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Medical malpractice: an empirical examination of the litigation process

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New data on medical malpractice claims against a single hospital in which a direct measure of the quality of medical care is available are used to investigate the roles of the negligence rule and incomplete information in the dispute settlement process in medical malpractice. We find that the quality of medical care (negligence) is an extremely important determinant of defendants' medical malpractice liability. More generally, we find that the data are consistent with a model in which plaintiffs are poorly informed ex ante *about whether there has been negligence, file suit to gather information, and either drop the case if they find that negligence was unlikely or settle for a positive payoff if they find that negligence was likely. We also find that the cases are resolved earlier in the litigation process when the parties are more certain, one way or the other, about the likelihood of negligence.*

1. Introduction

■ In this study we analyze a new data set on medical malpractice claims against a single hospital where a direct measure of the quality of medical care is available. We use these data to investigate the roles of the negligence rule and incomplete information in the dispute settlement process in medical malpractice.

The question of whether negligence matters in determining liability in medical malpractice cases is an important one for two reasons. First, making the injurer's liability for damage depend on whether negligence occurred has the desirable property of giving medical providers incentives for provision of high-quality medical care, although not necessarily

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incentives for provision of exactly the economically efficient quality level.[1] Second, although the rule of negligence is the traditional liability rule in the medical malpractice field, it has recently come under attack, and a number of jurisdictions either have replaced it or are considering replacing it with no-fault systems.[2] However, the operation of the negligence rule in medical malpractice has never been studied empirically, since data that include a measure of quality of medical care together with detailed information on the disposition of cases have not been available.

We find that the quality of medical care (negligence) is an extremely important determinant of defendants' medical malpractice liability—including both whether defendants are liable at all and how much defendants compensate plaintiffs in cases that settle out of court. More generally, we find that the data are consistent with a model in which plaintiffs are poorly informed *ex ante* about whether there has been negligence, file suit to gather information, and either drop the case if they find that negligence was unlikely or settle for a positive payoff if they find that negligence was likely. We also find that cases are resolved earlier in the litigation process when the parties are more certain, one way or the other, about the likelihood of negligence.

2. The litigation process in medical malpractice

■ The first stage of the litigation process generally involves the plaintiff filing a lawsuit, although case filing is sometimes preceded by communication in which the plaintiff attempts to extract a settlement offer without filing suit. In medical malpractice cases, plaintiffs' lawyers are normally paid on a contingency basis. The lawyer receives a proportion, typically around one-third, of the settlement amount if the case settles or of the damage award if the plaintiff wins at trial. If the plaintiff drops the case or loses at trial, the lawyer receives nothing. Thus the contingency fee system gives plaintiffs' lawyers a strong incentive to screen prospective plaintiffs and to accept only cases having sufficiently high expected value.

The second stage of litigation is pretrial discovery, which involves exchange of information (evidence) between the plaintiff and defendant. This process has a number of phases, which may include (1) the defendant (the hospital) providing the plaintiff with his or her medical records, (2) the hospital having a physician it names examine the plaintiff to verify damage claims, (3) each side deposing the other side's expert witnesses, and (4) the plaintiff's lawyer deposing the medical personnel involved in the incident. Each step in the discovery process increases both sides' legal costs.

In our sample, some cases were filed in local court and the rest in state court.[3] A feature of the litigation process specific to the state where our study was conducted is that mediation (nonbinding arbitration) is required as the next stage in the litigation process for cases filed in local court. In mediation, a panel of three lawyers, one named by each side and one named by the court, hears an abbreviated presentation of the evidence that each side will present at trial. It then decides on an award figure that is intended to encourage settlement. Each side must explicitly accept or reject the mediation award. If it is accepted by both

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[1] The negligence rule provides an incentive for medical care to be provided at the minimum quality level that meets the negligence standard, regardless of how the standard is set. See Danzon (1985) and Shavell (1978) and (1987).

[2] See the Harvard Medical Practice Study (1990) for a survey of jurisdictions that have adopted or are considering no-fault systems in medical malpractice.

[3] Factors that might affect the choice between state and local court are that no jury trials are permitted in state court and that cases have to be filed in state court if the hospital is the only defendant named (no doctors on or off the hospital staff). While these rules might lead to strategic behavior on the part of the plaintiff regarding where to file suit or who to name in the suit, there is no significant difference in our data between state and local court cases in care quality, severity of injury, case disposition, or settlement amounts. The data underlying these tests are described in more detail in Section 4.

sides, then the case ends with the defendant paying the amount of the mediation award. Otherwise, the case proceeds to further settlement negotiations or trial.[4]

The final stage of litigation is the trial. If the case goes to trial in local court, either side has the right to demand a trial by jury, and plaintiffs in medical malpractice cases often do so. Jury trials are not available in state court. The judge or jury decides both whether the defendant is liable and, if so, the amount of the damage award.

In practice, few cases go through all stages. Instead, most medical malpractice cases are either dropped by plaintiffs or settled out of court at some point during discovery. Cases may also be dismissed by the judge for a variety of technical reasons at any stage of the litigation process.[5] The two-way exchange of information during the discovery process encourages resolution of cases without trial by making the information available to both sides more alike and by increasing the likelihood that both parties have the same expectations about the trial outcome. Perhaps most important is the flow of information from the defendant to the plaintiff concerning the likelihood that negligence occurred. To the extent that the information indicates clear negligence, such as the plaintiff's medical record showing that the wrong drug or the wrong dose of a drug was administered, the defendant is likely to be found liable at trial and may decide to settle the case. But if the record indicates that negligence was unlikely, then the defendant is unlikely to be found liable and the plaintiff may decide to drop the case.[6]

The mediation procedure encourages the parties to resolve cases by providing them with a common external evaluation of the plaintiff's claim, which increases the likelihood that both sides will have similar expectations about the trial outcome. The incentive to settle after mediation is particularly strong, since if the litigation continues to trial, both sides must incur the high legal expenses of the trial itself.

3. An empirical framework

■ In any negotiation, the central governing factor is the dispute-settlement mechanism and the outcome if the parties fail to agree. In our medical malpractice study, if the parties fail to agree, the case will ultimately be decided at trial. Expectations about the decision that a judge or jury would make in a given case provide an important constraint on negotiations, in that each party will use this expected outcome as a benchmark to judge settlement offers (Mnookin and Kornhauser (1979), Farber and Katz (1979)).

A trial under a negligence rule requires that the jury (or judge) make a two-stage decision. First, it decides if there is liability, which requires negligence on the part of the defendant. Then, if the defendant is liable, it determines the amount of damages. The expected trial outcome is therefore

$$E(Y) = \Pr(L)*E(Y \mid L), \tag{1}$$

where $\Pr(L)$ is the probability that the defendant is found liable and $E(Y \mid L)$ is the expected damage award, given liability.

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[4] There is a financial incentive to accept mediation awards, since if the case proceeds to trial and the trial outcome is less favorable than the mediation award to a party that has rejected the mediation award, then that party is liable for the other side's legal expenses at trial. This is in effect a partial English Rule for allocating legal costs, because it covers only legal costs at trial rather than all legal costs and because it applies only to parties that reject the mediation award. In practice, the provision largely benefits plaintiffs because if the plaintiff rejects the mediation award and the defendant then wins at trial, then the defendant would have to try to collect its legal fees from the plaintiff, who often has few assets. See Snyder and Hughes (1990) for an analysis of the English Rule.

[5] It is often difficult to distinguish between cases dropped by plaintiffs and cases dismissed by the judge. These two outcomes are combined in the data set discussed below.

[6] There is a potential conflict of interest between plaintiffs and plaintiffs' lawyers at all stages of litigation. Where lawyers are paid on contingency, plaintiffs are likely to prefer to continue litigation even when their lawyers prefer to drop the case.

□ **The expected settlement and mediation awards.** Both sides base their behavior in settlement negotiations on the expected trial outcome and the costs of pursuing the case. Suppose the logarithm of the probability of liability is

$$\ln(\Pr(L)) = X_l\beta_l, \tag{2}$$

where X_l is a vector of variables that affect liability and β_l is a vector of parameters. Suppose further that the logarithm of damages conditional on liability is

$$\ln(Y \mid L) = X_y\beta_y, \tag{3}$$

where X_y is a vector of variables that affect damages and β_y is a vector of parameters. Addition of (2) and (3) yields the logarithm of expected damages

$$\ln(E(Y)) = X\beta + \epsilon_1, \tag{4}$$

where X is the union of the sets X_l and X_y and ϵ_1 is an additive error term that captures unmeasured factors.[7]

A wide class of bargaining models (e.g., Nash (1950), Crawford (1982), and Rubinstein, (1982)) suggests that the average negotiated outcome (settlement) will be equal to the expected trial outcome on average. This equality requires symmetry between the parties in two dimensions. First, they must hold either identical expectations about the trial outcome or expectations that are symmetric around the true value. Second, the parties must have the same cost of litigation, including both legal expenses at trial and any risk premium that they would be willing to pay to avoid the uncertainty of litigation. Given the assumption of symmetry, we can estimate equation (4) directly using the log of the settlement as the dependent variable.

We can shed some light on the validity of the symmetry assumption by assuming that the mediation award represents the mediation panel's estimate of the expected trial outcome and then comparing mediation awards with settlement amounts in the same cases. The bargaining models referred to above suggest that mediation awards will equal settlement amounts on average if the assumptions made above are satisfied. But if settlement amounts are systematically less than mediation awards on average, then bargaining must favor the defendant, and vice versa.

Another element that can shed some light on the symmetry assumption is information on how often each party accepts the mediation award. It is reasonable to assume (1) that parties independently accept (reject) mediation awards that yield them higher (lower) utility than they expect to get from continuing the litigation to trial, allowing for costs, and (2) that mediation awards are symmetrically distributed around the true expected trial outcomes. In this case, if the parties are symmetric with regard to both expectations and costs, they will accept mediation awards with the same frequency. If one party either is relatively optimistic about the trial outcome or has lower costs of continuing the litigation, then that party will reject mediation awards with higher frequency.

□ **The plaintiff's drop decision.** A risk-neutral plaintiff will compare the expected value of pursuing a case to its cost and will decide to drop the case if cost exceeds expected value. The criterion for dropping a case is, therefore,

$$I_d = \ln(C) - \ln(E(Y)) > 0, \tag{5}$$

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[7] Since there are only a small number of trials in our data set (and they all were decided in favor of the defendant), we cannot estimate (2) and (3) separately. Through estimation of (4), we can identify only the elements of β_l and β_y that relate to variables not contained in both X_l and X_y. While the negligence rule provides for a separation in which care quality determines liability and severity of injury determines damage, we make no attempt to recover β_l and β_y in our empirical analysis.

where C is the cost to the plaintiff of pursuing a case. Let ln (C) be a function of observable characteristics of the case such that

$$\ln (C) = Z\gamma + \epsilon_2, \tag{6}$$

where Z is a vector of characteristics which could include some or all of the variables in X as well as others, γ is a vector of coefficients, and ϵ_2 is an additive error term that captures unmeasured factors affecting the cost of pursuing a case. Substituting into (5) from (4) and (6), the criterion for the plaintiff dropping or the judge dismissing a case is

$$I = Z\gamma - X\beta + \mu > 0, \tag{7}$$

where $\mu = \epsilon_2 - \epsilon_1$. Assuming normality for the ϵ's, this is a standard probit specification.

Equations (4) and (7) define a two-equation system determining case disposition (drop versus settle) and settlement amount. There are cross-equation restrictions implicit in this model to the extent that there exist variables determining expected liability that do not affect the cost of litigation (i.e., variables in X that are excluded from Z). In Section 6, we estimate by maximum likelihood four specifications of our two-equation system: three restricted specifications where Z contains only some of the elements of X and an unrestricted specification where Z and X contain the same variables.

Our model implies that single-equation OLS estimation of the settlement equation will yield inconsistent estimates of the parameters because cases are dropped in a way that is correlated with the settlement values. The maximum likelihood estimation allows us to investigate the seriousness of this selection bias.

4. The data and descriptive statistics

■ The data used here consist of information on medical malpractice charges raised against a single large hospital and/or medical personnel on its staff by patients who received treatment there.[8] In order to be included in the data set, the case must have been initiated in 1977 or later and resolved by the end of 1989. An unusual aspect of the data is that the cases are taken not from court records, but from the hospital's internal records. There are 326 cases in total for which we have data on care quality, the severity of injury, and the outcome. In 68 of these cases, the hospital was one of several defendants. Since we do not have complete data on how cases were resolved against defendants other than the hospital, these cases are omitted from our analysis.[9] Of the remaining 258 cases, six were resolved through a binding arbitration process that the parties had agreed to *ex ante*, and these too are omitted from our analysis.

Table 1 contains breakdowns of the disposition of the 252 cases in a number of dimensions. Overall, 92 cases (36.5%) were dropped by plaintiffs or dismissed by the judge, 147 cases (58.3%) were settled out of court (with or without mediation), and only 13 (5.2%) were tried to a verdict in court. All 13 trials were decided in the defendant's favor.[10]

The breakdown of case disposition by venue (local versus state court) in Table 1 demonstrates that disposition is not significantly related to venue (p-value = .32). For cases filed in local court, mediation is mandatory before trial. The breakdown in Table 1 shows

[8] The state in which the hospital is located has not adopted tort reforms that limit liability in the medical malpractice area, nor is the hospital shielded from liability by governmental or charitable immunity.

[9] Cases filed against either the hospital alone or the hospital and physicians on its staff are included in the data set. The hospital managed the physicians' defense in all these cases. Cases filed against the hospital and another party such as an equipment manufacturer or another hospital are excluded.

[10] Twenty cases started trial, but six were settled and one was dropped or dismissed during the trial. Thus, while defendants "won" all of the cases tried to completion, they "won" only 14 of the 20 cases (70%) that started trial. This compares with a win rate in trial outcomes of 68% found by Danzon (1985) in a much larger sample.

TABLE 1 Disposition of Cases

	Dropped/Dismissed	Settled	Trial Outcome	Total
All cases	92	147	13	252
	(36.5%)	(58.3%)	(5.2%)	(100%)
Venue				
State court	41	59	3	103
	(39.8%)	(57.3%)	(2.9%)	(100%)
Local court (all)	51	88	10	149
	(34.2%)	(59.1%)	(6.7%)	(100%)
Local court (before mediation)	44	39	0	83
	(53.0%)	(47.0%)	(0%)	(100%)
Local court (after mediation)	7	49	10	66
	(10.6%)	(74.2%)	(15.2%)	(100%)
Care quality				
Bad quality	8	71	1	80
	(10.0%)	(88.8%)	(1.2%)	(100%)
Ambiguous quality	21	53	3	77
	(27.2%)	(68.9%)	(3.9%)	(100%)
Good quality	63	23	9	95
	(66.3%)	(24.2%)	(9.5%)	(100%)
Severity of injury				
Temporary	60	63	6	129
	(46.5%)	(48.8%)	(4.7%)	(100%)
Permanent partial	18	39	5	62
	(29.0%)	(62.9%)	(8.1%)	(100%)
Permanent total	3	8	0	11
	(27.3%)	(72.7%)	(0%)	(100%)
Death	11	37	2	50
	(22%)	(74%)	(4.0%)	(100%)

Note: Row percentages are in parentheses.

that local-court cases resolved before mediation were much more likely to be dropped than cases resolved after mediation (p-value = <.001).

□ **Care quality as a measure of negligence.** A key feature of our data set is that it contains a measure of care quality taken from the hospital's records. The hospital asks experts to evaluate each incident to determine whether the professional standard of care was met, i.e., whether the care provided was negligent. These evaluations may be provided by the supervisors of the relevant departments, by other hospital physicians in the relevant specialty, or by outside experts who would appear as the hospital's expert witnesses if the case went to trial. The experts' evaluations of care quality consider (1) whether the correct treatment was provided, (2) whether the actual treatment failed owing to inadequate care or because it was not provided quickly enough, and (3) whether any harm suffered by the patient was causally related to the treatment.[11]

Quality of care provided by the hospital is divided into three categories. Care was coded as "bad" if the experts' reports prepared for the hospital were in agreement that the care provided fell short of the professionally accepted standard in the relevant medical specialty. Care was coded as "good" if the experts' reports agreed that the care provided met the

[11] The last issue is important because a finding of liability by the jury requires that there be both causation and negligence, and the care-quality variable includes a judgment about both. Thus, the defendant's care quality would be rated good if the patient suffered harm but the expert believes that the harm was not due to negligence.

standard. Care was coded as "ambiguous" if the experts' reports were ambiguous or if there was disagreement. Although the evaluations of care quality were made for the hospital, they are not "discoverable" by the plaintiff.[12] This means that there is no incentive for the hospital to put biased information into its own record. These reports were used by the hospital in deciding on its litigation strategy in individual cases.

The breakdowns in Table 1 show that there is a strong relationship between care quality and disposition (p-value $< .0001$). When care quality was rated as good, two-thirds of the cases were dropped or dismissed. Since the hospital won all of the trials, plaintiffs received damage payments in only one-fourth of the good-care cases. Where care quality was bad, only 10% of the cases were dropped or dismissed, and plaintiffs received damage payments in 89% of the cases. Where care quality was ambiguous, the dispositions were intermediate. This is strong evidence that negligence matters in determining liability.

An interesting feature of the data in Table 1 is that the distribution of care quality within disposition category is indistinguishable between cases that were dropped/dismissed and cases that were tried to a verdict (p-value $> .99$). Of the cases with these dispositions, about two-thirds had good care and less than 10% had bad care. This contrasts with cases that were settled, of which only 16% had good care and almost half had bad care.[13]

□ **Severity of injury as a measure of damages.** The data also contain a measure of the severity of injury that the patient claims to have suffered as a result of the medical malpractice. (Note that the severity of injury due to medical malpractice is often a matter of dispute between the plaintiff and the defendant.) The severity measure is divided into four categories: temporary disability (51.2%), permanent partial disability (24.6%), permanent total disability (4.4%), and death (19.8%). The severity measure is a key determinant of the damage award if the defendant is found negligent at trial. Patients who suffer permanent total disability have higher future medical care costs and more lost income than patients who suffer permanent partial disability, so the hospital's expected liability is higher. For patients who die, future medical care costs are zero, so the hospital's expected liability is lower in cases involving death than in cases involving permanent total disability. The hospital's liability is lowest in cases of temporary disability.

The breakdowns in Table 1 show that there is a relatively strong relationship between case disposition and severity of injury (p-value $= .028$), with higher-damage cases significantly more likely to be settled rather than dropped/dismissed or tried to a verdict. There is no significant difference in disposition patterns by severity across the three higher-severity categories—permanent partial, permanent total, and death (p-value $= .634$).

As with care quality, there is no significant difference in disposition patterns by severity between cases that were dropped or dismissed and cases that were tried to a verdict (p-value $= .384$).[14] Thus, cases tried to a verdict in court look like the cases that were dropped/dismissed in the severity dimension as well as in the care dimension. This suggests that trials tend to result when plaintiffs make mistakes, i.e., they fail to drop cases that are not worth pursuing.

□ **The joint distribution of care quality and severity of injury.** Table 2 contains a breakdown of care quality by severity of injury for the 252 cases in our sample. There is a marginally statistically significant relationship between care quality and severity (p-value $= .068$), with

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[12] The expert reports are covered by the attorney's work product rule, so that they are considered to be part of the defendant's attorneys' legal work, which is not subject to discovery by the plaintiff.

[13] Despite the small number of cases with trial outcomes, we strongly reject the hypothesis that the cases with trial outcomes and the settled cases had the same distribution of care qualities (p-value $< .0001$).

[14] We reject the hypothesis that the cases with trial outcomes and the settled cases had the same distribution of severity (p-value $= .007$).

TABLE 2 Breakdown of Care Quality by Severity of Injury

Severity	Care Quality: Bad	Ambiguous	Good	Total
Temporary	36	34	59	129
	(27.9%)	(26.4%)	(45.7%)	(100%)
	[45.0%]	[44.2%]	[62.1%]	[51.2%]
Permanent partial	18	21	23	62
	(29.0%)	(33.9%)	(37.1%)	(100%)
	[22.5%]	[27.3%]	[24.2%]	[24.6%]
Permanent total	4	5	2	11
	(36.4%)	(45.5%)	(18.2%)	(100%)
	[5.0%]	[6.5%]	[2.1%]	[4.4%]
Death	22	17	11	50
	(44.0%)	(34.0%)	(22.0%)	(100%)
	[27.5%]	[22.1%]	[11.6%]	[19.8%]
Total	80	77	95	252
	(31.8%)	(30.6%)	(37.7%)	(100%)
	[100%]	[100%]	[100%]	[100%]

Note: Row percentages are in parentheses. Column percentages are in brackets.

bad-care cases more likely to be high-severity cases and good-care cases more likely to be low-severity cases.[15] This is consistent with a model where (1) bad care actually causes more severe damage than good care, (2) plaintiffs infer a higher probability of bad care in high-severity cases (without observing care quality directly), and (3) plaintiffs use this information in deciding whether or not to file suit.

□ **Settlement amounts.** The distribution of settlement amounts is dramatically right skewed, while the distribution of the logs is much more symmetric. The mean settlement is $191,000 (s.d. = $545,000), while the median is only $35,000.[16] In contrast, the distribution of log settlements is close to symmetric, with a mean log settlement of 10.39 (s.d. = 1.93) and an almost-identical median of 10.47. The analysis focuses on the log settlements.

The first two columns of Table 3 contain average log settlement amounts, broken down separately by care quality and injury severity for the 147 cases that settled. These results are presented in regression format to highlight differences in mean log settlements across groups. As expected, the results in the first column show that settlement amounts are significantly higher where care quality is ambiguous than where care quality is good (the base group) and are even higher where care quality is bad. The results in the second column show that settlements are also significantly higher when severity of injury is higher. Compared to the temporary injury category (the base group), patients who suffered permanent partial disability or death received significantly higher settlements; patients who suffered permanent total disability received even higher settlements. There was no difference between the groups that suffered death versus permanent partial disability. Even more striking is the fact that almost 40% of the variance in log settlements is accounted for by the four severity categories. In contrast, only 8% of the variance can be accounted for by care quality.

□ **Mediation awards.** An interesting feature of the 86 mediation awards in our sample is that the award was zero in only three cases. Defendants win most trials in medical malpractice

[15] Brennan *et al.* (1991) find the same relationship in their report on the recent Harvard Medical Practice Study (1990).

[16] All dollar amounts in the study are expressed in real 1982–1984 dollars.

TABLE 3 **Average Log Settlement Amounts and Mediation Awards, by Care Quality and Severity**

Variable	(1) Log Settlement Amount	(2) Log Settlement Amount	(3) Log Mediation Award	(4) Log Mediation Award
Constant	9.31	9.11	9.27	9.43
	(.389)	(.191)	(.662)	(.402)
Care ambiguous	.931		1.48	
	(.466)		(.612)	
Care bad	1.54		2.81	
	(.448)		(.662)	
Permanent partial disability		2.09		2.02
		(.309)		(.583)
Permanent total disability		4.17		4.09
		(.570)		(.962)
Death		2.03		1.17
		(.314)		(.704)
R-squared	.08	.40	.18	.22
n	147	147	86	86

Note: These are OLS regressions where the coefficients are mean differences from the base group. The base group is good care quality in the first and third columns and temporary disability in the second and fourth columns. Standard errors are in parentheses.

cases, so the probability of plaintiffs receiving nothing at trial is much greater than would be inferred from our mediation awards. This suggests that mediation panels do not attempt to mimic actual trial outcomes. Rather, the data are consistent with a model in which mediators award the expected trial outcome, which is the product of the probability of liability and expected damage, given liability.

The distribution of mediation awards, like settlement amounts, is right skewed, whereas the distribution of log mediation awards is much more symmetric.[17] The mean mediation award was \$291,000 (s.d. = \$777,000), while the median is only \$44,400. In contrast, the mean log mediation award is 10.69 (s.d. = 2.58) with an almost identical median of 10.70. Our analysis focuses on the log mediation awards.

The third and fourth columns of Table 3 contain average log mediation awards broken down separately by care quality and severity for the 86 cases where there was a mediation award. These results parallel those for log settlement amounts. Mediation awards are significantly negatively related to care quality and significantly positively related to severity of injury. In contrast to the analysis of settlement amounts, where severity of injury accounted for more of the variation than did care quality, both severity and care quality account for about 20% of the variance in log mediation awards.

□ **Comparison of mediation awards with settlement amounts.** There are 68 cases that settled, have mediation amounts available, and for which we know the parties' response to the mediation award. In 17 of these cases, the mediation award was accepted by both sides. The correlation between the mediation award and the settlement in the remaining 51 cases is .94 in levels and .81 in logs. The average settlement amount in these 51 cases of \$260,000 (s.d. = \$489,000) is significantly lower (p-value = .02) than the average mediation award in the same cases of \$446,000 (s.d. = \$981,000). The average log settlement amount is lower than the average log mediation award (average log difference = −.208), but this

[17] The three cases having zero mediation awards are included in our analysis as having zero log mediation awards (equivalent to mediation awards of \$1). The lowest nonzero actual mediation award is \$2590 (log = 7.86).

difference is not significantly different from zero (p-value = .303). In only 14 of the 51 cases was the settlement amount greater than the mediation award.[18]

The finding that settlement amounts are generally lower than mediation awards, together with the discussion in Section 3, suggests that bargaining favors the defendant. Therefore, the defendant's legal costs at trial are lower than the plaintiff's, the defendant is more optimistic than the plaintiff, or the plaintiff is more risk averse than the defendant. However, the defendant's legal costs at trial are likely to be higher rather than lower than those of plaintiffs. This is because the hospital incurs a substantial reputation cost if it loses at trial, owing to adverse publicity and the possibility that the loss will encourage more suits to be filed. Also, bargaining models in the law and economics area suggest that plaintiffs are more likely to file suit when they are optimistic about the outcome, while the defendant can make no such choice (Shavell, 1982). Thus the evidence suggests that plaintiffs are generally more risk averse than the hospital.

□ **Acceptance and rejection of mediation awards.** The framework presented in Section 3 suggests that the parties will make independent decisions about whether to accept a mediation award by comparing the award with their expectation of the value of continuing litigation. The model also implies that the parties will accept mediation awards at the same rate if expectations and costs are symmetric.

The breakdown of acceptances and rejections for the 80 cases where this information is available is contained in Table 4. The results are not consistent with this simple model. First, the parties are not making decisions regarding the mediation award independently (p-value < .0001). More importantly, plaintiffs are significantly more likely to accept the mediation award than is the defendant (p-value = .078). This is consistent with our earlier finding, and it suggests that plaintiffs are more risk averse than the defendant.

5. Single-equation estimation

■ In this section we estimate single-equation models of mediation awards, the settlement amount, and the drop decision. Cross-equation restrictions are ignored.

□ **OLS estimates of the log mediation award.** The first column of Table 5 contains estimates of the OLS regression of the log mediation award on a constant, two dummy variables for care quality, three dummy variables for severity of injury, and a dummy variable for whether

TABLE 4 **Acceptance of Mediation Awards**

	Plaintiff		
Defendant	Accepts	Rejects	Total
Accepts	6 (7.5%)	23 (28.8%)	29 (36.3%)
Rejects	34 (42.5%)	17 (21.3%)	51 (63.7%)
Total	40 (50%)	40 (50%)	80 (100%)

Note: Cell percentages are in parentheses.

[18] This fraction (14/51) is significantly less than .5 (p-value = .001). Of the remaining 37 cases, the mediation award was larger than the settlement in 31 cases. This fraction (31/50) is marginally significantly greater than .5 (p-value = .065). The settlement and the mediation award were equal in the remaining six cases.

TABLE 5 Single-Equation Estimation, Coefficient Estimates

Variable	(1) Log(Mediation Award) OLS	(2) Log(Settlement Amount) OLS	(3) Pr(Drop) PROBIT
Constant	8.08	7.73	.885
	(.496)	(.334)	(.178)
Care bad	2.27	1.69	−1.88
	(.596)	(.337)	(.246)
			[−.512]
Care ambiguous	1.37	1.15	−1.20
	(.539)	(.351)	(.221)
			[−.327]
Permanent partial injury	1.78	2.13	−.391
	(.524)	(.286)	(.231)
			[−.106]
Permanent total injury	2.61	3.62	−.212
	(.911)	(.540)	(.506)
			[−.0577]
Death	.824	1.92	−.399
	(.640)	(.290)	(.257)
Youth (age < 18)	1.67	.807	[−.109]
	(.541)	(.282)	−.465
			(.257)
			[−.127]
R-squared	.405	.507	
n	86	147	239
Log-likelihood			−115.8

Note: The base group is good care quality and temporary disability. The log-likelihood for a constrained probit model containing only a constant explaining the probability that a case is dropped is −159.3. The mean effect on the probability of a unit change in the variable in the probit is computed as the coefficient estimate times the mean value for the sample of the standard normal PDF evaluated at the parameters contained in column 3 (.272).

Standard errors are in parentheses. Mean effects on probability of unit change are in brackets.

the patient was under 18 at the time of the incident. The base groups for the analysis are good care quality and temporary injury. This analysis uses the 86 observations for which there was a mediation award.[19] Mediation awards are significantly related to all three groups of explanatory variables: (1) mediation awards are significantly negatively related to care quality, (2) mediation awards are significantly positively related to injury severity, and (3) young patients receive significantly higher mediation awards than those over 18.[20] The latter result may reflect either higher future medical costs and lost earnings for young patients or mediators' greater sympathy for young victims of medical malpractice.

These results are consistent with the view that mediation awards reflect estimates of the expected trial outcome.

□ **OLS estimates of the log settlement amount.** The second column of Table 5 contains estimates of the OLS regression of the log settlement amount on the same set of explanatory variables for the 147 cases that were settled. These estimates are qualitatively similar to

[19] The three cases with zero mediation awards are included as zero log mediation awards.

[20] Estimation of a model including a complete set of interactions between the care-quality and severity variables fails to reject the hypothesis that these interactions are zero (p-value = .99). The dummy variable for being under 18 was found to fit the data better than an age variable, a quadratic in age, or dummy variables measuring whether the patient was under ages other than 18.

those presented for the log mediation award: (1) settlements are significantly negatively related to care quality, (2) settlements are significantly positively related to injury severity, and (3) young patients had settlement amounts that were more than twice as high as those of adults.[21]

□ **Probit model of the drop decision.** The third column of Table 5 contains estimates of a reduced form probit model of whether cases are dropped/dismissed. The probit model includes the same set of explanatory variables used above, and it is estimated over the sample of 239 cases that were either settled or dropped/dismissed.[22] It is clear from the probit estimates that care quality has a strong and significant positive influence on whether a case is dropped. Also, the youth variable is significant and negative, implying that cases are less likely to be dropped when the plaintiff is under 18. However, none of the severity-of-injury variables are statistically significant, and a likelihood-ratio test of the hypothesis that the three severity variables have zero coefficients fails to reject (p-value = .24).

Our results present a puzzle when viewed in relation to the mediation award and settlement equations. The theory implies that the plaintiff's drop decision should be a function of the settlement value. Thus, any variables that significantly affect the settlement value should be significantly related to the drop decision.

Other researchers have found the expected empirical relationship between severity of injury and the disposition of medical malpractice cases (Hughes and Snyder (1989), Danzon and Lillard (1983)) and product liability cases (Lillard and Viscusi (1990)). However, none of these studies include measures of care quality, and we too find a significant relationship between case disposition and injury severity when care quality is not controlled (see Table 1). Recall that in our data, care quality and severity of injury are inversely related (see Table 2). We conclude that earlier findings that case disposition is related to severity of injury may be biased by the omission of important variables affecting the likelihood of negligence.

Our model can reconcile the finding that severity is related to settlements but not to the drop decision if high-severity cases are more costly to pursue as well as having higher settlements. In this case, higher legal costs offset the higher settlements, making high-severity cases no more attractive to pursue than low-severity cases. We estimate a version of the joint model of settlements and the drop/settle decision that allows for this possibility in the next section.

6. Joint estimation of the model of the drop decision and settlement amounts

■ Equations (4) and (7) define a two-equation system determining the settlement amount and the probability that a case is dropped assuming that the settlement amount is equal to the expected trial outcome. A log-likelihood function is constructed by assuming joint normality for ϵ_1 and μ. The contribution to the likelihood function for a case that is dropped is

$$\Pr(D_i = 1) = \Pr(\mu_i > X_i\beta - Z_i\gamma). \tag{8}$$

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[21] Estimation of a model including a complete set of interactions between the care-quality and severity variables rejects the hypothesis that these interactions are zero (p-value = .026). Further investigation suggests that this rejection is because settlements in the nine good-care permanent-partial injury cases are not very different from settlements in the eight good-care temporary injury cases. Repeating the analysis, deleting the nine good-care permanent-partial injury cases, we fail to reject the hypothesis that the care-quality/severity interactions in the log-settlement model are zero (p-value = .35). The basic results regarding the effects of care quality, severity, and age on settlements are unchanged in this restricted sample.

[22] The analysis does not include the 13 cases that were tried to a verdict. It is anomalous that these particular cases were pushed to a trial, and we present no theory explaining it.

The contribution to the likelihood function for a case that is settled (not dropped) at a particular value (S_i) is

$$\Pr(D_i = 0, \ln S_i = X_i\beta + \epsilon_{1i}) = \Pr(\mu_i < X_i\beta - Z_i\gamma, \epsilon_{1i} = \ln S_i - X_i\beta), \quad (9)$$

where D_i is a dummy variable that equals one if a case is dropped and zero if a case is settled.[23]

The log-likelihood function implied by these probabilities is

$$\ln L = \sum_i \{D_i \ln (\Pr(\mu_i > X_i\beta - Z_i\gamma)) + (1 - D_i) \ln (\Pr(\mu_i < X_i\beta - Z_i\gamma, \epsilon_{1i} = \ln S_i - X_i\beta))\}. \quad (10)$$

Note that this is the usual sort of likelihood function implied by a censored data problem.[24] The settlement amount is censored by the drop decision, and, because the drop decision is related to the settlement amount, joint estimation is required in order to derive consistent estimates.[25] In our case, the advantages of joint estimation go beyond this because there are important cross-equation restrictions. The β vector is common across the two equations, and, in contrast to the usual case without a structural theory for the censoring process, we are able to estimate the variance of the error (μ) in the probit that determines the drop decision. The parameters to be estimated include β, γ, and the three elements of the covariance matrix of ϵ_1 and μ (σ_μ^2, σ_ϵ^2, and $\sigma_{\mu\epsilon}$). We estimate three restricted versions of this model along with an unrestricted specification. Table 6 contains estimates of the four specifications, using the sample of 239 cases that were either dropped/dismissed or settled.

The unrestricted specification, model 4, is the benchmark. In this model, care quality, severity, and age are allowed to affect the drop decision through costs as well as through their effect on the settlement amount. Since there are no cross-equation restrictions (because there are no variables in X excluded from Z), we cannot identify all of the parameters in the model. We can estimate and identify only β, $(\gamma - \beta)/\sigma_\mu$, σ_ϵ^2, and $\sigma_{\mu\epsilon}/\sigma_\mu$.

Model 1 restricts the cost of pursuing a case to be constant across cases (other than the random error). There is a significant negative relationship between care quality and settlement value. There is also a significant relationship between severity of injury and settlement value, and young plaintiffs have higher settlement values. We estimate a significantly positive cost of pursuing a case. Assuming log-normality for the error, the expected cost is $60,779.[26] A likelihood-ratio test of the five over-identifying restrictions rejects model 1 against model 4 (p-value = .00015).

Model 2 allows the cost of pursuing a case to vary with severity of injury. As such, it is less restrictive than model 1, but it is still over-identified. This model fits the data significantly better than model 1 (p-value < .00001, using a likelihood ratio test). In addition, we cannot reject the two over-identifying restrictions against model 4 (p-value = .61). The results clearly indicate that high potential damage (high-severity) cases have higher expected settlements that are offset by higher costs of litigation. The estimates of β and γ for the severity variables are roughly equal, reflecting the fact that the drop probability is not sig-

[23] Note that (9) is not strictly a probability. It is the likelihood of the joint event that the case is not dropped and is settled at S_i.

[24] This structural censored data model has the same structure as the analysis of wages and female labor supply presented by Heckman (1974).

[25] Hughes and Snyder (1989) estimate a bivariate probit model using medical malpractice data that explains whether cases are dropped and, conditional on cases not being dropped, whether they settled or were tried. They find that correcting for selection bias had an important effect in their assessment of the effects of various legal reforms on whether cases settled or were tried.

[26] This computation is based on the fact that the mean of a log-normally distributed random variable is $\exp(\mu + .5\sigma^2)$.

TABLE 6 Maximum Likelihood Estimates of Model of Settlements and Drop Decision

	Model 1		Model 2		Model 3		Model 4	
Variable	ln(Settlement) (β) (1)	Cost (γ) (2)	ln(Settlement) (β) (3)	Cost (γ) (4)	ln(Settlement) (β) (5)	Cost (γ) (6)	ln(Settlement) (β) (7)	Drop $(\gamma - \beta)/\sigma_\mu$ (8)
Constant	6.63	8.53	7.40	8.39	7.71	8.58	7.52	.892
	(1.11)	(.746)	(1.68)	(1.07)	(.288)	(.251)	(2.40)	(.196)
Care bad	2.78		2.00		1.77		1.85	−1.88
	(.631)		(1.23)		(.296)		(1.78)	(.250)
Care ambiguous	1.98		1.34		1.17		1.26	−1.20
	(.461)		(.861)		(.238)		(1.30)	(.231)
Permanent partial injury	2.02		2.19	1.73	2.16	1.79	2.16	−.412
	(.476)		(.309)	(.364)	(.263)	(.335)	(.403)	(.234)
Permanent total injury	3.13		3.72	3.53	3.71	3.53	3.64	−.211
	(.777)		(.618)	(.931)	(.599)	(.912)	(.657)	(.682)
Death	1.83		1.98	1.58	1.95	1.58	1.95	−.392
	(.526)		(.419)	(.469)	(.369)	(.465)	(.496)	(.252)
Youth (age < 18)	1.03		.686		.610		.834	−.468
	(.295)		(.438)		(.198)		(.465)	(.272)
Variance	2.11	4.97	1.86	1.18	1.83	.926	1.84	1[a]
	(.633)	(2.43)	(.355)	(1.46)	(.283)	(.388)	(.355)	
Covariance	−1.40		.270		0[b]		−.167	
	(2.30)		(1.61)				(1.87)	
Log-likelihood	−381.0		−369.1		−369.2		−368.6	

Note: The base group is good care quality and temporary injury. The models were estimated using the 239 observations for cases that were either dropped/dismissed or settled. The likelihood function is defined in equation (10). Standard errors are in parentheses.

[a] The variance is normalized to one, and the parameter estimates are interpreted as ratio of $(\gamma - \beta)$ to σ_μ.

[b] Covariance constrained to zero.

nificantly related to severity.[27] Care quality affects both the expected settlement and the drop probability through the settlement function (β).[28]

Given the correlation between care quality and severity, it is also the case that a specification of the cost function that includes only a constant and the care quality variables cannot be rejected against the unrestricted model 4 (p-value = .33). Estimates of this model (not presented), which does not fit the data quite as well as model 2, indicate that the cost of litigation is higher in bad-care cases. The natural conclusion is that the cost function will fit the data well (measured against the unrestricted model) if it includes either the severity or care-quality variables. Both sets of variables are not required, but there are not sufficient data to determine accurately which particular restrictions are best.

The covariance between the errors ($\sigma_{\mu\epsilon}$) is estimated quite imprecisely in models 1, 2, and 4. In no case can we reject the hypothesis that the correlation is zero, implying that the data are consistent with there being no sample selection bias in the single-equation estimates of the settlement function (see Table 5). On the other hand, the large standard error on $\sigma_{\mu\epsilon}$ suggests that the data are also consistent with substantial sample selection bias. There are simply not enough data to estimate $\sigma_{\mu\epsilon}$ more precisely.[29]

Given the imprecision with which the covariance is estimated, we present estimates of a restricted version of model 2 where $\sigma_{\mu\epsilon}$ is constrained to equal zero (model 3).[30] Model 3 cannot be rejected against either model 2 (p-value = .65) or model 4 (p-value = .75). The estimates of model 3 are much more efficient than the estimates of model 2. With a very small and insignificant drop in the log-likelihood value, model 3 provides much more precise estimates of important parameters, including the intercepts, the coefficients of the care-quality variables in the settlement function, and the variance of the error in the drop function.

There are three conclusions to be drawn from this analysis. First, the settlement value of a case depends on both care quality and severity of injury. Second, the cost of pursuing a case depends significantly on the characteristics of the case (either the severity of injury *or* care quality). Third, we have insufficient data to determine the importance of sample selection bias in estimating settlement values from a sample of cases that are not dropped.

7. How are case outcomes related to care quality and severity of injury?

■ Rather than use our estimates of the structural model of settlements and the drop decision, we use our single-equation estimates (see Table 5) to recover the relationship between unconditional expected settlement amounts and case characteristics.

An appropriate interpretation of our single-equation estimates of the log settlement function (equation 4) contained in Table 5 is as the settlement conditional on a case not being dropped. This is

$$\ln (Y \mid D = 0) = X\beta + \epsilon, \tag{11}$$

where ϵ is now assumed to be normally distributed conditional on a case not being dropped.

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[27] The hypothesis that $\beta_j = \gamma_j$ cannot be rejected for any of the three severity variables.

[28] The joint hypothesis that the β's associated with the two care-quality variables are zero in the settlement function is rejected (p-value < .0001).

[29] This does not mean that the joint estimation is uninformative. The cross-equation restrictions implied by the model are useful to identify the cost function, as a diagnostic tool, and to obtain more efficient estimates.

[30] Note that zero is not a particularly natural value for the covariance because ϵ_1 is a component of μ. Estimation of the model constraining the $\sigma_{\mu\epsilon}$ to a wide range of specific values shows that the likelihood value is not affected to a significant extent by the choice of this value.

Given our OLS estimates in the second column of Table 5, we can compute the expected value of settlement conditional on a case not being dropped as

$$E(Y \mid D = 0) = e^{(x\hat{\beta}+.5\hat{\sigma}^2)}, \tag{12}$$

where $\hat{\sigma}^2$ is the estimated residual variance from the OLS regression.[31] We can use the probit estimates contained in the third column of Table 5 to derive the predicted probability that a case is not dropped as

$$\Pr(D = 0) = 1 - \Phi(X\hat{\Gamma}). \tag{13}$$

Finally, applying Bayes' rule, we can compute the unconditional expected settlement in a given case as

$$E(Y) = \Pr(D = 0) \cdot E(Y \mid D = 0) = (1 - \Phi(X\hat{\Gamma}) \cdot e^{(x\hat{\beta}+.5\hat{\sigma}^2)}. \tag{14}$$

The top panel of Table 7 contains mean unconditional settlements by care quality and severity for the sample of 239 cases. These are computed using zero as the settlement amount in the 92 cases that were dropped or dismissed. The actual amount is used in the 147 cases that were settled. The bottom panel of Table 7 contains predicted unconditional expected settlements as defined in (14). Both sets of numbers show that both care quality and severity are extremely important in determining expected settlements.

In order to derive an estimate of how sensitive the hospital's liability is to care quality, we compute the hospital's average liability across severity categories for each level of care quality. These are contained in the last column of Table 7, and they show that the hospital's liability is between 15 and 25 times as high when care quality is bad than when it is good.[32] Thus, it appears that the negligence system provides a substantial incentive for high-quality medical care.[33]

The last two rows of Table 7 contain weighted average expected settlements for each severity class. The motivation for computing these is to explore the notion that while plaintiffs are likely to be well informed *ex ante* about the severity of their injuries, they are probably not well informed about the likelihood that the hospital was negligent. In computing the first weighted average, we assume that plaintiffs know only the overall distribution of care quality in our sample (31.8% bad, 30.6% ambiguous, 37.7% good) and that they use this information to compute an expected settlement amount for their particular severity level. In computing the second weighted average we assume that plaintiffs know (and use) the distribution of care quality specific to their particular severity level. Both sets of numbers show that the *ex ante* expected value of filing a medical malpractice lawsuit is substantial relative to the cost of the initial filing, even where severity of injury is low and where there is no particular reason to believe that negligence occurred.[34]

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[31] The precise form of this expectation with the variance correction is based on the assumption of normality of ϵ. The estimated residual variance of the log-settlement equation in the second column of Table 5 is 1.92.

[32] This calculation attributes the higher severity of injury in bad-care cases to the low-quality care. In other words, we implicitly assume that if the hospital were to provide bad care in all cases, the distribution of severity would be what we actually observe in the bad-care cases. This is consistent with our finding that care quality and severity are related in our sample (see Table 2).

[33] This calculation may understate the incentives provided by the negligence system because a degradation of care quality could also result in more malpractice suits being filed. However, evidence not fully consistent with this view is provided by a recent Harvard (1990) study with information on both filed cases and cases not filed. The study does not find a strong relationship between care quality and the likelihood that a lawsuit is filed.

[34] This finding cannot be extended from our data set to the population of potential medical malpractice cases generally. Presumably the high expected value of cases in our data set reflects the screening done by plaintiffs' lawyers, who accept only the highest-value cases. Cases rejected by plaintiffs' lawyers may be more likely to involve good care quality and/or low damage severity. Since our data are limited to cases filed, we cannot carry out the analysis of the filing decision necessary to test this view. See the Harvard (1990) study and the previous note.

TABLE 7 **Predicted Unconditional Expected Settlement For Each Care-Severity Combination and Average by Severity**

Mean Unconditional Settlement[a]

	Severity				
Care Quality	Temporary	Permanent Partial	Permanent Total	Death	All Severities
Bad quality	$22,098	$493,345	$1,008,124	$107,609	$203,209
	(67,229)	(93,746)	(198,865)	(84,796)	(48,497)
	[35]	[18]	[4]	[22]	[79]
Ambiguous quality	$13,375	$314,132	$633,333	$57,826	$146,160
	(69,236)	(88,935)	(177,870)	(99,433)	(50,109)
	[33]	[20]	[5]	[16]	[74]
Good quality	$1,377	$35,301	$0	$46,694	$14,109
	(53,630)	(91,246)	(0)	(125,773)	(46,482)
	[55]	[19]	[2]	[10]	[86]
All care levels	$10,492	$277,782	$654,469	$78,324	
	(36,870)	(54,161)	(123,290)	(83,889)	

Predicted Unconditional Expected Settlement[b]

	Severity				
Care Quality	Temporary	Permanent Partial	Permanent Total	Death	Weighted Average
Bad quality	$27,107	$249,462	$1,067,110	$202,318	$177,320
	(6,021)	(67,955)	(582,439)	(53,156)	(42,633)
Ambiguous quality	$11,654	$119,747	$488,774	$97,305	$91,008
	(2,796)	(34,372)	(274,676)	(29,704)	(25,051)
Good quality	$1,120	$15,587	$55,615	$12,739	$7,112
	(379)	(5,503)	(35,652)	(4,810)	(2,356)
Weighted average 1	$12,608	$121,848	$509,872	$98,915	
	(2,404)	(29,901)	(273,909)	(24,399)	
Weighted average 2	$15,777	$137,655	$436,850	$83,199	
	(3,122)	(33,988)	(235,291)	(20,599)	

[a] Standard errors are in parentheses. Cell sizes are in brackets.

[b] Estimated standard errors are in parentheses.

Note: The mean unconditional settlement is computed over the sample of 239 cases assuming that the settlement amount is zero for the 92 dropped cases. The calculations of the predicted unconditional expected settlement assume that the patient is an adult and are based on equation (14) and the estimates in columns 2 and 3 of Table 5. The weighted averages for each severity level are probability (of a given care quality) weighted averages of the expected unconditional settlements at each care level for that severity level. Weighted average 1 uses as weights the observed overall marginal distribution of care quality for all severity classes. Weighted average 2 uses as weights the observed care-quality distribution within each severity class. The severity-weighted average in the last column uses as weights the care-quality specific distribution of severity. These distributions are in Table 2. The estimated standard errors are computed as the square root of the estimated variance of a first-order Taylor Series approximation to equation (14).

8. Incomplete information, uncertainty and the litigation process

■ A high proportion of cases in our data set are dropped or dismissed. In the litigation literature, the phenomenon of dropped cases has usually been associated with nuisance suits.[35] However, our study suggests a different explanation for lawsuits frequently being

[35] See Bebchuk (1988) for a model.

filed and then dropped. In the medical malpractice area, potential plaintiffs considering filing a lawsuit do not know whether the hospital was negligent or not. In order to learn about care quality, they must file a lawsuit and proceed with the discovery process. Our calculations of high *ex ante* expected values conditional on injury severity for suits filed suggest that it is worthwhile for plaintiffs to file lawsuits but to drop them if they learn during discovery that negligence was unlikely. Thus, incomplete information on the part of plaintiffs provides an alternative explanation for a substantial fraction of cases being filed and later dropped.

We would expect suits in which the evaluation of care quality is clear (one way or the other) to be resolved (one way or the other) more quickly than cases in which information is less clear. Two of our three care-quality categories (good care and bad care) imply that the hospital's evaluation of care quality was clear. The third, ambiguous care, implies that the hospital's information involved substantial uncertainty as to whether negligence occurred or not. In this situation, neither party can predict the outcome at trial with any degree of certainty, and this suggests that litigation is likely to go on longer.

We can examine the hypothesis that clear information about care quality is associated with earlier resolution of disputes by examining the frequency with which local court cases of different care qualities are resolved before versus after the mandatory mediation process. Table 8 contains this analysis for the 149 local-court cases. Fully 62.7% of cases having either good care quality or bad care quality are resolved before mediation. However, only 41.7% of cases involving ambiguous care quality are resolved before mediation. This difference is statistically significant (p-value = .017).

9. Concluding remarks

■ We found strong evidence that negligence, as measured by care quality, plays an important role in the negotiation and dispute resolution process in medical malpractice cases faced by one hospital. The hospital's expected liability for damage is 25 times as high on average in cases where negligence occurred (bad care) than in cases where it did not (good care). Thus the negligence rule provides a strong financial incentive for high-quality health care. It should be noted once again, however, that the negligence rule does not necessarily provide incentives for the care quality level to be economically efficient, since in medical malpractice the negligence standard is set to reflect prevailing practice rather than (as in other fields of accident law) being set at the economically efficient level of care.

We also find evidence consistent with the view that (1) plaintiffs are not well informed *ex ante* about the likelihood of negligence and (2) the expected value of a lawsuit to the plaintiff is high relative to the costs of filing and getting more information. Thus, suits are filed even where there is no concrete reason to believe there has been negligence, and virtually

TABLE 8 **Stage of Resolution by Care Quality**
149 Local Court Cases: Frequency

Care Quality	Before Mediation	After Mediation	Total
Bad care	28	15	43
	(65.1%)	(34.9%)	(100%)
Ambiguous care	20	28	48
	(41.7%)	(58.3%)	(100%)
Good care	35	23	58
	(60.3%)	(39.7%)	(100%)
Total	83	66	149
	(55.7%)	(44.3%)	(100%)

Note: Row percentages are in parentheses.

all suits are either dropped or settled based on the information gained after filing. Where information on the likelihood of negligence is clear, we find that suits are resolved earlier in the litigation process.

Finally, our comparison of mediation awards with negotiated settlements and our analysis of acceptance rates of mediation awards suggest that plaintiffs face higher costs of litigation and/or are risk averse relative to the defendant/hospital. Although the number of cases tried in court was too small to allow us to estimate a model determining trial outcomes, we did find that cases tried were indistinguishable from cases dropped or dismissed. This suggests that cases go to trial because some plaintiffs fail to drop cases even when it is relatively clear that negligence did not occur, rather than because bargaining over a settlement breaks down.

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