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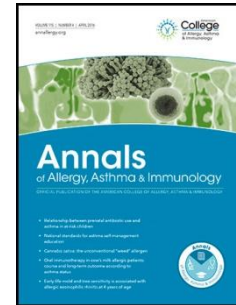
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Systematic Review of Professional Liability when Prescribing Beta-Lactams for Patients with a Known Penicillin Allergy

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Abstract: Objective: To describe medical negligence and malpractice cases in which a patient with a known penicillin allergy received a beta-lactam and experienced an adverse reaction related to the beta-lactam.

Data Sources: Lexis-Nexus, Westlaw, and Google Scholar were searched.

Study Selections: Medical negligence and malpractice cases were eligible for inclusion if they met the following criteria: the plaintiff had a known penicillin allergy, received a beta-lactam, and experienced an adverse event. All United States federal and state cases were eligible.

Results: Twenty-seven unique cases met inclusion criteria. Eighteen cases involved the receipt of a penicillin-based antibiotic; of these cases with a known legal outcome, the plaintiff (patient or representative) prevailed or settled in three cases and defendants (providers) prevailed in seven cases. Seven cases involved the receipt of a cephalosporin; of these cases with a known legal outcome, the plaintiff settled with physicians prior to trial in one case and defendants prevailed in three cases. Two cases involved the receipt of a carbapenem. Defendants prevailed in one case and the legal outcome of the other case is unknown. In cases where the defense successfully moved for summary judgment, judges

cited a lack of scientific evidence demonstrating a cephalosporin or carbapenem was contraindicated for a patient with a penicillin allergy.

Conclusion: The cases with published legal outcomes found limited professional liability for clinicians who prescribed either cephalosporins or carbapenems to a patient with a known penicillin allergy. These results may decrease the litigation fears of providers and risk managers within healthcare systems.

Introduction

Penicillin is the most commonly identified medication allergy. The incidence rate of penicillin allergy in the United States is approximately 10% in the general population and 15% for the hospitalized population.^[1] These allergies range from type I IgE mediated allergies with anaphylactic symptoms, to predictable adverse reactions including gastrointestinal upset. The frequency of serious allergic reactions, or type I allergies, within cohorts of patients labeled as penicillin allergic, is less than 10%.^[2]

There are several consequences of being labeled as penicillin allergic. In a cohort of patients labeled as beta-lactam allergic, rates of clinical failure were compared between patients treated with beta-lactams and non-beta-lactams.^[3] The results found that patients were more likely to experience treatment failure when exclusively treated with non-beta-lactams and no less likely to experience a hypersensitivity reaction. Macy and Contreras performed a matched cohort study of more than 100,000 Kaiser Permanente Health plan patients.^[4] They discovered that patients labeled as penicillin allergic received vancomycin and fluoroquinolones more often than patients without a penicillin allergy label. The penicillin allergic cohort had higher rates of secondary *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus*, and vancomycin-resistant *Enterococcus* species infections and longer lengths of stay compared with those without penicillin allergies. In addition to worse clinical outcomes, unnecessary avoidance of beta-lactam antibiotics has been shown to increase health care costs for the patient and healthcare system. A study by Picard et al. found that patients identified as having a penicillin allergy carried an additional cost of more than \$15,000 because of

the use of alternative non-beta-lactam antibiotics.^[5] As evidenced by Li et al., non-beta-lactam costs can be 1.82- to 2.58-fold higher compared with first-line antibiotics when used in patients with a penicillin allergy.^[6]

Significant efforts have been made by organizations within the medical community to educate healthcare professionals about the diagnosis of type I (anaphylactic) allergic reactions and antibiotic use in patients labeled as penicillin allergic in the name of antibiotic stewardship and curbing the development of antibiotic resistance. The Centers for Disease Control and Prevention (CDC) created a fact sheet that describes the evaluation and diagnosis of a penicillin allergy. It includes recommendations that healthcare professionals evaluate patients for true penicillin allergy by conducting a history, physical, skin test and oral challenge dose in select patients. The American Academy of Allergy, Asthma & Immunology (AAAAI) recommended performing penicillin skin testing as part of the Choose Wisely® campaign, an initiative of the American Board of Internal Medicine. The Penicillin Allergy in Antibiotic Resistance Workgroup within AAAAI followed up the Choose Wisely® recommendation with a position statement stating penicillin allergy testing should be performed routinely in patients with self-reported penicillin allergy.^[7]

Even with the availability of a commercial penicillin skin testing product, many healthcare settings will not have either the time or expertise needed to screen and test all patients labeled as penicillin allergic. In this scenario, providers may still utilize non-beta-lactams in an effort to avoid an allergic reaction and subsequent legal action on behalf of the patient. Fear of litigation is not without warrant. Jena et al. completed a search of physician-level data on malpractice claims from a large, physician-owned professional liability insurer that provided coverage to physicians in every U.S. state and the District of Columbia and found that each year 7.4% of all physicians had a malpractice claim.^[8] Nearly 10% of all reported medication-related malpractice claims involved penicillin antibiotics.^[9] More recently a review of the medical literature found that antibiotic allergies were the most common medication error associated with litigation.^[10] It is with this in mind that we sought to review the medical malpractice and medical negligence case databases in an effort to identify if the practice of avoiding beta-lactam antibiotics in patients with known penicillin allergies is legally advantageous. We hypothesize that providers who prescribe penicillin-based antibiotics to patients with a penicillin allergy will be found liable for negligence more frequently than providers who prescribe cephalosporin or carbapenem antibiotics.

The objective of this systematic review is to describe the frequency and outcome of medical negligence and malpractice cases in which a patient with a known penicillin allergy received a beta-lactam and experienced an adverse reaction related to the beta-lactam. The primary outcome is the number of cases in which the defendant (provider) was found liable based on the receipt of either a penicillin, cephalosporin, or carbapenem.

Methods

Data sources and search strategy

Google Scholar and the subscription legal databases of Lexis-Nexis and Westlaw were searched for all relevant cases from state or federal courts. These two subscription databases were selected specifically because they are the primary databases used in professional legal research, which would inform the decisions of hospital and health system risk management decisions, and because they include both published and unpublished state and federal cases as well as all reported US federal and state supreme court decisions. The search terms for Google Scholar were penicillin, allergy, and allergic reaction in all state and federal courts. The search criteria for Lexis-Nexis and Westlaw was: “(ampicillin or amoxicillin or bacampicillin or carbenicillin or cloxacillin or dicloxacillin or flucloxacillin or methicillin or mezlocillin or nafcillin or oxacillin or penicillin or piperacillin or pivamicillin or pivmecillin or ticarcillin) w/p allerg! w/p negli!”. Cases cited within a case from the initial search were also reviewed for inclusion. The original search was conducted in 2015 and updated March of 2017.

Inclusion criteria and case selection

Health professional malpractice and/or negligence cases were screen for inclusion. The definition of professional malpractice or negligence was where the plaintiff was called upon to establish that the provider had a duty of care to the patient, that duty was breached, and that the breach caused harm, and resulted in compensable damages. Cases were eligible for the systematic review if they met the following criteria: the plaintiff had a known penicillin allergy, received a beta-lactam, and experienced an adverse event. All United States federal and state cases were eligible. The

two reviewers independently examined all cases for eligibility. Conflicting or ambiguous cases were discussed and adjudicated by the same reviewers.

Data collection process

Cases were reviewed for inclusion by two independent reviewers. Data extraction was performed independently. In the setting of differing data collection, reviewers met to resolve differences by consensus. Variables collected from each case included date of publication, legal jurisdiction, date of injury, plaintiff and defendant demographics, health care setting, plaintiff clinical outcome, and legal outcome. When data were not included in the published case a Google search was employed using the party names in an effort to find more details about the case.

Results

Of the 78 court opinions identified in the initial search, 27 cases were excluded because they were not about an allergic reaction to a beta-lactam; 15 cases were excluded because the patient did not have a known or documented pre-existing penicillin allergy; 5 cases were excluded because the patient did not receive a beta-lactam; 3 cases were excluded because the patient did not experience an allergic reaction; and 1 case was excluded as the patient was not human.

Twenty-seven unique cases were included in the systematic review. The earliest case was published in 1959 and the most recent in 2013. The highest number of cases (n=7) filed occurred in the most recent 10 year segment, from 2005 to 2015 (Figure 1). Fifteen cases had published legal outcomes. In this subset of cases, the plaintiffs who received a penicillin-based antibiotic prevailed or settled in 3 of 10 (30%) cases with known outcomes. Plaintiffs who received a cephalosporin prevailed in 1 of 4 (25%) cases with known outcomes and 0 of 1 case when receiving a carbapenem.

Penicillin-base antibiotic use in patients with known penicillin allergy

Eighteen cases involved the receipt of penicillin (n=11), ampicillin (n=5), or amoxicillin (n=2). All 18 cases are described in Table 2. The three cases in which the plaintiff prevailed are *Yorston v. Pennell*, *Mathieu v. Scalea*, and *Corbin v. Thomas*.

The first case, *Yorston v. Parnell*, involved a man who was admitted to a hospital in 1956 after a nail from a nail gun penetrated his right leg and fractured the fibula which required surgery. Yorston received four doses of intravenous penicillin post-operatively. Six days later, he developed a skin rash and had a cardiovascular accident on day 7 that resulted in physical and personality changes. The prescribing surgeon was found liable.

The second case, *Mathieu v. Scalea*, involved a woman who was admitted to a hospital in 1998 with a suspected pulmonary infection and received ampicillin. The plaintiff claimed that the negligent administration of ampicillin contributed to Mathieu's death. A court dismissed the wrongful death claim after determining that the cause of death was pre-existing coronary artery disease and not the negligent administration of ampicillin but still awarded the plaintiff \$12,000 for the pain and suffering caused by the negligent administration of ampicillin.

The third case, *Corbin v. Thomas*, involved a woman who was having dental work completed in 2007. Corbin had a heart murmur and took antibiotics prior to each dental visit. The patient also had a history of Stevens-Johnson syndrome after taking penicillin in the 1960s. Prior to a dental appointment, Dr. Thomas prescribed penicillin. Corbin caught the error and contacted Dr. Thomas to request an alternative antibiotic. Dr. Thomas's office called in a second prescription to the pharmacy for amoxicillin. Corbin picked up the prescription on the way to her dental appointment and took a pill before noticing it was amoxicillin. Over the next week, Corbin experienced erythema, swelling, and itching of her hands initially. Symptoms progressed to include pedal, facial, and orbital edema, purple discoloration on feet and legs, and lack of urine output resulting in admission to the hospital. The jury found Dr. Thomas 75% at fault and Corbin 25% at fault for the allergic reaction to amoxicillin. Corbin was awarded \$125,000 in damages.

Cephalosporin use in patients with known penicillin allergy

Seven cases involved the receipt of a cephalosporin (1st generation n=5, 3rd generation n=2). All seven cases are described in Table 3. The sole cephalosporin case in which the plaintiff prevailed is *Killeen v. Reinhart*. In 1971 Killeen, who was six months pregnant, presented to her obstetrician with an asthma attack. She received an unknown medication which did not alleviate her symptoms. She was admitted to the obstetrics ward of the hospital with breathing difficulties, coughing, and vomiting. Her asthma symptoms initially improved but then Killeen deteriorated quickly. Amid her deterioration she was prescribed cephalothin, a first generation cephalosporin, for a possible

pulmonary infection. Within 24 hours, Killeen died due to symptom deterioration. The immediate cause of death was bronchial pneumonia. Anaphylactic shock secondary to cephalothin was ruled out. Three physicians were initially sued and settled before trial for \$265,000. The trial proceeded against the hospital on the claim that Killeen should have been placed in an internal medicine ward, not the obstetrics ward. The trial resulted in a general verdict against the hospital for \$650,000. The hospital appealed. The appellate court remanded the case back to the trial court and stated that it cannot be concluded that the administration of cephalothin was so clearly contraindicated as to cast liability upon the hospital's staff to have failed to question the doctors' use of this medication. Results from the new trial were not publically published.

Carbapenem use in patients with known penicillin allergy

Two cases involved the receipt of a carbapenem (imipenem n=1, ertapenem n=1). Both cases are described in Table 4. Plaintiffs did not prevail in the one case with a known legal outcome.

Discussion

The number of medical negligence cases in which a patient with a known penicillin allergy received a beta-lactam has increased in the past two decades. However, despite being a commonly cited concern of health care professionals, our results suggest that malpractice lawsuits based on prescribing or administering penicillin to a patient with a known penicillin allergy is uncommon, and rarely successful. Of the 15 cases with known outcomes, defendants (providers) prevailed in all cases involving cephalosporins and carbapenems, except for one case in which the physicians settled with the patient prior to trial. The most common scenario in which the plaintiff prevailed was in the setting of receiving either penicillin itself, amoxicillin, or ampicillin despite a known and documented allergy to penicillin.

The plaintiff prevailed in one case involving cephalosporin because the physicians settled prior to the trial. Defendant liability in the Killeen v. Reinhart case is questionable because it cannot be concluded that the receipt of cephalothin was a proximate or a contributing cause of death in the context that the patient died suddenly of bronchial pneumonia and only received cephalothin after clinical deterioration. The appellate court identified this as one of the

reasons to grant a new trial for the defendants. In an alternative setting in which cephalothin had been a contributing cause of death, the prescribing provider could have been found liable based on published data available in 1979. The first case series detailing cross-reactivity between cephalothin and penicillin initially appeared in 1966.^[38] One out of six (16%) patients with a history of anaphylaxis and positive skin test to penicillin also had a positive skin test for cephalothin. Larger studies assessing the rate of cross-reactivity between penicillin and other beta-lactams were not published until later. An epidemiologic penicillin allergy skin test study found cross-reactivity rates of 73% (41/56) between penicillin and ampicillin and 54% (38/71) for penicillin and cephalothin.^[39] It is important to note that cross-reactivity between penicillins and cephalosporins is not a class effect but due to similarities in side-chains. Penicillin and cephalothin have similar side chains at the C-7 position and is likely why cross-reactivity rates are so high between this pair of antibiotics.^[40,41]

Beyond the cases included in this systematic review, providers have also been found liable in the setting of failing to recognize or diagnose an allergic reaction to a penicillin-based antibiotic. In the case of *Gunn v. Grossman*, a woman presented to the emergency department and received amoxicillin/clavulanate for a suspected upper-respiratory tract infection in 1992. Gunn returned the next day with unspecified worsening symptoms and was admitted to the hospital. An infectious diseases physician was consulted and recommended ampicillin/sulbactam which was ordered by her cardiologist. Over the course of three doses she deteriorated and was diagnosed with toxic epidermal necrolysis and died. Expert witnesses testified that it was negligent to initiate ampicillin/sulbactam after Gunn had exhibited an allergic reaction to amoxicillin/clavulanate. At the conclusion of the trial, the jury found in favor of Gunn, apportioning 30% fault to the cardiologist 30% and 70% fault to the infectious diseases physician 70%. The decision was appealed and upheld. The case was not included in this systematic review as the patient did not have a known allergy to penicillin.

This systematic review has important limitations. Lexis Nexis, Westlaw, and Google Scholar and other subscription legal search databases only include published cases and some unpublished but reported cases; the vast majority of lawsuits filed are never published or reported and no universal searchable database exists to track all filed malpractice suits. In response to the proliferation of caseloads and ensuing opinions, state and federal courts have limited the number of opinions published. The following criteria are commonly used to determine whether to publish a

case whether: a case establishes a new rule or changes an existing rule, involves an issue of public interest, or resolves an issue of law in conflict. Lexis-Nexis and Westlaw include all opinions released for publication by state and federal libraries and files, as well as other decisions considered, “substantive” or dispositive of an issue at hand in an adversarial case. More often than not, the cases selected for publication focus on the resolution of legal issues rather than factual issues. Accordingly, many of the cases reviewed in this process had limited factual information regarding the selection of antibiotic, outcome for the patient, and the resolution of those cases where additional legal proceedings were required under the law. The ultimate legal outcomes of several cases were unknown in this study, because several of the included cases were remanded back to the trial court for further proceedings. The outcomes of these cases could include settlement, additional motion practice, or the return of a jury verdict for either party. In spite of these limitations, Lexis Nexis and Westlaw are two of the most commonly subscription databases in legal and health sciences settings and are therefore likely informing the legal and risk management personnel at health care facilities for developing institutional policies that limit or reduce liability exposure for malpractice.

Conclusion

To our knowledge, this is the first systematic review of medical negligence and malpractice cases regarding the use of beta-lactams for patients with a known penicillin allergy. Our results indicated that providers are unlikely to be found liable when prescribing a cephalosporin or a carbapenem for a patient with a known penicillin allergy. However, avoiding cephalosporins with similar side chains to penicillin is clinically and likely legally prudent as cross-reactivity rates can exceed 50%.

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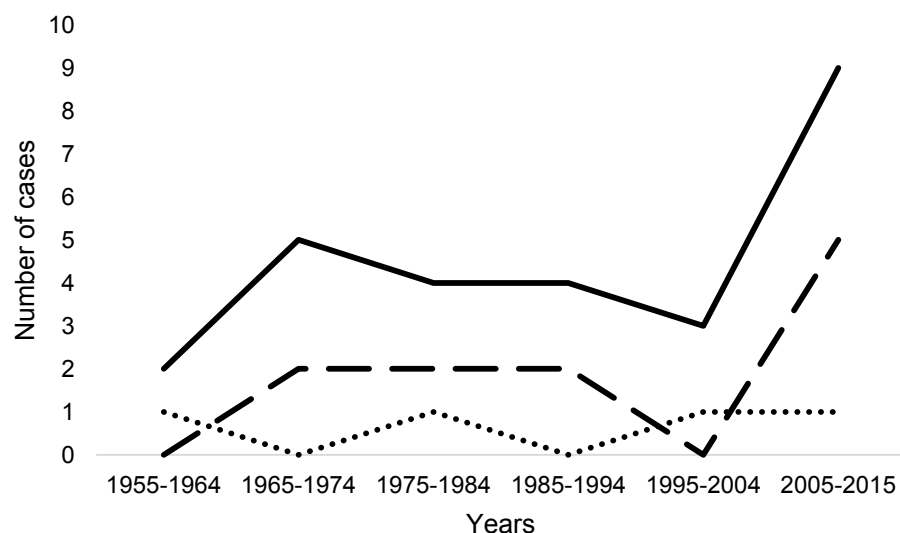
Figure 1 Legend

Number of medical malpractice or negligence cases per decade in which a patient with a known penicillin allergy experienced an adverse reaction to a prescribed beta-lactam.

Solid line: Number of cases filed per decade (n=27)

Dashed line: Number of cases with a known outcome in which the defendant prevailed (n=4)

Dotted line: Number of cases with a known outcome in which the plaintiff prevailed (n=11)



304 Table 1 Legal terminology and definitions

Affirm	What an appeals court does if it agrees with and confirms a lower court's decision.
Apportion	Divide or allocate (i.e., fault, liability or damages)
Court	
Appellate court	Appeals court or court of appeals
Trial court	Where cases are heard for the first time
Defendant	An individual, company, or institution sued or accused in a court of law
Directed verdict	A ruling entered by a trial judge after determining that there is no legally sufficient evidentiary basis for a reasonable jury to reach a different conclusion
Liable	Responsible by law
Malpractice	An act or continuing conduct of a professional which does not meet the standard of professional competence and results in provable damages to his/her client or patient
Negligence	Failure to exercise the care toward others which a reasonable or prudent person would do in the circumstances, or taking action which such a reasonable person would not
Motion	A formal request made to a judge for an order or judgment
Plaintiff	The party who initiates a lawsuit by filing a complaint with the clerk of the court against the defendant(s) demanding damages, performance and/or court determination of rights.
Remand	To send back, i.e., an appeals court may remand a case to the trial court for further action
Reverse	To overturn or invalidate; i.e., an appellate court may reverse the trial court's findings, rulings, or verdict.
Settle, settlement	The resolution of a dispute or lawsuit; it may include a settlement payment to the plaintiff or other injured party.
Summary judgement	A judgment rendered by the court prior to a verdict because no material issue of fact exists and one party or the other is entitled to a judgment as a matter of law
Time barred; statute of limitation	A lawsuit that is defective on its face, it has been filed too late according to either the statute of limitations

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307 Table 2 Case outcomes for patients with a penicillin allergy who received penicillin antibiotics

Case Year published	Penicillin given	Adverse Reaction	Defendant	Legal Outcome	Ultimate Trial Outcome
Plaintiff prevailed					
Yorston v. Pennell ¹¹ 1959	Penicillin	Cerebrovascular event	Hospital and physicians	Appellate court affirmed trial court's jury finding for the plaintiff, against physicians, but not hospital as it was immune as a charitable entity	Plaintiff
Mathieu v. State of New York ¹² 1999	Ampicillin	Rash, shortness of breath	State hospital	Plaintiff filed case against state hospital court. Hospital was found negligent for administration of ampicillin to a patient with a penicillin allergy	Plaintiff \$12,000 for pain and suffering
Corbin v. Thomas ¹³ 2010	Amoxicillin	Swelling and itching; hospitalized due to reaction and developed pneumonia	Dentist	Jury found dentist 75% at fault; Plaintiff 25% at fault	Plaintiff- jury awarded \$120,000; apportioned fault: 75% to dentist, 25% to plaintiff
Defendant prevailed					
Tishman v. City of New York ¹⁴ 1969	Penicillin	Allergic reaction, death (unrelated to allergy)	Hospital and City of New York	Court affirmed the trial court's order of dismissal- failure to make case against hospital	Defendant
Cohran v. Harper ¹⁵ 1967	Penicillin	No allergic reaction	Physician	Appellate court affirmed trial court's grant of summary judgment in favor of defendant	Defendant
Leary v. Rupp ¹⁶ 1979	Ampicillin	Aseptic necrosis	Physician and hospital	Court reversed and remanded the case- not time barred	Defendant Hospital dismissed Physician-unknown
Branch v. Hensgen ¹⁷ 1988	Penicillin	Allergic reaction, kidney failure	Pharmaceutical company, hospital and physician	Trial court denied motion to dismiss based on statute of limitations, defendants prevailed at trial. Plaintiff and defendants appealed, appellate court found plaintiff's claims should have been time barred.	Defendants
Comiskey v. US ¹⁸ 1994	Penicillin	Renal complications	US (Veterans Administration Hospital)	Court entered judgment in favor of defendant- care didn't deviate from applicable standard of care	Defendant
Mathieu v. Scalea ¹⁹ 2001	Ampicillin	Death ruled to be due to pre-existing coronary artery disease	Physicians	Physician were granted a summary judgment as death caused by pre-existing coronary artery disease and plaintiff was barred from re-litigating the case	Defendant

Carson v. Dallas Co Jail ²⁰ 2013	Penicillin-based antibiotic	Skin rash	Jail, Sheriff, warden, medical officer, physician, and nurses	Dismissed all claims, actions did not rise to level of deliberate indifference	Defendant
Cases with unknown legal outcomes					
Frohs v. Green ²¹ 1969	Penicillin	Allergic reaction	Hospital and physicians	Judgment of trial court reversed, and case was remanded for further proceedings. Despite time passed since injection, the suit was not time barred	Unknown
Hayden v. Groff ²² 1960	Penicillin	Death	Physician and hospital as well as car owners of vehicle involved in accident	Court dismissed car owners' objections, and granted these defendants leave to answer or plead.	Unknown
Walstad v. University of Minnesota Hospital ²³ 1971	Penicillin	Skin rash	Hospital, treating physicians	Directed verdict for defendant (at end of plaintiff's case in chief) Remanded to trial court for purposes of considering claim related to administration of penicillin.	Unknown
Thomas v. Pate ²⁴ 1974	Penicillin	Allergic reaction	Prison warden, Illinois Department of Corrections/ Illinois State Penitentiary	Court found trial court erred in dismissing known allergy complaint - civil rights violation	Unknown
Edwards v. St. Mary's Hospital ²⁵ 1982	Ampicillin	Death	Treating physicians, hospital	Appellate court reversed and remanded trial court decision that removed action to arbitration	Unknown
Williams v. MacCarelli ²⁶ 1993	Penicillin	Allergic reaction	State of New Jersey, Correctional facility director and Jail	Denial of application to file a late notice of claim was mistaken, Order was reversed and case was remanded	Unknown
Brown v. Health Services ²⁷ 1997	Amoxicillin	Allergic reaction, Death	Clinic, but as a federal Health Center Program Grantee was and was substituted for US	Court dismissed plaintiff's complaints, with leave to file in compliance with Federal Tort Claims Act	Unknown
Saindon v. Kellner ²⁸ 2002	Ampicillin	Skin rash	Physician and hospital	Court denied defendants' motions to strike plaintiff's claims of recklessness	Unknown

310 Table 3 Case outcomes for patients with a penicillin allergy who received cephalosporin antibiotics

Case Year published	Cephalosporin received	Adverse Reaction	Defendant	Legal Outcome	Ultimate Trial Outcome
Plaintiff prevailed					
Killeen v. Reinhart ²⁹ 1979	Cephalothin	Death	Obstetrician and practice partner, internal medicine physician, attending physician, and hospital	Original trial found hospital 50% at fault. Hospital appealed and a new trial was granted on the issue of the hospital's liability. Plaintiff settled with obstetrician and discontinued action against attending physician.	Plaintiff received settled of \$265,000 Unknown as to Hospital
Defendant prevailed					
Addison v. Cook County Hospital ³⁰ 1977	Cephalothin	Death	Hospital	Court affirmed the trial court's grant of defendant's motion to dismiss - statute of limitations	Defendant
Boone v. William W. Backus Hospital ³¹ 2005	Ceftriaxone	Death	Hospital	Judgment of trial court, affirmed. Defendant's motion for summary judgment granted on the basis that Plaintiff	Defendant Summary judgment

				failed to disclose an expert witness	
Brown v. Roche ³² 2014	Ceftriaxone	Stevens-Johnson Syndrome, Toxic Epidermal Necrolysis	Drug manufacturer	Plaintiff sued drug manufacturer for failure to warn physicians to test and sub an alternative for penicillin sensitive patients.	Defendant Summary judgement
Cases with unknown legal outcomes					
Baylis v. Lourdes Hospital ³³ 1991	Cephalexin	Anaphylactic shock	Hospital, physician	Judgment dismissing the action was reversed and the case was remanded for trial.	Unknown
Sloan v. Dept of Rehabilitation and Correction ³⁴ 1997	Cephalexin	Allergic reaction-Hives	Department of Rehabilitation (State Prison)	Court of Claims granted verdict for defendants, Court of Appeals reversed the Court of Claims and remanded for new trial	Unknown
Dispigno v. Berroya ³⁵ 2006	Cefazolin	Injuries sustained during carotid endarterectomy which included allergic reaction	Hospital, surgeon, surgeon's practice	Court denied defendant's motion for summary judgment as to claim of administration of cefazolin	Unknown

				other medical malpractice claims were dismissed.	
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Table 4 Case outcomes for patients with a penicillin allergy who received carbapenem antibiotics

Case Year published	Carbapenem received	Adverse Reaction	Defendant	Legal Outcome	Ultimate Trial Outcome
Soares v. Greenblatt ³⁶ 2013	Ertapenem	Hyper- and Hypopigmentation and scarring	Physicians, physician professional corporations, hospital	Granted summary judgment for all defendants. Expert witness for plaintiff unable to prove ertapenem is contraindicated in patients with penicillin allergies.	Defendants Summary judgment
Lacombe v. Bullhead City Hospital ³⁷ 2008	Imipenem	Death	Hospital	Denied Defendant's motion for summary judgment, ordered pre-trial conference and that a trial date be set.	Unknown