are

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