

Malpractice litigation in cardiac surgery: Alleged injury mechanisms and outcomes

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Abstract

Background and Aim: The feared prospect of involvement in malpractice litigation ultimately becomes a reality for many physicians in high-risk specialties such as cardiothoracic surgery. This study systematically analyzes malpractice claims by procedure type and alleged injury mechanism.

Methods: An extensive nation-wide database of medical malpractice claims was searched, and 140 involving cardiac procedures were identified. The primary reason for the lawsuit was classified as a periprocedural injury, postoperative mismanagement, failure to operate in a timely manner or at all, performing an unnecessary procedure, performing a procedure too soon, lack of informed consent, or patient abandonment.

Results: Cardiac surgeons were defendants in 47.8% of cases and cardiologists in 56.4%. Forty percent of cases involved coronary artery bypass grafting, valvular surgery, or both; 50% of these received defendant verdicts. The most common reason for the lawsuit was periprocedural injury, most frequently due to poor prosthetic valve fit/securement (23.1%) or surgical site infection (15.4%). For congenital cases, most lawsuits alleged periprocedural injury, with perfusion-related issues (cooling during circulatory arrest, failure to inform surgeon about poor oxygenation) cited in 37.5%. Cardiologists and cardiothoracic or vascular surgeons were codefendants in 14.3% of cases, most commonly coronary artery bypass grafting (40%) or cardiac catheterizations (25%). In all catheterization cases, the allegation against the surgeon was a failure to diagnose/treat the complication in a proper or timely manner. In postoperative mismanagement cases, bleeding/tamponade was the most common allegation category (31.8%).

Conclusions: A careful review of cardiac surgical malpractice litigation can identify common contributory factors to adverse patient outcomes and catalyze practice improvement.

KEYWORDS

cardiovascular research, quality improvement

1 | INTRODUCTION

The feared prospect of involvement in a medical malpractice lawsuit eventually becomes reality for many physicians practicing in high-risk

specialties such as cardiac surgery and cardiology. A study¹ of 40 916 physicians covered by a large nation-wide professional liability insurer from 1991 to 2005 found that 18.9% of thoracic-cardiovascular surgeons faced a claim each year, second only to neurosurgeons.

It was projected that by age 65, 98.4% of physicians in these specialties would face a malpractice claim. Cardiac surgical procedures are indisputably high-risk, as one study² of 114 233 Medicare patients who underwent coronary artery bypass graft (CABG) demonstrated a 13.64% incidence of at least one of seven complications: reoperation, hemorrhagic or postoperative shock, postoperative adult respiratory distress syndrome, new-onset hemodialysis, postoperative stroke, postoperative infection, or sepsis.

The present study, based upon a large nation-wide database of medical malpractice claims, is the largest within the very limited existing body of cardiothoracic surgical malpractice literature to stratify claims by specific procedure types and provide in-depth analysis of the specific mechanisms alleged to cause injury in each case. It was hypothesized that the largest proportion of cases would involve CABG or valvular surgery, most commonly for graft vessel complications or inadequate prosthetic valve fit or function. When postoperative mismanagement was alleged, it was hypothesized that infection or stroke would be the most frequent injury mechanisms.

2 | MATERIALS AND METHODS

Cases were identified using VerdictSearch (<http://verdictsearch.com>), a national legal database containing more than 200 000 cases whose verdicts or settlement outcomes are reported by involved attorneys. Because the data are publicly available, an exemption was obtained from the Yale University Institutional Review Board (New Haven, CT). A search was performed for all cases listed under the category "Medical Malpractice" plus subcategory "cardiac surgery," "cardiac care," or "heart surgeon." Cases were excluded if unrelated to the performance of a cardiac procedure, including those cases alleging that a patient inappropriately received cardiac clearance for a noncardiac surgical procedure.

2.1 | Statistical analysis

For each case, the following data were recorded: patient sex and age at the time of event (if only a decade range was provided, such as "in his 60s," then the median age within that range, in this case "65," was used), year of event, type of procedure performed (cases in which the aortic valve was replaced during aortic surgery were coded only as "aortic surgery," not as "valvular"), types of physicians sued, case outcome (a case was categorized as "plaintiff verdict" as long as at least one of the defendant parties was found guilty during trial), monetary amount of plaintiff award or settlement if applicable, plaintiff injury type, and alleged type of negligence. Allegations were classified into the following categories: periprocedural injury, inadequate postoperative management, failure to perform the correct operation in a timely manner or at all, the performance of an unnecessary procedure, performing a procedure too soon, lack of informed consent, and patient abandonment.

Data were entered into Microsoft Excel (Microsoft Office 2010, Version 14.0.7208.5000). Means were calculated for patient age and

monetary amount of plaintiff award. Percentage distributions were obtained for sex of the patient, procedure type, medical specialties sued, case outcome, and events alleged. Fisher's exact test was used to determine whether significant associations existed between injury type and the likelihood of plaintiff or defendant verdicts.

3 | RESULTS

3.1 | Baseline case characteristics

Three hundred forty-two medical malpractice cases were found in the VerdictSearch database under the category "Medical Malpractice" plus subcategory "cardiac surgery," "cardiac care," or "heart surgeon." Two hundred two cases were excluded because they were unrelated to the performance of a cardiac procedure; 18 alleged inappropriate cardiac clearance for a patient to undergo surgery, but the procedure itself was noncardiac. After all exclusion criteria were applied, 140 medical malpractice cases involving cardiac procedures remained for analysis.

Baseline case characteristics were identified (Table 1). The mean plaintiff age was 56.9 years, and 60.1% were male. A defendant verdict was entered for 55.0% of cases and a plaintiff verdict for 27.9% (with an average payout \$5 212 719.79), while parties in the remaining 17.1% of cases reached a settlement. Cardiac surgeons were defendants in 47.8% of cases (67 of 140). Coronary artery bypass grafting and/or valvular surgery comprised 68.6% of these lawsuits, 11.9% were congenital cases, 7.5% were aortic surgeries, 4.5% were catheterizations by cardiologists with which the surgeon became involved following a complication, 3% were heart transplants, and 4.5% were other procedures—pericardial window, pseudoaneurysm repair, or pacemaker insertion (Figure 1). Cardiologists were defendants in 56.4% of cases (79 of 140) (Table 1) (Figure 2).

3.2 | Reasons for malpractice litigation by procedure

3.2.1 | Cardiac surgery cases

Forty percent (56 of 140) of all cases in this data set involved CABG, valvular surgery, or both (Table 1). The primary allegations (Figure 3) were periprocedural injury in 44.6%; inadequate postoperative management in 33.9%; failure to operate in a timely manner, or at all, in 16.1%; performing the procedure too soon in 3.6%, before carotid revascularization in one case and resolution of acute kidney injury in another; and performing unnecessary CABG procedures in the final case (1.8%, 1 of 56). Failure to obtain proper informed consent was listed as an additional allegation in 8.9% of cases (1.8%, 5 of 56).

When periprocedural injury was alleged in CABG/valvular surgery cases, the most common narratives (Figure 3) were poor prosthetic valve fit or securement, 23.1% (6 of 26); surgical site infection, 15.4% (4 of 26); compromise of CABG vessel or performing an incorrect graft, 19.2% (5 of 26); gastrointestinal tract injury from

TABLE 1 Baseline characteristics across all cases and coronary artery bypass graft/valvular surgery only

Characteristics	All cases	CABG/ valvular only
Mean plaintiff age, y	56.9	62.1
Plaintiff sex, %		
Male	60.1	66.1
Female	39.3	32.1
Unspecified or multiple plaintiffs	0.6	1.8
Verdict outcome, %		
Defendant	55.0	50
Plaintiff	27.9	25
Settlement/arbitration	17.1	25
Mean award amount		
Plaintiff verdict	\$5 212 719.79	\$4 956 990.58
Settlement	\$19 54 419.21 (single settlement of \$419 000 000.00)	\$32 500 357.14 (single settlement of \$419 000 000.00)
Procedure type, %		N/A
CABG and/or valvular	40.0	
Cardiac catheterization/angioplasty/stent	29.3	
Pacemaker/ICD	10.7	
Congenital	6.4	
Electrophysiology study/ablation	4.3	
Aortic surgery	4.3	
Profession sued, %		
Cardiac surgeon	47.8	83.9
Cardiologist	56.4	26.8
General/vascular surgeon	2.8	0
Anesthesiologist	2.8	3.6
Hospital only	6.4	12.5
Injury type, %		
Death	47.1	44.6
Brain	17.8	25
Limb	7.1	8.9
Other	27.8	23.2

Abbreviations: CABG, coronary artery bypass graft; ICD, implantable cardioverter defibrillator. Plaintiff sex was not available for two cases in each data set because they contained multiple plaintiffs. Age was not available for four cases overall and two within the CABG/valvular surgery data set. Procedure types included in the data set with a frequency of less than 3% are not listed in this table (for instance, Greenfield filter placement). In 6.4% of cases overall, the hospital was sued as a collective entity rather than an individual physician(s). For cases in which the hospital as well as individual physicians were sued, the case was listed under the relevant physician specialty types but not under "hospital only."

Cases Against Cardiac Surgeons

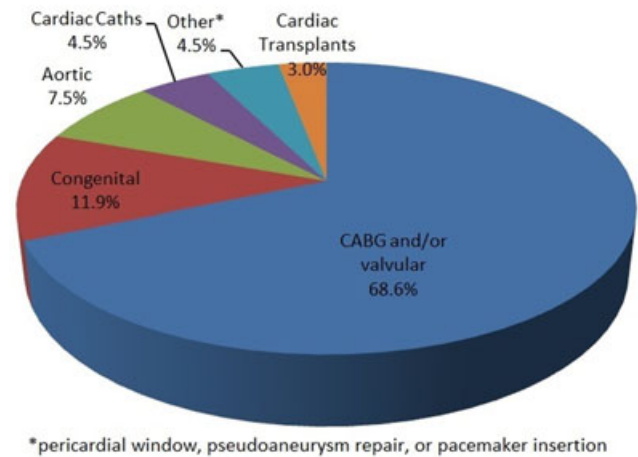


FIGURE 1 Cases against cardiac surgeons. The majority of cases were CABG and/or valvular surgery. The next most common case type, in a distant second, was congenital cardiac surgery. CABG, coronary artery bypass graft

TEE probe, 7.7% (2 of 26); injury to a noncardiac structure, 7.7% (2 of 26); and retained foreign object, 7.7% (2 of 26). In postoperative mismanagement cases, the most common allegation was a failure to detect and manage surgical bleeding in a timely manner (31.6%, 6 of 19), followed by stroke due to improper anticoagulation management (4 of 19) and wound infection (3 of 19). Plaintiff death was cited in 44.6% of CABG/valvular surgery cases, 25% alleged brain injury, 8.9% alleged limb injury, and 23.2% listed another injury type (Table 1). Fisher's exact test revealed that the likelihood of a plaintiff, vs defendant, the verdict was not significantly associated with brain injury or death ($P < 0.05$). Defendant verdicts were reached in 50% of cases, plaintiff verdicts in 25%, and settlements in 25%.

Among eight congenital cardiac surgery cases (the ninth was percutaneous atrial septal defect closure performed by a cardiologist), most (75%, 6 of 8) cited periprocedural injury as the reason for the lawsuit, while the remaining two cases alleged poor inpatient postoperative management. Perfusion-related issues (cooling during circulatory arrest, failure to inform surgeon about poor oxygenation) were described in 37.5% of cases. Two cases involved anesthesiologists. The first entailed a plaintiff verdict against the anesthesiologist for administering a calcium chloride overdose; the medication had been dosed in the correct manner for calcium gluconate, which was much more commonly utilized in this anesthesiologist's practice setting. In the second case, after erroneously placing a patch over a patient's eustachian valve, the defendant surgeon argued that it had been the anesthesiologist's responsibility to interpret the postoperative transesophageal echocardiogram correctly.

In two-thirds of aortic surgery cases (4 of 6), the lawsuit reason was surgeon failure to operate in a timely manner, while the final two cases argued patient abandonment. Death was the resultant injury in two-thirds (4 of 6), while one case alleged brain damage and the final case alleged permanent limb injury: left lower extremity necrosis and

Malpractice Allegations in CABG and Valvular Surgery

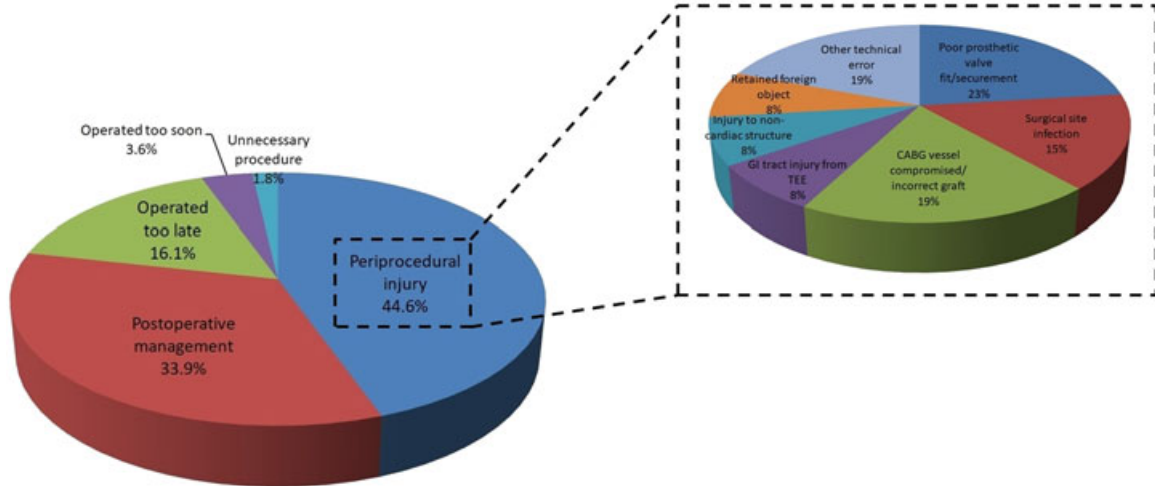


FIGURE 2 Malpractice allegations in CABG and valvular surgery. The periprocedural injury was the most common allegation category, followed by postoperative mismanagement. The most common alleged mechanism of periprocedural injury was poor prosthetic valve fit/securement, followed by CABG vessel compromise or grafting of an incorrect vessel. CABG, coronary artery bypass graft

gangrene necessitating an above-the-knee amputation and bilateral lower extremity paralysis.

3.2.2 | Cardiac surgeons and cardiologists as codefendants

A cardiologist was named as a codefendant with a cardiothoracic or vascular surgeon in 14.3% of cases (20 of 140) in this data set. Of the 20 cases, one was a lawsuit with many plaintiffs who alleged that unnecessary cardiac catheterizations and CABG had been performed, and eight cases (40%) involved only CABG (Figure 3). Five of the cases (25%) involved cardiac catheterizations only, and all included an injury to one of the following structures: left main coronary artery, aorta, brachial artery, or peritoneum. In all catheterization cases, the

allegation against the surgeon was a failure to diagnose and/or treat the complication in a proper or timely manner. Three of the codefendant cases (15%) were valvular surgery, where two alleged aberrant postoperative management and the third claimed failure to operate in a timely manner. Two of the cases (10%) were aortic surgery; both alleged failures to operate in a timely manner. The final codefendant case was ventricular septal defect closure.

3.3 | Malpractice in postoperative management

When postoperative mismanagement was alleged, 50% of cases reached a defendant verdict, 27.3% were decided in favor of the plaintiff, and 22.7% reached a settlement (Table 2). The failure to detect and manage postoperative bleeding, including cardiac tamponade, in a

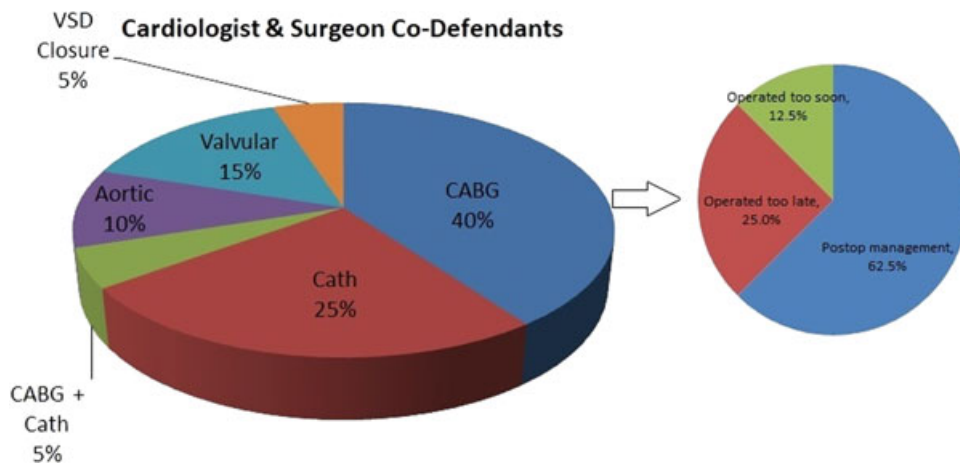


FIGURE 3 Cardiolgist and surgeon codefendants. Forty percent of the cases in this data set for which a cardiologist and a cardiothoracic or vascular surgeon were codefendants were CABG only, and 25% were cardiac catheterization only. Of the CABG cases, the most common allegation category was postoperative management, followed by the claim that the surgeon operated too late. CABG, coronary artery bypass graft

TABLE 2 Baseline characteristics of cases alleging postoperative mismanagement

Characteristics	Values
Mean plaintiff age, y	62
Plaintiff sex, %	
Male	77.3
Female	22.7
Verdict outcome, %	
Defendant verdict	50
Plaintiff verdict	27.3
Settlement	22.7
Mean award amount	
Plaintiff verdict	\$3 910 099.68
Settlement	\$3 720 000.00
Injury type, %	
Death	44.6
Brain	25
Limb	8.9
Other	23.2

Males represented the majority of plaintiffs, one-half of cases reached a defendant verdict, and nearly one-half of cases involved death.

timely manner, was the most common allegation type in postoperative management malpractice cases, cited in 31.8% (7 of 22) (Figure 4). The likelihood of a plaintiff verdict in these cases was 42.8%, while a defendant verdict and settlement were equally likely at 28.5%. Mismanagement of postoperative stroke, and/or of anticoagulation

that may have prevented it, was implicated in 22.7% of cases (5 of 22), and another 22.7% (5 of 22) involved infection: surgical wound or endocarditis. The other five cases involved various issues: failure to detect bradycardia and connect the patient's temporary pacing wires; respiratory arrest when a patient was extubated without first undergoing a spontaneous breathing trial; failure to order gastroenterology consultation in the setting of dropping hemoglobin; failure to drain a postoperative pleural effusion; and failure to follow up and detect a leaking aortic valve. All of these cases resulted in defendant verdicts, aside from the bradycardia detection case that resulted in a plaintiff verdict against the hospital (Figure 4).

4 | DISCUSSION

This retrospective study of a leading nation-wide legal database demonstrated that most cardiac surgical malpractice cases involve CABG or valvular surgery, most commonly in the setting of poor prosthetic valve fit or surgical site infection; and that, for congenital cardiac surgery, periprocedural injury related to perfusion concerns is the most common reason for the lawsuit. When cardiothoracic or vascular surgeons are named as codefendants in cardiologist lawsuits involving catheterizations, the surgeon's most likely alleged role is a failure to diagnose and/or treat a complication in a proper or timely manner. When they are sued for postoperative mismanagement, it is most commonly due to alleged failure to detect and manage postoperative bleeding, including cardiac tamponade.

When a medical malpractice suit is brought to court, the plaintiff has the burden of proving that the defendant breached his or her

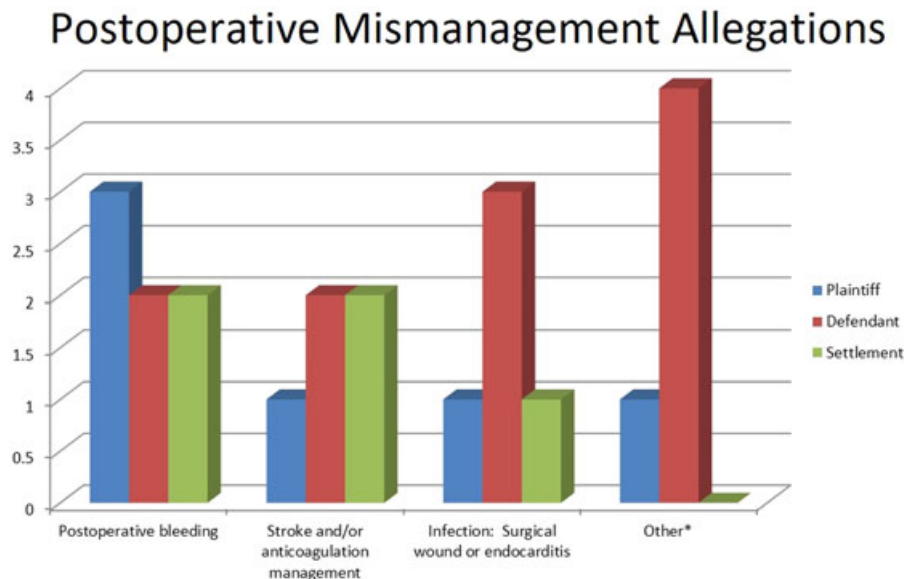


FIGURE 4 Postoperative mismanagement allegations. The most common allegation overall was a failure to detect and manage postoperative bleeding, including cardiac tamponade, in a timely manner; this was also the allegation category most likely to result in a plaintiff verdict. The second most common category was mismanagement of stroke and/or anticoagulation that could have prevented it. The highest number of defendant verdicts occurred in the "other" category, which consisted of: failure to detect bradycardia and connect temporary pacing wires; respiratory arrest when extubation occurred without a spontaneous breathing trial; failure to order gastroenterology consultation in the setting of dropping hemoglobin; failure to drain a postoperative pleural effusion; and failure to follow up and detect a leaking aortic valve

duty to provide patient care by departing from the current acceptable standards³; thus, this study reflects, through case outcomes, the widely perceived and accepted standards of care within cardiothoracic surgery at present. One example lies in the perceived communication expectations between cardiothoracic surgeons and anesthesiologists or perfusionists during cases. In a congenital case in this study, the perfusionist allegedly failed to inform the surgeon about poor oxygenation and severe anemia; a settlement was reached. In another case, the defendant surgeon was successful in arguing that it had been the anesthesiologist's responsibility to interpret the postoperative transesophageal echocardiogram and communicate that a patch had been incorrectly placed over the patient's eustachian valve. A careful review of specific allegations and case outcomes catalyzes quality improvement as patterns are recognized and possibilities for policy change identified.

This study's findings are in contrast to those of Hui et al,⁴ who found that among 68 cardiac surgical cases, only 7.4% had plaintiff rulings, and the only injury type significantly associated with plaintiff victory was neurologic. In the present study, 55% of cases had defendant verdicts, and neither brain injury nor death were significantly associated with the likelihood of a plaintiff, vs defendant, verdict. However, Hui et al's⁴ study consisted of only federal district court cases, while the present study included local and state court proceedings. Similarities between the studies include that CABG and valvular surgery had the highest incidence of lawsuits in both, followed by congenital cardiac surgery and that the majority of congenital cases alleged intraoperative injury rather than aberrant postoperative management.

This study's findings for the CABG and valvular surgery subset are fairly consistent with those of a large analysis of Medicare patients undergoing CABG,² as patients in that study were 3.86 times more likely to experience hemorrhage/shock as a postoperative complication than stroke and 4.45 times more likely to experience it than infection, while the present study found the likelihood of postoperative mismanagement allegations related to bleeding was 1.2 times higher than stroke and 1.5 times higher than infection. Moreover, this study's congenital surgery cases bear similarity to those of a small study⁵ in which perioperative injury was far more common in lawsuits than postoperative mismanagement.

While VerdictSearch is a large legal research database, its use does present a limitation to this study's design, in that the database is limited

to the states, courts, and attorneys who actually elect to complete this reporting. A number of cases related to cardiac surgical malpractice were likely not included, and selection biases may exist in terms of various aspects of case content, such as geographical location, plaintiff characteristics, or practice setting. However, although it could be anticipated that the attorney on the opposing end of the Jury's ruling in a case would be de incentivized to report it to a public database, the attorney on the victorious end would be equally as incentivized to use the verdict as a personal marketing tool,³ so the selection biases in each direction may ultimately cancel out one another.

This study, among the first of its kind, demonstrates that careful review of cardiac surgical malpractice litigation can elucidate common contributory factors to adverse patient outcomes and catalyze improvements in clinical practice and decision-making.

CONFLICT OF INTEREST

The author declares that there are no conflict of interest.

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