Does Sorry Work?

The Impact of Apology Laws on Medical Malpractice

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<u>ABSTRACT</u>

It has been shown that when doctors apologize for adverse medical outcomes, patients are less likely to litigate. However, doctors are socialized to avoid apologies because apologies admit guilt and invite lawsuits. Apology laws specify that a physician's apology is inadmissible in court, in order to encourage apologies and reduce litigation. Using a difference-in-differences estimation, we find that State-level apology laws expedite settlements increasing the number of settlements by 15% within 3 to 5 years. Using individual level data, we find such laws have the greatest reduction in payment size and settlement time on cases involving more severe patient outcomes.

"It's sad, so sad
Why can't we talk it over?
Oh, it seems to me
That sorry seems to be the hardest word"

~ "Sorry Seems to Be the Hardest Word": *Elton John*

1. Introduction

Healthcare costs are a growing popular concern in the United States. Many reports identify the rising number of medical malpractice lawsuits, the corresponding increase in medical malpractice insurance premiums, and the widespread practice of defensive medicine as the main factors that contribute to the rising cost of health care.[1] In response, national and state legislatures have proposed and enacted legislation to put into place a number of reforms, including jury award caps, insurance premium price caps, state medical malpractice funds, greater information disclosure, and of particular relevance to the current paper, apology exemptions. In 1986, Massachusetts became the first state to adopt some form of an apology law, which was designed to protect doctors from statements they might make to their patients regarding complications the patient suffered under their care. More recently, these apology laws specifically declare that a statement of apology made by a medical practitioner to a patient is inadmissible as evidence of liability in court. In September 2005, then-Senators Clinton and Obama cosponsored the National MEDiC Act, which would have implemented such exemptions at a national level. As of January 2009, 36 states have implemented various forms of apology laws.

State apology laws are premised on two stylized facts. The first fact is that doctors would like to apologize to their patients for medical mistakes, but are stymied by their fear of inviting a

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[1] For more discussion and overview on medical malpractice see Sloan and Chepke's (2008) book *Medical Malpractice*.

lawsuit. Research shows that doctors are typically told to avoid admissions of fault and apologies because of the risk of lawsuits (Lamb et al., 2003; Novack et al., 1989; Pinkus, 2000). The second fact is that a main motivation patients give when asked why they chose to sue their doctors is anger, and that this anger would have been assuaged by an apology (Hickson et al., 1992; May & Stengel, 1990; Vincent & Young, 1994). These two facts lead to a vicious cycle that breaks down patient-doctor communication and thereby increases litigation costs. By making apologies inadmissible as evidence in malpractice lawsuits, it is hoped that doctors would communicate with patients more effectively, thus reducing patient confusion and anger in the case of adverse complications and thereby reducing the cost of medical malpractice (Cohen, 2003).

To date, this paper is the first economic study to investigate the impact of the state-level apology legislation on settlements and malpractice payments.[2] In legal studies, apologies have been found to have an important impact on the outcome of many legal cases. Unsolicited apologies can have an impact on conviction rates as well as sentence and judgment sizes (Rehm & Beatty, 1996). Some studies which give subjects hypothetical situations report that apologies may reduce the subjects' likelihood to litigate (Mazor et al. 2004; Robbenholt, 2003; Wu, 1999; Wu et al., 2009). There are a few studies in the medical/legal literature that are similar to our current research. These studies examined the apology programs in individual hospitals in Pennsylvania (Liebman & Hyman, 2004, 2005) and Tennessee (Kraman & Hamm, 1999) and found that programs that encourage effective apologies and disclosure of mistakes can dramatically reduce malpractice payments. Most notably, the University of Michigan Health Service reported that their per case payments decreased by 47% and the settlement time dropped

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[2] There is an extensive literature investigating the impact of tort reform on the speed of settlements and the amount of malpractice payments (Browne & Puelz 1999; Danzon 1984, 1986; Durrance, 2009; Yoon 2001), but to our knowledge, apology laws have always been ignored in past studies.

from 20 months to 6 months since the introduction of their 2001 apology and disclosure program (Boothman, 2009). While the findings associated with hospital-level apology programs are promising, one is uncertain of the generalizability of these results. The reason why the hospitals in these studies decided to pioneer such programs could be endogenous, or there could be other concurrent reforms at the hospital level, as such programs are often implemented by a charismatic and reforming administrator. Therefore, the true effect of apologies on medical malpractice litigation could be overestimated and the external validity of these studies is in question.

Our study examines the impact of state-level apology legislation. We use data from the National Practitioner's Data Bank (NPDB) Public Access File (2009), which includes the universe of all medical malpractice payments made by or on behalf of a healthcare provider since 1991. Our analysis is conducted at two levels. The first is a difference-in-differences analysis using the time variation from the staggered implementation of state-level apology laws to investigate the impact on the total number of settlements and payments within a state-year. We further explore the change of case composition by the severity of injury. The second is a duration analysis on the impact of apology laws on time to resolution (i.e., how long it takes for a malpractice suit to be resolved), which is conducted at the individual level. We further investigate the impact of apology laws on settlement payments and how the size of this impact depends on the severity of the patient's medical injury. Similar to the concern raised earlier about the hospital-level apology policy, one may be concerned that the passing of apology laws at the state level could also be endogenous, which would result in a biased estimate. To address these concerns we perform various robustness checks and the results remain consistent.

The analysis suggests that the apology laws could increase the number of closed settlements by about 10−15% in the short run (3−5 years). One can attribute the increased number of settlements to several reasons. Most notably, the increase can be due to an overall increase in the number of claims or it could be due to faster settlement times. Consistent with our theory, we find evidence that suggests that the overall increase in closed cases is due to faster settlement times, while in the long run, the total number of lawsuits being brought forth is declining. For example, on the subset of cases involving insignificant injuries—those cases which are most likely to be resolved in the 3 to 5 years of available data—we see a 16−18% reduction in total cases. When we investigate the impact of apology laws on the duration of cases by the severity of medical outcomes, the hazard analysis results suggest that conditional on the cases resolving before 2009, the cases with most severe outcomes settle sooner in states that have the apology laws relative to states that do not. As for the dollar amount of the settlements, again conditional on the cases resolving before 2009, apology laws reduce the settlement amount of the most severe cases by $58,000−73,000 per case and the settlement amount of the "somewhat" severe cases by $7,000−14,000 per case. In sum, we find that apology laws, at least in the short run, induce faster settlements and lower payments for those malpractice cases brought by patients who sustained the most severe medical injuries. Also, while we do not observe the composition of cases that have yet to settle, the evidence suggests that these effects should persist.

The remainder of the paper proceeds as follows: in Section 2, we provide background on apology laws. In Section 3 we provide a model. Section 4 describes out dataset. In Section 5, we discuss our empirical specification and present our findings. Section 6 concludes.

2. Background of Apology Law

As of January 2009, apology laws had been enacted in 36 states, all of which were enacted between 1999 and 2008 (except for Massachusetts, whose law dates to 1986). Table 1 lists all of the state legal codes pertaining to medical apologies.[3] Table 2 shows that the timing of other medical malpractice tort reform is generally not correlated with the passage of apology legislation. Unlike other tort reforms, which have predominantly been a Republican issue (Durrance, 2009), apology laws are not disproportionately supported by any particular political party.[4] While there is no hard data to substantiate the following claim, it is anecdotally accepted that apology laws have been passed due to activist pressure rather than systemic changes in the litigation environment, which means that apology laws are unlikely to be correlated with other changes that affect litigation (e.g., tort reform).[5]

[Insert Table 1 About Here]

[Insert Table 2 About Here]

State apology laws are very similar to one another as they tend to be copied from similar templates. Connecticut's apology law is a typical example. The Connecticut law states that:

> In any civil action brought by an alleged victim of an unanticipated outcome of medical care, or in any arbitration proceeding related to such civil action, any and all statements, affirmations, gestures or conduct expressing **apology, fault, sympathy, commiseration, condolence, compassion or a general sense of benevolence** that are made by a health care provider or an employee of a health care provider to the alleged victim, a relative of the alleged victim or a representative of the alleged victim and that relate to the discomfort, pain,

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[3] California, Massachusetts, Florida, Tennessee, Texas, and Washington have general apology statutes that apply across all industries while the other 30 States have specific laws that only protect the statements of apology made by health care providers. The states can be first divided into two types depending on the applicability of these laws: general versus health practitioners only. We perform an F-test checking whether we can group the general versus health-care only laws together, the F-test fails to reject the null hypotheses that these two types of apology laws have the same impact. Therefore, for the remainder of the paper, we are not going to differentiate between general and health-care only apology laws.

[4] In regressions not reported in the current paper, we find that political composition in the state Senate and state House has no significant explanatory power on the passage of apology laws.

[5] See for example the efforts of the Sorry Works Coalition (Wojcieszac, Saxton, and Finkelstein, 2007).

suffering, injury or death of the alleged victim as a result of the unanticipated outcome of medical care shall be inadmissible as evidence of an admission of liability or as evidence of an admission against interest. (emphasis added)
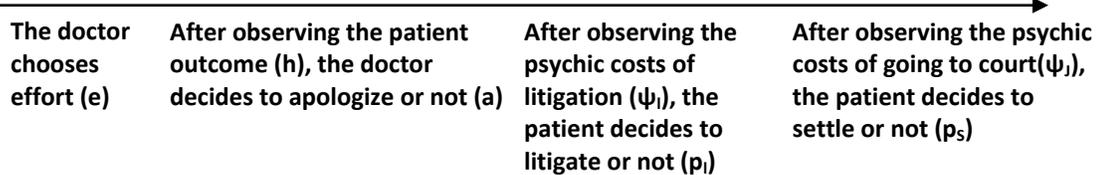
Depending on the state, there is a slight variation in the types of statements that are protected by these statutes. Protected statements typically include a combination of apology, fault, sympathy, commiseration, condolence, compassion, and admissions of mistakes, errors, and liability. In the legal literature, some studies divide apology laws into one of two categories: 1) full apology laws that protect against all types of apologies including those that contain statements of fault, mistakes, errors, and liability versus 2) partial apology laws that only protect against statements of sympathy, commiseration, condolence, and compassion.[6] An *F*-test fails to reject the null hypotheses that full and partial apology laws have the same impact. Therefore in our analysis, we will not differentiate between full and partial apology laws.

3. Theory

To illustrate the mechanisms that we are analyzing, consider first the simplest possible model of how doctors decide to apologize and how patients decide to litigate and settle. Previous models of apologies (Ho, 2009) and litigation (Daughety & Reinganum, 1994, 2000; Farber & White, 1994; Spier, 2005) have focused on asymmetric private information, but these assumptions introduce considerable complications to the analysis that we will return to at the end of this section.

Consider a situation in which there are two players: a patient/plaintiff (P) and a doctor/defendant (D) who play a game of healthcare provision, apology, and litigation with the following timeline:

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[6] The divisions between full and partial apology laws are arguably poorly defined. A paper by McDonnell and Guenther (2008) reports eight states as having full apology laws, whereas an article by Morse (2009) reports only five states as having full apology laws.

The doctor chooses effort (e)	After observing the patient outcome (h), the doctor decides to apologize or not (a)	After observing the psychic costs of litigation (ψ_l), the patient decides to litigate or not (p_l)	After observing the psychic costs of going to court(ψ_J), the patient decides to settle or not (p_S)

The patient's health outcome, $h(e,\varepsilon)$,[7] depends on the doctor's effort, e, which can be thought of as whether the doctor adhered to the standard of care, $e = \bar{e}$), but also depends on the patient's circumstances, which are represented by a noise term, $\varepsilon \sim F(\varepsilon)$, and are unobserved by the doctor when deciding effort. We will assume for now that the doctor always adheres to the standard of care ($e = \bar{e}$), but later we will consider the possibility that the doctor's efforts may depend on the incentives created by the threat of malpractice payments. The doctor then decides whether to apologize ($a = 1$) or not apologize ($a = 0$).[8]

The cost of an apology for the doctor is that the apology can be used as evidence against him/her in court. If litigation occurs, since the court cannot observe the doctor's effort, we assume that the expected judgment, $J(h,a)$,[9] is exogenously decreasing with better health outcomes and exogenously increasing with the doctor's apology (Sloan & Hsieh, 1990) since the apology can be used as evidence (Rehm & Beatty, 1996). We consider the implications of endogenizing the judgment size in Section 3.

The benefit of an apology to the doctor is that it increases the psychic cost of litigation. Numerous case studies suggest that anger is a main motivator for litigation that can overcome the patient's aversion to litigate (Hickson et al., 1992; May & Stengal, 1990; Vincent et al., 1994).

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[7] Higher h indicates better health. It is increasing with e, the doctor's effort. See for example, Gaynor and Gertler (1993).

[8] In this model, even though doctors adhere to the standard care procedure, since the court cannot observe the level of care, they might still want to apologize if apology helps reduce the probability of litigation. Patients could still sue the doctors as long as the utility from litigation is higher than the disutility from litigation.

[9] This is the amount that the patient receives and the doctor is required to pay after accounting for the probability that the patient wins.

Studies also find that apologies reduce patient anger, increase communication, and reduce the patient's motivation to litigate (Liebman & Hyman, 2004, 2005; Ohbuchi, Kameda, & Agarie, 1989; Sloan & Hsieh, 1995). We capture these psychological factors by saying there is a psychic disutility of initiating litigation, $\psi_l(a)$, and a psychic disutility for going to court, $\psi_J(a)$. Both disutilities would increase if the doctor apologizes. These psychic costs are modeled as random valued functions of whether a doctor apologizes where $\psi_i(1)$ first order stochastically dominates $\psi_i(0)$ for $i \in \{l, j\}$. For now we assume that apologies exogenously increase the patient's psychic disutility to litigate, but in Section 3 we discuss alternatives for which apologies serve as signals.

After the doctor apologizes (or not), the patient observes the realization of his psychic disutility of litigating. It is now the patient's turn to decide whether to litigate or settle. We define p_s as the probability the patient decides to settle, p_l as the probability the patient decides to litigate, and c_p as the economic cost of going to court.

Solving then by backward induction, the patient decides to settle if the benefit of settling, $S(h, a)$, is greater than the benefit of going to trial, $J(h, a) - c_P - \psi_J(a)$. How the settlement is determined relative to the judgment size typically depends on a bargaining game that we will abstract away from the current paper. For this paper will we simply say that the settlement, $S(h, a)$, is some fraction of the judgment size, $S(h, a) = \lambda J(h, a)$ where $\lambda \in [0,1]$.

If the patient decides to litigate, then the probability of settling is:

$$p_s = \Pr\left[S(h, a) > \left[J(h, a) - c_P - \psi_J(a)\right]\right]. \qquad (1)$$

From here, we can take a step back and compute the expected malpractice payment to be equal to the expected value from settling plus the expected value from a judgment minus the costs (both psychic and economic) of going to court:

$$E\left[p_s S(h,a) + (1-p_s)\left(J(h,a) - c_P - \psi_J(a)\right)\right]. \quad (2)$$

The patient's probability of litigating, p_l, is then given by the probability that the expected malpractice payment is greater than the psychic disutility of litigating:

$$p_l = \Pr\left[E\left[p_s S(h,a) + (1-p_s)\left(J(h,a) - c_p - \psi_J(a)\right)\right] > \psi_l(a)\right]. \quad (3)$$

Consistent with the empirical evidence found by Sloan and Hsieh (1995), equation (3) predicts that patients are more likely to litigate given more serious health outcomes.

To summarize, patient utility depends on the patient's health plus expected malpractice payments net of litigation and psychic costs, while doctor utility depends on the doctor's cost of effort minus expected malpractice payments and the economic costs of litigation (c_D):

$$U_P(l,s) = h(e,\varepsilon) + p_l\left[p_s S(h,a) + (1-p_s)\left(J(h,a) - c_P - \psi_J(a)\right) - \psi_l(a)\right] \quad (4)$$

$$U_D(e,a) = -e - p_l[p_s S(h,a) + (1-p_s)(J(h,a) + c_D)].$$

Doctors will apologize if and only if $U_D(\bar{e}, 1) \geq U_D(\bar{e}, 0)$. Note that a rational doctor will only apologize if the apology reduces his expected costs from litigation. Therefore, it follows that the probability that the patient litigates, p_l, must go down in the event of an apology.[10] The impact of an apology on the probability of the patient obtaining a settlement is ambiguous since apologies increase the patient's psychic cost of going to trial, but by providing the patient with more evidence to use against the doctor, apologies also increase the potential judgment that would be awarded.

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[10] A doctor only apologizes if the size of his expected malpractice costs, $p_l[p_s[S(h,a)] + (1-p_s)(J(h,a) + c_D)]$, is decreasing in apologies. Assume for the sake of contradiction that p_l increased with a, then that would imply that expected payments also increased, because the apology made the psychic cost of litigation increase so that the patient would only litigate if expected payments increased. However, if that were the case, then the doctor would never apologize. Therefore, p_l must be decreasing in apologies.

Introducing Apology Laws

Now suppose that the legislature passes a law excluding apologies as evidence in court. Assume that the law has no effect on how apologies affect psychic costs and that the only effect of an apology is to reduce judgments such that the new expected judgment function, $\hat{J}$, treats all cases as if no apology was ever tendered: $\hat{J}(h, 1) = \hat{J}(h, 0) = J(h, 0)$. We will examine how introducing asymmetric information changes both of these assumptions later in this section.

Continuing with the symmetric information case, the law has no effect on the doctor's payoff when he does not apologize, but when he does apologize, the patient is unambiguously more likely to settle and less likely to litigate, thus reducing the size of the expected medical malpractice payment. Consider the expression for p_s. Rearranging terms, a patient chooses to settle if the cost of seeking a court judgment outweighs the benefit of seeking a court judgment:

$$p_s = \Pr\big[c_p + \psi_J(a) > J(h, a) - S(h, a)\big]. \quad (5)$$

After substituting $S(h, a)$ with $\lambda J(h, a)$, we can rewrite equation (5) as:

$$p_s = \Pr\big[c_p + \psi_J(a) > (1 - \lambda)J(h, a)\big]. \quad (6)$$

Equation (6) shows that a patient settles if the cost of going to court is greater than the incremental benefit of seeking a judgment. Apology laws reduce the benefit of seeking a judgment, without affecting the costs; thus patients settle more often. Furthermore, going back to equation (3), a patient decides to initiate litigation if the expected benefit from litigation outweighs the costs of litigation. Apology laws reduce judgment sizes and increase settlements, both of which decrease the benefits of litigation; and thus, the probability that the patient litigates decreases as well.

Moreover, given symmetric information and risk neutral parties, the welfare implication of the law is unambiguous: since for now we assume that doctor effort is unaffected, litigation

results only in transfers from the defendant to the plaintiff and the deadweight loss of the cost of litigation ($c_P + c_D$). Thus the reduced likelihood of litigation means that the law must increase welfare.

If we make additional assumptions about the distribution of psychic costs, then we can say more. Assuming the psychic costs are uniformly distributed, the model predicts that the apology law would increase the probability of settlements relative to going to trial more for those cases with higher expected malpractice payments and for the cases in which patients have relatively less pretrial bargaining power,[11] which might occur when the patient has less evidence of wrongdoing and needs a trial to substantiate it. Similarly, these same conditions that lead to a larger increase in the probability of settlements also lead to a corresponding decrease in the probability of litigation.

With an overall decrease in the number of lawsuits, and an increase in the number of settlements (relative to going to court), the cases that make it to a court judgment should on average be more severe. However, when considering two cases with the same characteristics before and after the passage of an apology law, it becomes clear that the apology law reduces the amount of evidence available to the plaintiff and thus should reduce the size of the expected judgment payment.

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[11] If we assume that ψ takes on the uniform distribution that is shifted by α in the case of an apology such that $\psi \sim [\underline{\psi}, \bar{\psi}]$ if there was no apology and such that $\psi \sim [\underline{\psi} + \alpha, \bar{\psi} + \alpha]$ if there was an apology. Since we know from the patient's utility function that he will settle if $p_s = \text{Pr}[c_p + \psi_J > (1 - \lambda)J(h, a)]$, then we can say that $p_S(a = 1) - p_S(a = 0) = -[(1 - \lambda)[J(h, 1) - J(h, 0)] - \alpha]$. Introducing the law means that apologies no longer affect judgment sizes $\hat{J}(h, 1) = \hat{J}(h, 0)$, so the first term goes away and we are left with $p_S(a = 1) - p_S(a = 0) = \alpha$. Thus the change in the probability of settlements is given by : $(1 - \lambda)[J(h, 1) - J(h, 0)]$

Introducing Private Information

The preceding analysis presumes that there is no private information between players. Much of the past theoretical literature on malpractice litigation has focused on asymmetric information, and thus, introducing private information is important for increasing the validity of the model. Unfortunately, private information also makes most of the model's predictions indeterminate.

The obvious place to introduce private information is to introduce moral hazard into the doctor's effort. The doctor knows whether she adhered to the standard of care (i.e., the doctor's effort), but the patient and the courts cannot directly observe the doctor's standard of care. To ensure a range of efforts are provided, the model needs heterogeneous doctor types so that different doctor types have different marginal costs of effort. The consequences of such moral hazard on the effects of the apology law are numerous.

One consequence is that the welfare effects become ambiguous, because as noted by Polinsky and Rubinfeld (1988), malpractice litigation is an important deterrent to moral hazard. By reducing the expected malpractice payments a doctor faces, apology laws could reduce doctor effort. This increase in moral hazard is echoed by Cohen (2002) who worries that the predicted decrease in lawsuits filed will have a detrimental impact on the natural process of remediation. Already, very few cases of medical malpractice come to trial (Huycke & Huycke, 1994). One could argue that since these lawsuits are essential for restorative justice and efficient monitoring, patient welfare would be enhanced if there were more lawsuits, not fewer.

A second possible consequence, in a world in which patients are imperfectly informed about their own health and doctors have private information about the health outcomes, is that an apology could lead to the disclosure of health information that informs the patient about his

chance of winning a lawsuit. However, a rational doctor would only apologize if the apology reduced his expected medical malpractice payment, and thus the law should still reduce malpractice payments.

However, if the law leads to a potential devaluation of the apology, then it could have ambiguous effects on malpractice payments. Ho (2009) analyzes a more general model of apologies and shows that the impact of an apology is increasing in the cost of tendering it.[12] By reducing an apology's potential consequences, the apology laws make apologies less effective, thereby potentially increasing lawsuits and decreasing patient welfare. Such concerns are echoed on legal and ethical grounds by Taft (2000) who argues that apology laws reduce the moral weight of apologies. Consider the following scenario that illustrates this counterintuitive result. In the event of a medical error in a state in which there is no apology law, an apology could possibly satisfy the patient and removed his desire to litigate. But if an apology law were in effect, a lawyer might tell the patient that the doctor only apologized because she was protected by the apology law, thus prompting the patient to litigate anyway. Furthermore, in states where apology laws have made apologies easier to tender, the lack of an apology could become even more offensive to a patient since the doctor no longer has a potential lawsuit as an excuse for not apologizing.

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[12] Ho (2009) also predicts when apologies would be most prevalent, and therefore, when one might expect the apology laws to have the greatest impact. For example, Ho's theory predicts that apologies are more prevalent when the patient has greater uncertainty about the doctor's abilities. Thus one might look at specialties in which the doctor's effect on the outcome is more difficult to observe. The theory also suggests that apologies are more important when reputations are less well established, and thus, one would expect younger doctors to apologize more frequently. Also, the differential importance of reputation means that apologies potentially play a bigger role in specialties such as obstetrics/gynecology (OB/GYN), for which patients shop around more for their doctors, as opposed to specialties such as emergency medicine, for which circumstances typically dictate which doctor the patient sees. Apologies are more important in longer term relationships with repeated doctor-patient interaction. Thus, one would expect larger effects in oncology, which has a long course of treatment, than in anesthesiology, which has little doctor-patient interaction. The theory predicts that conditional on there being a mistake; competent doctors apologize more than incompetent doctors. One would expect that doctors with fewer prior offenses or state licensing actions are more likely to apologize than doctors with more prior offenses. Finally, the theory predicts that apologies are more effective when outcomes are less severe, thus apologies are more effective for emotional injuries or minor temporary injuries rather than cases of major permanent injury or death.

The impact on the likelihood of settlement and the time to settlement are also affected by private information. The impact on the likelihood of settlement depends critically on the assumptions about the negotiation and settlement process (Bebchuk, 1984; Spier 1992). Settlement offers could both serve to screen or to signal (Daughety & Reinganum, 1994; Spier, 1994). These models tend to predict that more asymmetric information reduces settlements and increases bargaining time (Spier, 2004). If the law does increase information disclosure to the patient, then states which implement apology laws could be expected to experience more settlements and faster resolution of malpractice cases.[13]

Thus, while the theory presented here offers some guidance on the effects to expect, the net effect of apology laws on whether they increase or decrease medical malpractice litigation and whether the laws increase or decreases malpractice settlements becomes an empirical question that this paper intends to resolve. To connect between the theory and the empirical analysis, we would ideally like to analyze at the individual level the probability of settlements for all for open claims. At the aggregate level, assuming that the total incidents of malpractice should not be affected by apology laws, we would like to conduct our analysis on the total number of malpractice claims ever filed (including both open and closed claims). Unfortunately, to our knowledge, there does not exist any comprehensive and public data available on all open claims that have yet to be resolved.

4. Data

To assess the impact of these various types of apology laws, we use data drawn from the National Practitioner Data Bank's (NPDB) Public Use Database (2009). Due to the federal

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[13] A decrease in bargaining time and an increase in settlements would reduce the uncertainties involved in litigation, which would cause risk-averse patients to litigate more frequently.

Health Care Quality Improvement Act (HCQIA), all malpractice payments—either as part of a settlement or as part of a court judgment—made by or on behalf of a licensed health care provider must be reported within 30 days. The NPDB contains the universe of all malpractice cases with non-zero payments and it provides additional information about each claim beyond payment size. For each claim, there is information regarding the year the incident occurred, the nature of the allegation (e.g., diagnosis related, anesthesia related, surgery related, etc.), the outcome of the incident (e.g., emotional injury, minor temporary injury, major permanent injury, death, etc.) ,[14] the practitioner's graduation year and age group, the practitioner's work and licensing state, and whether the payment was for a judgment or a settlement. This dataset has been widely used in many studies related to medical malpractice (see Baicker & Chandra, 2005; Durrance, 2009; Matsa, 2007).

We restrict our analysis to the reports in which adverse events occurred after 1991 due to the incomplete reporting in the earlier years. Table 3 provides summary statistics at the individual level. There are a total of 225,319 payment reports in our sample.[15]

[Insert Table 3 About Here]

In Figure 1 we present, by the year the event occurred, the number of resolved cases and the average number of years taken to resolve them.[16] Since the NPDB only receives information about an offense/omission when the payment is made, the dataset is truncated for

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[14] The outcome variable only became mandatory for recording in 2004. The categories of injuries are reported by the entities that make payments to the patients.

[15] The NPDB dataset is not free of problems. It has been criticized because of a "corporate shield" loophole, through which settlement payments made on behalf of a practitioner end up excising the practitioner's name from the settlement data in the NPDB. Chandra, Nundy, and Seabury (2005) compare data from the NPDB with other sources of malpractice information and while they find approximately 20% underreporting, they find that underreporting is not systematically different across states. Therefore, for our analysis, which is extracting information at the state level, there is no obvious reason why the corporate shield loophole would bias the effects of the apology legislation. It is also important to note that the NPDB dataset has been used for most recent influential studies of medical malpractice reform (Currie & MacLeod, 2008)

[16] Figure 1 includes both those cases settled out of court and those cases resolved in court.

offenses/omissions that occurred late in the dataset but have yet to be resolved. For example, as evident in Figure 1, fewer than 1,000 offenses that occurred in 2007 are included in our data since the rest of the cases have yet to be resolved. Therefore, the interpretation of regression results requires extra caution, which will be addressed in the analysis section.

[Insert Figure 1 About Here]

Besides the individual-level data, the NPDB was used to generate an aggregate dataset where an observation is at the state-year level. We establish two measures at the state level. First, is the total number of settlements made by practitioners working in a given state for an offense committed in a given a year.[17] Second, is the value of malpractice payments made by medical practitioners in a given state for an offense committed in a given year.[18] Table 4 presents summary statistics for the dataset. With 51 states (including the District of Columbia) reporting over a 17 year period (1991-2007), there are 867 observations in the state-level dataset.[19] In 2000, the median number of incidents per state was 184 incidents and the median total value of payments was $35.7 million. Note that the average time to settlement was 3.86 years with a standard deviation of 2.15. Longer settlement times are associated with cases that involve more severe injuries. This variability in settlement time will be crucial for understanding our results. In Figure 2 we present a histogram of settlement times for cases that occurred in 1992 so that we can be reasonably certain that this represents a fairly complete distribution of cases.

[Insert Table 4 About Here]

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[17] Another way to construct the state-level dataset is by the total number of settlements made in a given year. Our goal is to analyze the impact of apology laws, which intend to encourage practitioners to apologize and communicate more openly with their patients. The impact on the settlement is hinged upon the apology. While the model in Section 2 cannot distinguish the timing of the apology, the apology is likely to be most effective soon after the incident occurs, not a few years later. Therefore, we aggregate it by the year of incident instead of the year of settlement.

[18] We adjust the settlement by CPI. Therefore, all payments are in Y2000 dollars.

[19] We have excluded all cases that occurred in 2008 since only less than 100 cases which occurred in 2008 had been settled by 2009.

[Insert Figure 2 About Here]

5. Empirical Specification and Results

The effect of apology laws on medical malpractice outcomes is estimated using a difference-in-difference method. The validity of this specification rests on the assumption that the states that have passed apology laws would have otherwise followed the same trend as those states that have not passed apology laws. Therefore, we perform various checks to examine the validity of this assumption. Another crucial assumption that merits attention is that the passage of apology laws is not correlated with any other event that would affect medical litigation—an obvious possibility being the passage of other tort reform or malpractice laws. To ensure that a correlation with other malpractice laws does not drives our results, we include controls for other tort reforms as studied by Currie and MacCleod (2008) in each of our specifications.[20] Furthermore, in each specification, we cluster standard errors by state to avoid problems of serial correlation (Bertrand, Duflo, & Mullainathan, 2004).

State-Level Analysis

There are two main outcome variables. The first variable is the number of already-resolved malpractice cases for incidents that occurred in year t and state s, while the second variable is the value of the total payments made in state s for incidents that occurred in year t.

We first employ OLS to estimate the following:

$$\log Y_{st} = \lambda\, controls_{st} + \beta\, apology_{st} + \sum_t \delta_t Year_t + \sum_s \delta_s State_s + \varepsilon_{st},$$

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[20] The other law measures for which we have controlled the timing in our study include the existence of noneconomic cap, punitive cap, law on full information disclosure, joint and several liabilities, and collateral source rule. The information on the existence of the laws (excluding information disclosure laws) is from the annual produced by the American Tort Reform Association. The information on the disclosure laws is from Gibson and Del Vacchio (2006).

where Y_{st} is the outcome variables and *apology* is a dummy variable which is one if an apology

law was in effect in state *s* during year *t* and otherwise is zero. Our main coefficient of interest is

β, which represents the percentage change in the number of closed cases due to the adoption of

the apology law.

The results are presented in Table 5. Columns 1 and 4 are presented without controls,

columns 2 and 5 add a full set of social policy changes (the existence of a noneconomic cap, a

punitive cap, joint and several liabilities and collateral source rule, and a law on full information

disclosure), while columns 3 and 6 include a set of time-varying state demographics including

the number of physicians in the state, racial compositions, population, and percentage of

population that are 65 or above. The results show a consistent 14−15% increase in the number of

payments related to malpractice settlements. The results for total payments also show an increase

of 20−27%. The fact that the percent increase shown in columns 4-6 is larger than those in

columns 1-3, suggests that the payment per case increases after the law is enacted. Both of these

results are surprising given the model's predictions and the intentions of the apology laws'

proponents. However, both the increase in the number of cases and in payments can be explained

by a change in the composition of the cases that are being resolved.[21] The same analysis has also

been performed on settlements excluding all cases that result in judgments and the results are

similar.

[Insert Table 5 About Here]

It could be worrisome if the effect of the states is spurious to the structure of the data or

the time period upon which we estimate the data. Therefore, we perform various robustness

checks. First, we randomly assign half of the states as having adopted the law between 2000 and

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[21] The high R^2 is mostly due to the state and year fixed effects. In regression without any other covariates, the R^2 is about 0.96 for specification in columns 1-3. This is pretty natural as the number of cases resolved is mostly related to the year in which the case occurred.

2005 and estimate the same difference-in-difference regression. The results are presented in columns 1-3 of Table A1 in the Appendix. Moreover, for all the states that have adopted apology laws, we subtract three years from the year of adoption and perform the same analysis to capture any possible spurious effect attributable to properties of the states in question rather than to the laws themselves. The coefficients remain insignificant in columns 4 and 5. Lastly, as we intend to interpret the result as a causal interpretation, we need to check to see if the increase in settlements came after the adoption of the apology laws. Therefore, we include in our differences-in-differences specification a series of lead dummy variables, which specifies whether apology laws will be adopted in that state 1 year, 2 years, 3 years, 4 years, or 5 years into the future. We find that all coefficients on the lead dummies are not statistically different from zero, suggesting that the effects that we find do not predate the passing of the apology laws. Now, knowing that the results are robust and not due to spurious effect, we need to find the hypotheses that could explain the seemingly surprising results.

There are two hypotheses that could explain the positive coefficients in Table 5. One is that there are increasing numbers of malpractice claims filed after the law is enacted in a state, either because doctors exerted less effort or patients have more information about their chances of winning lawsuits. The second hypothesis is that cases are resolved more quickly after states have enacted the apology laws. If there is such a distributional shift in the duration of malpractice cases (as illustrated in Figure 3), given that our dataset only includes resolved cases, we would temporarily observe an increase in the number of resolved cases.[22] We find further evidence in Tables 6 and 7 that the results are driven by a compositional shift rather than a real increase in the number of cases. If the result is only due to a shift in composition that arises from

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[22] In other words, if our dataset include all open claims data, then we would not be able to find this increase. This is artifact of data structure.

the data truncation, we should expect the upward bias to be more pronounced in the latter years. In other words, for cases that occurred in the earlier years—since more years have elapsed and more cases have been resolved—the estimated coefficients should be closer to the true impact of apology laws. For example, if we estimate the apology laws' effect on cases that occurred in 2007, and the average settlement time shifts from an average of 4 years to 2 years, then we would see an increasing number of resolved cases in those states with apology laws. However, in cases that occurred in 2004, given that many more years have elapsed, we would see a smaller bias.

[Insert Figure 3 About Here]

Therefore, in Table 6 we restrict our sample to the four states that passed an apology law before 2002 and those states that have never passed an apology law. For each column, the dependent variable is the natural log of the number of cases that occurred. Column 1 considers only the number of cases that occurred before 2002 and thus gives us an estimate of the apology laws' net effect after 7 years have elapsed. Column 2 considers the effect on all cases that occurred before 2003, thereby giving an estimate of the apology laws' net effect after 6 years have elapsed. Similarly, column 8 considers the effect on cases before 2008 and thus gives us a sense of the apology laws' net effect on current cases. Table 6 suggests that the apology laws' net effect is zero (or possibly negative) in the long run—the fact that these coefficients increase from left to right provides further evidence for our conjecture that the positive coefficients that we observe are caused by the laws speeding up the time to reach a settlement—and that the long-term effect of the apology laws is zero (or possibly negative).[23]

[Insert Table 6 About Here]

_____

[23] One might think using the aforementioned logic, the dependent variable should be the cases that occurred in exactly 2002 in column 1, those that occurred in 2003 in column 3, etc. However, we would only have 21 observations in each regression and would not be able to capture any general state or year trends.

The interpretation of the large settlement increases should be tempered by the fact that since most of the apology laws were passed after 2004, the magnitudes of these increases only represent the effect of the laws conditional on settlement before 2009. For example, columns 7 and 8 of Table 6 show that the impact of the law leads to a 23% increase in the number of cases resolved compared to states that have not passed apology laws. However, recall from Figure 3 that there are relatively few cases that occurred in 2007 and 2008 that have been resolved, and thus a small decrease in the time to settlement can lead to a large percentage increase in the number of cases.

Table 7 considers the composition of cases in terms of the type of injury. The dependent variable is the log number of cases in each medical injury category (e.g., insignificant injury, "somewhat" significant injury, and major permanent injury/death).[24] Restricted by the sample of cases that occurred after 2002,[25] Table 7 shows that the overall increase in settlements observed is due entirely to the increase of settlements for major/permanent injury and death. For insignificant injuries, which normally settle quickly enough to see the apology laws' full effect, we see a net reduction of 16.7−18.5% in the number of cases. Again, to think about which hypothesis explains this result, suppose that doctors are exerting less effort after the apology laws are implemented, it is difficult to explain why there is such a pattern based on case severity. The results in Table 7 suggest that after passing the law, there is a short-term increase in the number of cases that normally take years to resolve,[26] but an overall decrease in the number of cases involving the least significant injuries. This is consistent with Figure 3 in which the apology laws cause a shift of case settlement distribution to the left.

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[24] There are nine categories of injuries in the NPDB, which we group into three categories for the ease of analysis and presentation (see Table 3 for subcategories).

[25] The severity of injuries is only available for cases reported after 2002. For a similar analysis grouped by the size of payment, see Table A2 in the Appendix.

[26] From this dataset we can observe that it is true that cases involving more severely injured patients usually take longer to resolve than insignificant injury cases.

[Insert Table 7 About Here]

Individual-Level Analysis

Since we have data on the year in which the incident occurred and the year it was settled, hazard models provide a natural framework for modeling settlement probabilities (e.g., Hannan & McDowell, 1984). Let t be the time elapsed from the time of incident to the time of settlement, $X_i(t)$ be a vector of relevant explanatory variables, and β be a vector of coefficients. Denoting the cumulative density function as $F_i(t|X,\beta)Prob(T \leq t|X,\beta)$ and the density function as $f_i(t|X,\beta)$, the hazard function which indicates the probability of settlement at period t, conditional upon no settlement by time $\{t-1\}$, is defined as $h_i(t|X,\beta) = f_i(t)/[1 - F_i(t)]$.

The general form of the proportional hazard function is $h(t|X(t),\beta) = h_0(t) \, exp\{X'(t)\beta\}$ where $h_0(t)$ is the baseline hazard. Since our regression result has indicated the hazard is time dependent, we use a Weibull baseline hazard specification:

$$h(t|X(t),\beta) = \delta_i t^{\delta_i - 1} exp\{X'(t)\beta\}.$$

The hazard ratios from the aforementioned regressions are reported in Table 8. To interpret the coefficient, one needs to be cautious that the reported hazard ratios are conditional on resolution. Here, we see the law has no significant effect on the speed of resolution for insignificant injuries whereas for a case involving a major/permanent injury, conditional on resolution, the probability it resolves in any given year is increased by 24−25% when the apology law is in effect.[27]

In Table 9, we consider the impact the law has on the dollar value of malpractice payments using a difference-in-difference model. We find that after the law is adopted, payment

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[27] We have also attempted a maximum likelihood estimate of the unconditional hazard ratio using a proportional hazards model that accounts for right truncation from Finkelstein, Moore, and Schoenfeld (1993). However, due in part to their model being weakly identified, the procedure largely does not converge.

amounts would be reduced by approximately $17,000−27,000 for somewhat severe cases and $55,000−73,000 for the most severe cases.[28]

[Insert Table 8 About Here]

[Insert Table 9 About Here]

Taken together, Tables 7, 8, and 9 suggest that apology laws are consistent with the symmetric information model presented above as well as the legislators' intent; the apology laws' combined effect is to increase apologies and decrease expected settlement time, and should in the long term speed up settlements and reduce the total number and value of malpractice payments. We see that the apology laws reduce the total number cases which tend to settled quickly and reduce the payment size while increasing the settlement speed of cases involving major injuries/death.

Our model does not directly offer predictions as to which specialties should be most impacted by the adoption of apology laws, nevertheless it is still interesting to examine whether there is a differential impact on different subgroups. There is no data in the NPDB on the physicians' specialties, but the NPDB does divide the nature of the allegations into 11 categories: diagnosis related, anesthesia related, surgery related, medication related, IV and blood product, obstetrics related, treatment related, monitoring related, equipment/product related, other miscellaneous, and behavioral health related. In Table 10, we interact the allegation categories with the apology law dummy, controlling for medical outcome, gender, patient age, physician experience, and timing of other tort reform. The results suggest that relative to the diagnosis-related cases, anesthesia-, surgery-, and obstetrics-related cases would experience a greater

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[28] Regressing the same specification on different payment size quantiles finds that the law has the largest effects on the 3rd quantile and no effect on the 1st and 4th quantile. The lack of effect on 4th quantile payments could be due to the fact that apologies are likely to be less important in cases worth millions of dollars, or that the largest cases take many years to resolve and thus cases of this size have yet to be resolved in most states where apology laws have been passed.

reduction in payments. In regression results not reported in the current paper, we perform the same analysis controlling for the same set of covariates, but with our main coefficients of interest being the health practitioner's age. In this case, we find that compared to younger health practitioners, those who are between 31 and 59 years of age experience a $25,000−30,000 payment reduction per case due to the adoption of apology laws.

[Insert Table 10 About Here]

Threat to Validity: Robustness Check

Given that both main outcomes of interest are non-negative, we can also reanalyze the main outcomes using a Poisson model which makes assumptions about the distribution. The results are presented in Table A3 of the Appendix. We still find that most of the increases in the number of cases are from the medical cases involving the most severely-injured patients and that there is little change in the frequency of the cases involving minor injuries.

We examine the sensitivity of our results with a number of alternative specifications. First, we omit in turn each of the 36 states and each of the available years, and the regressions yield similar results, suggesting that the results are not driven by a single outlier or a particular year. Furthermore, median regression and population weighted least squares yield similar positive significant results.

Our regressions above are analyzed based on the year the offense occurred because the apology laws largely apply only to apologies that were made for adverse events that occurred after the law was passed. Also, arguably apologies are most effective shortly after the adverse event occurred, so medical errors that occurred years before the law was passed should be unaffected. As a robustness check, we provide a difference-in-difference analysis in which the dependent variable is the natural log of settlements grouped by the year of settlement, and we

find that laws have no impact on the on the incidents that occurred before the passing of the apology laws. The results are presented in Table A4 of the Appendix.

One of our theory's predictions is that the probability a settlement is reached should increase. It may seem natural to look at the ratio between settlements over judgments across states over time. However, given that only 3% of the cases in this dataset are judgments, and that cases that have gone to court usually take much longer to resolve and thus would not enter our dataset, this ratio cannot be meaningfully estimated.

6. Conclusion

We have demonstrated both theoretically and empirically the effects of apology laws on medical malpractice lawsuits. We find that in the short run the law increases the number of resolved cases, while decreasing the average settlement payment for cases with more significant and permanent injuries. While having an insignificant impact on the settlement payments for cases involving minor injuries, the apology laws do reduce the total number of such cases. While the short term increase in malpractice settlements could be a surprise to policymakers and advocates of apology laws, we believe this is an artifact of data limitations. Our findings suggest that apology laws reduce the amount of time it takes to reach a settlement in what would normally be protracted lawsuits, leading to more resolved cases in the short run. In the long run, the evidence suggests there could be fewer cases overall.

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Figure 1: Cases Settled By Year of Incidents
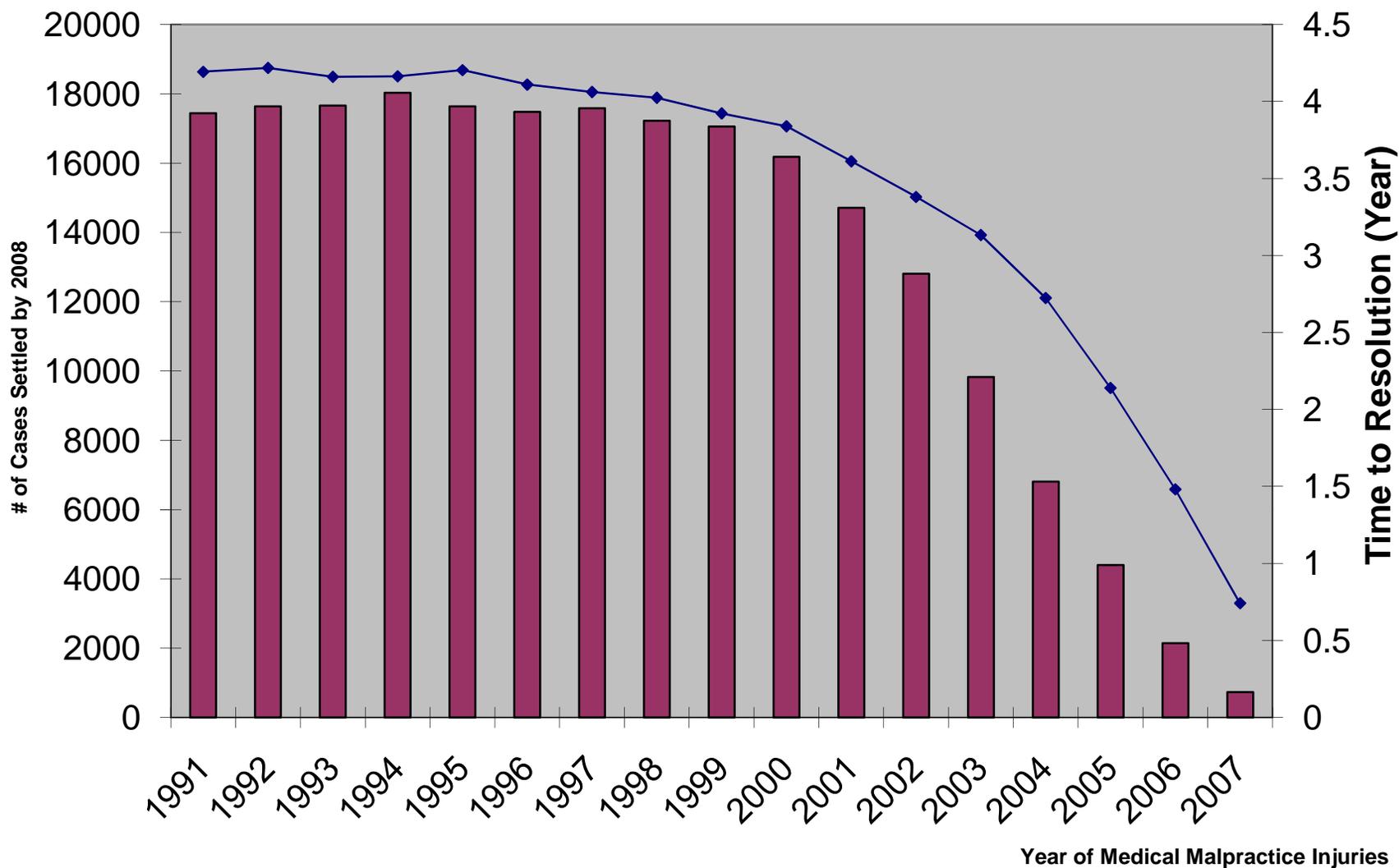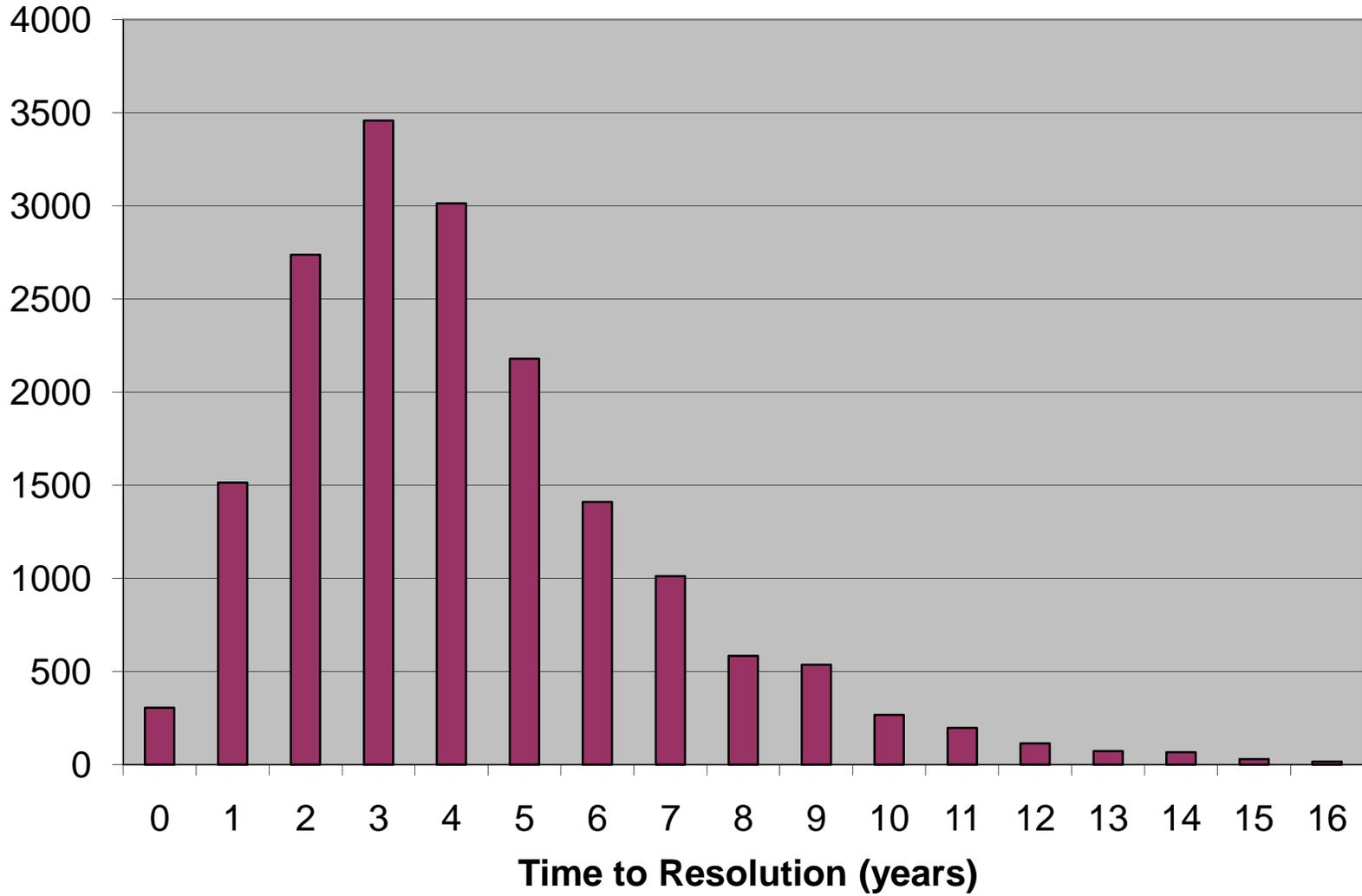
Figure 2: Histogram of Claims By Time to Resolution
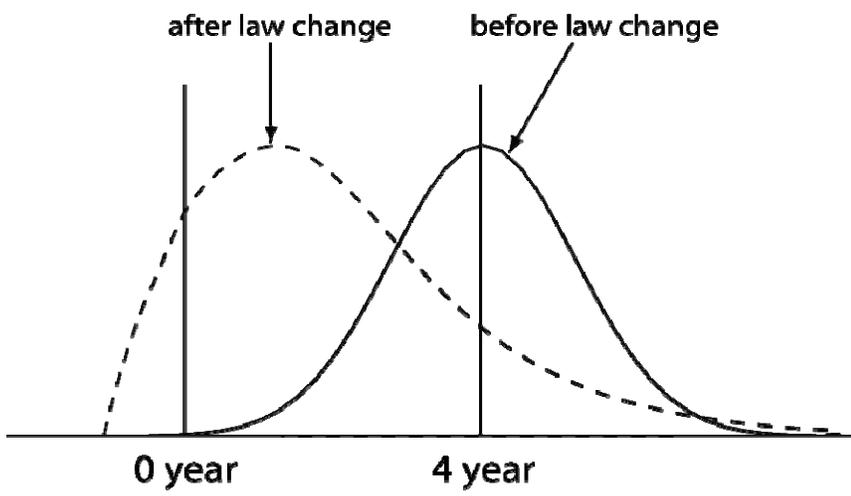
Figure 3: Two Scenarios of Shifting of Distribution

after law change   before law change

0 year   4 year

after law change   before law change

0 year   4 year
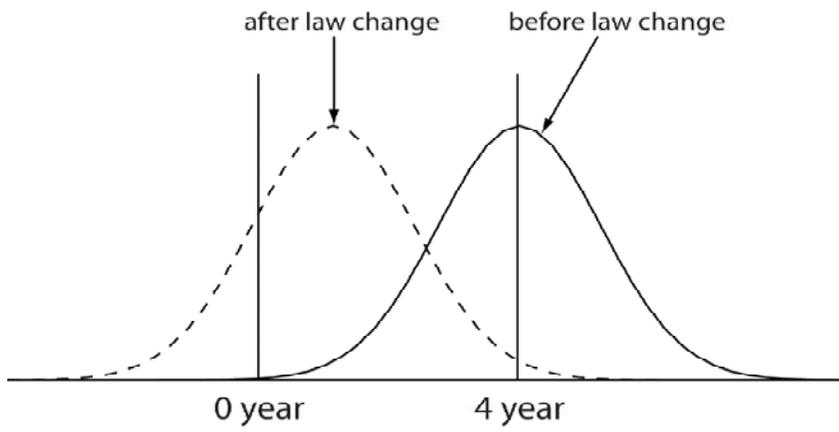
Table 1. State with Statutes Pertaining to Apology Law

State	Year Law Passed	Full Versus Partial	Statutes
Massachusetts	1986	Partial	ALM GL ch. 233, § 23D (1986)
Texas	1999	Partial	Tex Civ Prac & Rem Code Ann 18.061 (1999).
California	2000	Partial	Cal Evid Code 1160 (2000).
Florida	2001	Partial	Fla Stat Ann Ch 90.4026 (2004).
Washington	2002	Partial	Rev. Code Wash. §5.66.010(2002)
Tennessee	2003	Partial	Tenn. Evid. Rule §409.1
Colorado	2003	Full	Colo Rev Stat Sec 13-25-135 (2003)
Oregon	2003	Partial	Oreg Rev Stat Sec 677.082 (2003).
Maryland	2004	Partial	Md. COURTS AND JUDICIAL PROCEEDINGS Code Ann. § 10-920
North Carolina	2004	Partial	N.C. Gen. Stat. § 8C-1, Rule 413 (2004)
Ohio	2004	Partial	ORC Ann. 2317.43 (2006)
Oklahoma	2004	Partial	(63 Okl. St. § 1-1708.1H
Wyoming	2004	Partial	Wyo Stat. § 1-1-130
Connecticut	2005	Full	Conn. Gen. Stat. § 52-184d (2005)
Louisiana	2005	Partial	La. R.S. 13:3715.5 (2005)
Maine	2005	Partial	24 M.R.S. § 2907 (2005)
Missouri	2005	Partial	Mo.Rev.Stat §538.229 (2005)
New Hampshire	2005	Partial	N.H.Rev. Stat. Ann. § 507-E:4 (2005)
South Dakota	2005	Partial	S.D. Codified Laws § 19-12-14 (2005)
Virginia	2005	Partial	Va. Code Ann. §8.01-581.20:1 (2005)
Arizona	2005	Full	A.R.S. § 12-2605
Georgia	2005	Full	O.C.G.A. § 24-3-37.1
Illinois	2005	Partial	735 ILCS 5/8-1901 (2005)
Montana	2005	Partial	Mont. Code Anno., § 26-1-814 (2005)
West Virginia	2005	Partial	W. Va. Code § 55-7-11a (2005)
Delaware	2006	Partial	Delaware Del. Code Ann. Tit. 10, 4318 (2006)
Idaho	2006	Partial	Ida. ALS 204; 2006 Idaho Sess. Laws 204;
Indiana	2006	Partial	Ind. HEA 1112
Iowa	2006	Partial	Iowa HF 2716 (2006)
South Carolina	2006	Full	South Carolina Ch.1, Title19 Code of Laws 1976, 19-1-190 (2006)
Utah	2006	Partial	2006 Ut. SB 41
Vermont	2006	Partial	Vermont S 198 Sec. 1. 12 V.S.A. 1912 (2006)
Hawaii	2006	Partial	HRS section 626-1, Hawaii Rules of Evidence Rule 409.5
Nebraska	2007	Partial	Nebraska Neb. Laws L.B. 373 (2007)
North Dakota	2007	Partial	North Dakota ND H.B. 1333 (2007)
District of Columbia	2007	Partial	D.C. Code 16-2841 (2007)

Table 2. Examples of Tort Reform Timing

	NE cap	PD cap	CSR	JSL	Disclosure	Apology
Texas	2003	1987	-	1987	-	2000
Maryland	1986	-	-	-	-	2004
Idaho	1987	2003	1990	1987	-	2007
North Carolina	-	1996	-	-	-	2004
Nevada	2002	1989	-	2004	2003	-

Source: American Tort Reform Assocation (2009), Currie & MacLeod (2009)

Table 3. Summary Statistics--Individual Level

Individual Level

Number of Observation	224,904
Average Amount of Settlement	$200,120
(standard deviation)	(378,986)
Average Years to Settlement	3.86
(standard deviation)	(2.15)
Practitioners' License Field (%)	
Physicians and Physician Intern	72.9
Osteopatic and Osteopatic Intern	4.81
Dentist and Dentist Intern	13.13
Others (RN, Pharmacist, Chriopractor)	9.16
Outcomes (Available If Reported After 2004) (%)	
Emotional Injury Only — *Insignificant injury*	2.09
Insignificant Injury	3.04
Minor Temporary Injury	14.89
Major Temporary Injury — *"Somewhat" Sign. injury*	9.36
Minor Permanent Injury	13.77
Signifant Permanent Injury	13.94
Major Permanent Injury — *Significant Injury*	9.17
Quadriplegic	4.32
Death	27.68
Cannot be Determined	1.76
Payment Type (%)	
Settlement	90.28
Judgment	2.54
Unknown	7.18

Table 4. Summary Statistics--State Level

State Level	Mean	SD	Median
Incidents occurred in 2000	316.9	444.6	155.0
Payments in 2000	$71,332,844	$105,560,095	$28,030,700
Physicians in 2000	13,892	16,724	8,581
Population in 2000	5,532,783	6,184,308	5,532,783
Noneconomic Damage Cap	51%	-	
Punitive Damage Cap	33%	-	
Collateral Source Rule	53%	-	
Joint & Several Liablity	61%	-	
Law on Information Disclosure	12%	-	
Apology Law	63%	-	

Note: All laws are tabulated in 2007.

Table 5. The Impact of Apology Law on Medical Malpractice Settlements (% Change)

Dependant Variable	# of Cases			Value of Payments		
	(1)	(2)	(3)	(1)	(2)	(3)
Apology Law Change	0.142	0.153	0.147	0.279	0.276	0.202
	(0.086)	(0.083)*	(0.095)	(0.163)*	(0.163)*	(0.181)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
N	867	867	867	867	867	867
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustesed at the state level. The dependent variables are either Log (Number of Cases) in a state-year or Log (Total amount of Settlement) in a state-year.

a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr_tort and jsl_tort.

b. Covariates include population, % Black, % White, % of population that are 65 or above, and # of Physicians.

Table 6. Impact of Early Apology Law on Medical Malpractice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2001	2002	2003	2004	2005	2006	2007	2008
Treat	0.001	0.044	0.082	0.082	0.130	0.163	0.236	0.234
	(0.038)	(0.045)	(0.041)*	(0.045)*	(0.050)**	(0.061)**	(0.077)***	(0.086)**
Observations	210	231	252	273	294	315	336	357
R-squared	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98

Note: Includes only states that passed apology laws prior to 2002 and states that have never passed an apology laws.

All regressions include state and year dummies and controlling for other tort reforms

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses.

Table 7. The Impact of Apology Law on Medical Malpractice Cases by Severity of Outcomes (% Change)

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	-0.167	-0.182	-0.194	0.118	0.091	0.047	0.27	0.265	0.217
	(0.099)*	(0.104)*	(0.101)*	(0.124)	(0.124)	(0.121)	(0.129)**	(0.133)*	(0.141)
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	255	255	255	255	255	255	255	255	255
R-squared	0.91	0.91	0.92	0.93	0.93	0.93	0.93	0.93	0.94

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level. The dependent variables are Log (Number of Cases by severity of outcome) in a state-year
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr and jsl tort
b. Covariates include Population, % Black, % White, % of population that are 65 or above, and # of Physicians

Table 8. The Impact of Apology Law on Prob of Resolution By Severity of the Outcome

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	1.094	1.099	1.089	1.202	1.209	1.209	1.255	1.243	1.252
	(0.103)	(0.102)	(0.097)	(0.126)*	(0.124)*	(0.129)*	(0.125)**	(0.130)**	(0.130)**
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	12864	12864	11242	23945	23945	22586	26437	26437	25153

Note: Numbers reported above are hazard ratios. Each column shows the results from a separate duration analysis with Weibull Specification. The dependent variable is time to settlement (year of settlement minus the year of incident). Errors are clustered at the state level

a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information disclosure

b. Other covariates include allegation nature, patient gender, settlement type, experience of physician

Table 9. The Impact of Apology Law on Payments By Severity of Outcome

	Insignificant Injury Baseline Mean $45,019			"Somewhat" Significant Injury Baseline Mean $155,070			Major Permanent Injury/Death Baseline Mean $342,869		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	-431	632	3,132	-24,017	-27,264	-16,990	-73,097	-67,645	-55,248
	(4,236)	(4,132)	(3,894)	(13,432)*	(13,564)**	(9,538)*	(17,334)***	(21,188)***	(18,022)***
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	13317	13317	11618	24156	24156	22780	26561	26561	25273

Note: Numbers reported above are payments in Y2000 dollar. Each column shows the results from a separate OLS regression. The dependent variable is the amount of payment.
a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information closure
b. Other covariates include allegation nature, patient gender, patient age, experience of physician, exp2

Table 10. Change in Payment By Allegation Nature

	Value of Payment
Anesthesia	-65,066
	(29,004)**
Surgery	-19,218
	(9,146)**
Medication	-18,751
	(18,718)
IV & Blood Product	35,064
	(48,473)
Obstetrics	-88,968
	(45,384)*
Treatment Related	8,456
	(13,864)
Monitoring Related	-25,346
	(20,158)
Equipment/Product Related	8,950
	(26,086)
Other Miscellaneous	-1,275
	(16,157)
Behavioral Health Related	38,893
	(49,429)
Other Law Change[a]	X
Other Covariates[b]	X
State-Year Fixed Effects	X
N	63640
R-squared	0.2

Note: The default category is diagnose related cases.
a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information closure
b. Other covariates include allegation nature, patient gender, patient age, experience of physician and square of experience

Appendix Table A1. Threat to Validity (% Change)

Dependant Variable	Randomly Assign Law Year			Earlier Law Year		
	(1)	(2)	(3)	(4)	(5)	(6)
Apology Law Change	0.044	0.041	0.046	0.044	0.041	0.046
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
N	867	867	859	867	867	859
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Appendix Table A2. The Impact of Apology Law on # of Cases by Size of Payments (% Change)

	1st Quantile ($775-$22,500)		2nd Quantile ($22,500~$84,322)		3rd Quantile ($84,322~$229,288)		4th Quantile (>$229,288)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apology Law	0.032	0.075	0.186	0.27	0.369	0.392	0.008	0.152
	(0.084)	(0.056)	(0.096)*	(0.104)**	(0.122)***	(0.129)***	(0.142)	(0.145)
Other Law Change[a]	X	X	X	X	X	X	X	X
Other Covariates[b]		X		X		X		X
State Fixed Effects	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X
N	867	867	867	867	867	867	867	867
R-squared	0.94	0.94	0.93	0.94	0.93	0.94	0.92	0.93

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level.
The dependent variables are Log (Number of Cases by severity of outcome) in a state-year.
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr and jsl tort
b. Covariates include Population, % Black, % White, and # of Physicians

Appendix Table A3. Poisson Model of the Impact of Apology Law on Medical Malpractice Cases by Severity of Outcomes

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	-0.006	-0.016	-0.026	0.17	0.15	0.161	0.188	0.164	0.221
	(0.089)	(0.088)	(0.062)	(0.108)	(0.110)	(0.096)*	(0.107)*	(0.107)	(0.089)**
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	255	255	255	255	255	255	255	255	255

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level. The dependent variables are Log (Number of Cases by severity of outcome) in a state-year.
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr and jsl tort
b. Covariates include Population, % Black, % White, % of population that are 65 or above, and # of Physicians

Table A4. Threat to Validity (% Change)

Depentant Variable	# of Cases		
	(1)	(2)	(3)
Apology Law Change	-0.053	-0.055	-0.03
	(0.045)	(0.046)	(0.050)
Other Law Change[a]		X	X
Other Covariates[b]			X
State Fixed Effects	X	X	X
Year Fixed Effects	X	X	X
N	911	860	860
R-squared	0.96	0.96	0.96

Note:
The dependent variables are Log (Number of Cases) in a
state-year. The number of cases in a state-year is based on
the year of settlement.
a. Other law change includes non-economic damage cap,
punitive damage cap, law on medical malpractice disclosure.
b. Covariates include Population, % age 65 or above, %
Black, % White, and # of Physicians.