

MEDICAL MALPRACTICE:
DO PHYSICIANS HAVE KNOWLEDGE
OF LEGAL STANDARDS AND
ASSESS CASES AS JURIES DO?

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Abstract

One of the primary functions of the medical malpractice system is to act as an encompassing deterrence structure such that the actors within the system are given the appropriate incentives to provide socially acceptable (i.e., nonnegligent) care. Two fundamental assumptions underlie this deterrence structure—actor knowledge of the structure itself and a single standard of medical appropriateness.

In an effort to assess the validity of these assumptions, the author interviewed 20 radiologists at a single academic medical center to determine physician knowledge of the current medical malpractice system and their concordance with the verdicts of 11 actual malpractice cases. Physicians were found to have incomplete and incorrect perceptions of the medical malpractice legal standard of negligence as well as no knowledge of the common law. Further, there was significant discordance between actual jury verdicts and physician assessments of medical malpractice cases with physicians assessing these cases as juries did only 44% of the time. These cases were also given to nonphysicians who concurred with jury verdicts significantly more often than the physicians. Finally, the physicians in this study were found to have high levels of disagreement amongst themselves with regard to medically appropriate care in the jury verdict cases.

Thus, for this sample of physicians, there appears to be a significant question as to actual knowledge of the medical malpractice tort system as well as the existence of a single medical appropriateness standard.

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know about incentives in order to be affected by them.⁹ Second, negligence assessments of physician action by juries and physicians are assumed to utilize a single standard of

⁹Past empirical study has asserted that common law is well known to physicians and other providers. For example, the *Tarasoff* decision (*Tarasoff v. Regents of the University of California*, 17 Cal.3d 425, 551 P.2d 334 (1976) (holding that a mental health therapist had a duty to exercise reasonable care to protect those third parties whose physical well-being was threatened by a patient)) has been empirically investigated. These researchers have concluded that "the court and its critics were justified in believing the *Tarasoff* decision would be well known [to providers] and therefore might have a significant influence on therapeutic practice." See Daniel J. Givelber et al., *Tarasoff, Myth and Reality: An Empirical Study of Private Law in Action*, 1984 WIS. L. REV. 443, 457 (1984). However, this finding that a specific common law case is well known to providers cannot be generalized to all common law. Since the case was such a significant, controversial and publicized decision affecting mental health providers, it is reasonable that therapists were acquainted with it. In fact, Givelber et al. themselves noted that the primary source of information regarding the *Tarasoff* case was *professional sources*, not the common law ("If we combine professional sources, i.e., professional organizations and literature, colleagues and administrators, we see that more than eight out of ten psychiatrists and psychologists and more than seven out of ten social workers learned most about *Tarasoff* from professional sources." *Id.* at 460). Thus, the *Tarasoff* study does not provide any general guidance as to the relative effectiveness of general common law "teaching."

In addition, another well known case has been empirically studied in assessing if physicians have knowledge of and have been impacted by a court decision. In *Helling v. Carey*, 83 Wash.2d 514, 519 P.2d 981 (1974), the Washington Supreme Court held that a court could change a medical standard of practice even though the customary standard was established and undisputedly followed. A researcher has assessed the effect of the case through surveying physicians and asking if the case had any impact on their practice. The author found that "[t]he comparative analysis does seem to indicate that the court's decision had some impact upon the behavior of [physicians] in the State of Washington." See Jerry Wiley, *The Impact of Judicial Decisions on Professional Conduct: An Empirical Study*, 55 S. CAL. L. REV. 345, 383 (1981). However, the proposed generalizability of these findings is also limited. First, the *Helling* case was (like *Tarasoff*) a potentially well known one due to its significant character which changed the traditional negligence standard in medical malpractice. This is evidenced by the medical press attention subsequent to the decision (see, e.g., *A Precedent with Big Implications*, MED. WORLD NEWS, May 24, 1974, at 33; W. J. Curran, *Glaucoma and Streptococcal Pharyngitis: Diagnostic Practices and Malpractice Liability*, 291 NEW ENG. J. MED. 508 (1974)). Second, as the author himself noted, "[t]he data generated by [this] study, however, indicate that the impact of court decisions may be seriously overestimated." *Id.* at 386.

medical appropriateness¹⁰ as commonly understood by both groups: this implies that if physicians and juries use the same medical appropriateness standard, physicians should theoretically have knowledge of negligent and nonnegligent care through their own professional training and thus should similarly assess negligent versus nonnegligent care as defined by juries.¹¹

This study thus reports on an empirical inquiry assessing the validity of these key assumptions. Do physicians have knowledge of the medical malpractice system through, for example, an understanding of the legal concept of negligence (i.e., the standard by which their actions are judged) and the relevant case law (i.e., the formal communication method between the medical malpractice system and society at large, including physicians)? Is physician assessment of actual malpractice cases in relative concordance with jury verdicts reflecting an application of the same standard of medical appropriateness?

The answers to these questions may be relevant in determining how the system is functioning and, if necessary, methods to improve it. Physician knowledge of the law may

However, these empirical studies suffer not only from methodological problems (including the use of closed-ended multiple choice survey questions that identified the relevant cases as possible reasons for changing practice patterns, thus signaling the participating providers), but they also did not address the *general* effects of (less celebrated) tort law decisions on physician practice. Overall, the deterrence effect of the malpractice tort system on physician behavior is not well understood as underscored by a recent Office of Technology Assessment report: “[t]he role of the malpractice system as a deterrent against too little or poor-quality care—one of its intended purposes—has not been carefully studied.” U. S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, DEFENSIVE MEDICINE AND MEDICAL MALPRACTICE, OTA-H-602, 2 (July 1994) (hereafter, “OTA Report”).

¹⁰As defined by the medical profession itself. See *supra* note 3 and accompanying text.

¹¹However, if physicians and juries are using different standards in determining liability, it is reasonable to suppose that the malpractice system will not exhibit an appropriate incentive effect.

lay determination of whether care rendered by the radiologists was negligent.¹⁵ The cases with citations and the survey instrument are reproduced in the Appendix.

2. Results

The demographic information and answers to open ended questions are reported in Table 1. As expected of physicians at an academic center, all radiologists surveyed were board certified and had academic titles. It is interesting to note that there was no formal medical malpractice program at the academic center in radiology. Further, most physicians surveyed had not been expert witnesses; this was initially somewhat surprising as it would seem that those on the cutting edge of medical knowledge would be the most reasonable choice to be “experts” in medical malpractice cases. Upon additional questioning, this finding was explained by the fact that most radiologists surveyed did not serve as expert witnesses due to their aversions to the legal system; most of the physicians had been requested to serve as expert witnesses at one time or another.

Clearly, most radiologists surveyed did not have a fundamental understanding of the legal definition of negligence. Of the four factors, only a mean of 1.45 (standard deviation 1.05) were correctly identified by this sample; no physician identified all four factors. Note that within this sample, one physician had co-authored a chapter on law and radiology for a major medical textbook (AR1); however, even this radiologist did not correctly identify all four factors of negligence. As well, one physician who completed the survey had previously been licensed to practice medicine in a state which required ten hours per year of malpractice “risk management” continuing medical education credit

departure from the standard of care is the proximate cause of injuries as indicated through proof from plaintiffs medical expert testimony or affidavit).

¹⁵ Note that NPs were given cases to determine their *tabula rasa* perceptions regarding physician actions.

(AR19). This physician also failed to identify all four factors.¹⁶ Aside from this physician, the source of physician information on malpractice generally focused on the medical or lay press. Importantly, no physician reported to reading the common law on malpractice cases, or even to knowing what the common law was. Overall, there was a sense that the physicians surveyed spent little or no time ascertaining the moiré's of the legal system.¹⁷

However, in addition to having incomplete information regarding the legal definition of negligence, it appears that some surveyed radiologists had *incorrect* information. For example, there was a great deal of confusion as to what type of act results in a finding of negligence. The following is a sampling of "requirements" cited by the surveyed physicians in order for care to be deemed legally negligent: a willful, deliberate act; an unintentional act; an act of commission rather than omission; treatment resulting in a long term, permanent injury; and treatment that does not comport with *local* standards¹⁸ or does not follow the majority school of accepted medical practice even if

¹⁶Further, another physician who was also previously licensed in this state identified *no* factors of negligence correctly. This physician's responses were not included in the study results because during the second half of the survey administration, she was called away on a medical emergency. If this physician's results were included, the mean number of negligence factors identified by this sample would have been 1.38 (standard deviation 1.07).

¹⁷Some physicians indicated that their exposure to "the law" was based primarily on 1-serendipity (i.e., if a particular academic medical journal or newspaper had a piece on law that physicians had time to read, they would, as one physician put it, "glance over it"); and on 2-requirements of the department or licensing authority. However, on direct questioning, no physician indicated more than 1 hour *per year* devoted to understanding legal issues.

¹⁸In fact, national standards represent the primary standard applicable to medical malpractice cases. This has been particularly relevant for board certified specialties such as radiology. See EPSTEIN, *supra* note 1, at 182-183. Note that board certification is available for virtually every medical residency (and some post-residency training); thus, most malpractice cases would be adjudicated under national standards.

there is an accepted minority school. Finally, many physicians perceived that treatment which had a poor outcome was enough for a finding of negligence.¹⁹

The results of radiologist agreement with jury verdicts is summarized in Table 2. There was a wide range of individual physician agreement with jury verdicts (range 0.17—0.70) over all cases that were assessed as negligent or nonnegligent.²⁰ Further, there was significant *interphysician* variation per individual case assessment (range 0.05—0.79). There was thus significant variation in what medically appropriate care in radiology represented to these physicians, potentially reflecting a lack of a single standard of care. Overall, for all cases that were evaluated as negligent or nonnegligent, the mean agreement combining physician responses (Total MD Agreement Average, Table 2) as compared to the actual jury verdicts was only 44%. There was no association between the number of negligence factors identified and relative concordance with jury verdicts at the 0.05 level of significance.

Table 3 summarizes NP responses to the cases presented to the radiologists. Similar to physicians, there was a wide range of individual NP agreement with jury verdicts (range 0.27—0.73) over all cases that were assigned negligence or nonnegligence values. There was also inter-NP variation (range 0.09—0.82). NP's were in agreement

¹⁹The idea that a poor outcome was equivalent to negligence was not simply an articulation of physician cynicism. Physicians reported that this was an actual *component* of negligence that was a necessary and sufficient condition for a formal determination of negligence.

²⁰The agreement results do not include "can't tell" responses. Agreement with jury verdicts was defined as follows: if a jury verdict was rendered for the plaintiff patient, a physician response of "negligent" or "most likely negligent" was deemed agreement and assigned a value of 1; if a physician response for the case was "most likely not negligent" or "nonnegligent", then the response was deemed not in agreement and assigned a value of 0. Similar considerations are applicable for jury verdicts for defendant physicians. Thus, the closer the number is to 1, the greater the agreement between physician and jury.

with jury verdicts more often (52% versus 44%) than physicians. This difference was significant at a high statistical level.²¹

In addition, when comparing average Likert values between physicians and NPs across cases, in seven of the eleven cases statistically different average values were given by physicians and NP's. Of the five plaintiff verdict cases, four of the five were given statistically different values by physicians and NP's.²² Interestingly, in each of these plaintiff verdict cases, *NP's gave statistically higher Likert values as compared with physicians*. Further, in the three significantly different cases that were defendant verdicts,²³ *NP's again gave statistically higher Likert values as compared with physicians*. As well, in three of the four cases that did not result in statistically different values between physicians and NP's, NP's again assigned higher average values than physicians. Recall that since relatively higher values are those representing progressively more negligence, it appears that NP's *may* be exhibiting a *prima facie* propensity to assign negligence to physician actions.²⁴ These results are summarized in Table 4.

²¹This result was determined using a two-tailed T-test with a significance level set at $p < 0.05$. In fact, for the difference in means for physician and nonphysician jury agreement, p was less than 0.009.

²²Cases 3, 5, 9, and 11 were statistically different; case 8 was not. The level of significance was tested using a two-tailed T-test at a significance level of 0.05.

²³Cases 2, 4, and 7 were defendant verdict cases whose Likert values were found to be statistically different between physicians and nonphysicians. Cases 2, 6, and 10 were not. Significance levels were determined as in *id.*

²⁴Of course an alternate explanation is that physicians categorically low-ball negligence values so that their resulting mean negligence values are lower; or that both "high-balling" by NP's and low-balling by physicians are occurring. It is difficult to parse out the two effects but the possibility that physicians deem care relatively nonnegligent while NP's deem care relatively negligent may provide physicians with an additional impetus to assume that the tort system, perceived rightly or wrongly, will result in greater negligence determinations against them.

III. DISCUSSION

1. Do physicians have knowledge of the medical malpractice system through knowledge of the definition of negligence and existence of the case law?

At a fundamental level, in order to be affected by an economic incentive, an actor must have knowledge of that incentive. Further, even if the actor has a generalized knowledge of the existence of the incentive, that knowledge must be complete and *correct* in order for the incentive to have its optimal effect. The results of this study indicate that the physician knowledge assumption, at least for this sample of physicians, is of questionable validity and thus the medical malpractice system may not be providing an appropriate incentive structure for physicians to provide optimal medical care.

First, the legal definition of negligence was clearly not apparent to the physicians sampled in this study, i.e., the standards by which the legal system adjudges physician actions were not clear to the actors within the incentive structure. Further, the high degree of *incorrect* perceptions regarding the legal definition of negligence points toward not only a potentially ineffective incentive structure but also an inappropriate one.²⁵

Second, the surveyed physicians did not appear to have knowledge of the malpractice system's specification role as to what care constitutes appropriate care. These physicians were ignorant of the common law and its assumed role in providing "teaching" to physicians as to socially acceptable and unacceptable care. This lack of knowledge regarding the *law* as a source of medical appropriateness is not surprising given that the level and volume from *medical* sources that must be continually assimilated in order to maintain clinical competence is significant; hence physicians would seem to have less time

²⁵See *id.* for additional incorrect factors that could be included with misperceptions of negligence that could provide physicians with inappropriate incentives.

to actively obtain knowledge regarding the legal system's dictates.²⁶ Further, the nature of decision dissemination of the common law provides additional hurdles for physician study of malpractice. Specifically, fact-specific malpractice cases are *not* as a rule published: judgments are simply rendered and then entered by the clerk for enforcement. Indeed, only if malpractice cases have some precedential value and/or independent legal significance (e.g., inappropriate instructions to the jury at trial,²⁷ inapplicability of unfair trade practices and consumer protection law to malpractice,²⁸ appropriate site for suit²⁹) will

²⁶ Although this is true, it can certainly be argued that physicians have an interest in learning about the negligence system as it represents the single greatest risk of pecuniary loss in medical practice. Physicians may not seek to maximize wealth or perhaps the marginal return of learning about the tort system is not worth its cost. One paper has questioned the premise of tort law as a deterrence mechanism due to an inability to identify a psychiatric or psychological theory of human behavior that is consistent with the tort system. See Daniel W. Shuman, *The Psychology of Deterrence in Tort Law*, 42 U. KAN. L. REV. 115 (1993). However, physicians were not specifically studied in the paper and there was no empirical data reported. As well, it may be that physicians are limited in terms of capacity, time, and attention span in their efforts (or potential efforts) to learn about the legal system and thus additional information may not result in any systematic changes. See H. Simon, *Theories of Bounded Rationality*, in 12 STUDIES IN MATHEMATICAL AND MANAGERIAL ECONOMICS: DECISIONS AND ORGANIZATION (C. McGuire & R. Radner, eds., 1972).

Further, it is not clear that physicians should spend their time learning about the legal system. For example, social benefits may be highest if physicians maximize their efforts to learn clinical information in their medical specialty. But if physicians are assumed to have knowledge of the medical malpractice system and the system acts on the basis of those assumptions, there may be untoward effects on resource allocation in the medical care delivery system such as the physician practice of defensive medicine. See *infra* examples 1, 1A, 2, notes 51-60 and accompanying text.

²⁷ See, e.g., *Harding v. Noble Taxi Corp.*, 582 N.Y.S.2d 1003 (N.Y. Sup. Ct., April 2, 1992) (error for trial court to advise jury at length of its reasons for dismissing claims against two defendants in malpractice suit).

²⁸ See, e.g., *Foflygen v. Zemel*, 615 A.2d 1345 (Pa. Superior Ct., Sept. 23, 1992) (unfair trade practices and consumer protection laws do not apply to medical care providers in informed consent case).

they be published.³⁰ these are generally subject matters of little direct relevance to physicians. This lack of relevant publication would tend to make it difficult for physicians generally to access and be taught by malpractice decisions. Thus, it appears that the surveyed physicians did not obtain any medical practice “learning” from the legal system’s common law “teaching”, and even if they had wished to do so, there are significant access barriers to overcome.³¹

Overall, physicians in this study exhibited an incomplete and in many cases inaccurate definition of negligence; these factors coupled with a lack of knowledge of the legal system’s “teaching” illustrates an incentive structure that significantly departs from the traditional rational actor model where tort injurers are assumed to have complete knowledge and the incentive to act optimally.³² An important implication of this

²⁹See, e.g., *Sondergard v. Miles Inc.*, 985 F.2d 1389 (8th Cir. 1992) (patient who suffered stroke in Utah allegedly from taking an over the counter medication could sue manufacturer in federal district court in South Dakota).

³⁰Consistent with this lack of malpractice case publication, it was difficult for the author who is trained in the law to obtain information on jury malpractice verdicts for this study: several legal databases and publications needed to be identified and then scrutinized to find the cases used. These cases were obtained from the Lexis database library VERDCT; the Westlaw database library LRP-JV; and the National Jury Verdict Review & Analysis newsletter.

³¹Further, even if physicians were affected by malpractice decisions through their knowledge of them, because a vast majority of malpractice cases are settled, a correspondingly vast majority of cases do not serve the purported “teaching” function.

³²Note that it could be argued that physicians have no rational incentive to learn about the legal system due to the existence of malpractice insurance. Because physicians may bear little or no pecuniary exposure to malpractice judgments, they may be theoretically indifferent to legal adjudications against them. However, physicians at least in this study do not appear to be so indifferent. First, since malpractice judgments are not necessarily limited to malpractice coverage amounts, physicians may be exposed to some pecuniary loss beyond their insurance coverage; in addition, insurance premiums will rise if

malpractice judgments or settlements are made against physicians. Further, however, this sample of physicians displayed an extremely high disutility associated with being sued. Reputational effects, emotional costs, and opportunity costs were all factors that made malpractice an event that “would make me stop practicing [radiology]”, “drive me to doing insurance physicals”, and “[would make me] get an MBA”, as several physicians put it. Similar effects were also reported in the OTA report: “[a]lthough the financial and professional costs of malpractice liability are real, the primary impact on physicians may be psychological ... [including] losses of self-esteem ... clinical depression, anger, fatigue, or irritability ... behavioral or personality changes, or physical illness.” OTA Report, *supra* note 9, at 29 (citations omitted). Finally, in addition to potential pecuniary losses as well as nonpecuniary effects, a settlement by or adjudication against a physician in a malpractice suit requires a report to the National Practitioner Data Bank (NPDB). The NPDB is a national database created under federal law (*see* 45 C.F.R. §60.10) that requires hospitals and providers to report any adverse malpractice action against physicians. This database *must* be used by hospitals when hiring new physicians as well as every two years for review of current staff; further, HMOs, other medical care groups, as well as state licensing boards use the NPDB when determining whether to grant a physician clinical privileges or a medical license. Thus, a malpractice suit can clearly impact physicians above and beyond any existence of malpractice insurance that covers simply pecuniary loss.

It might also be the case that physicians under managed care arrangements may not have incentives to learn about malpractice due to transference (or sharing) of liability under a *respondeat superior* or ostensible agency theory with the HMO or insurance company. However, the majority rule in malpractice suits against physicians who are associated with managed care organizations is that physicians are generally considered independent contractors of the managed care organization and thus the managed care organization is not liable for physician actions; only if the physician is an employee (or a close approximation) of the managed care group will it shoulder liability. *See, e.g., Raglin v. HMO Illinois*, 230 Ill.App.3d 642, 595 N.E.2d 153 (1992) (neither health insurer nor its health maintenance organization subsidiary could be held vicariously liable for negligence of doctors under contract with them to provide medical services to members of the health care plan); *Chase v. Independent Practice Association, Inc.*, 31 Mass.App.Ct. 661, 583 N.E.2d 251 (1991) (IPA which contracted with HMO to arrange for health services for HMO members was not vicariously liable for alleged negligence of physician who provided services to HMO member, and IPA which contracted with HMO to arrange for health services for HMO members was not liable for alleged negligence of physician under apparent agency theory); *cf. Boyd v. Albert Einstein Medical Center*, 377 Pa.Super. 609, 547 A.2d 1229 (1988) (primary inquiry to determine if physician an ostensible agent of an HMO is if the physician is an employee of the HMO or whether the HMO “holds out” the physician as an employee).

incomplete and inaccurate incentive structure may be that a socially inoptimal level of care will be delivered by these physicians. For example, overtreatment decisions in patient care can be made:

Example 1: Assume that a physician is deciding whether a specific patient requires additional radiologic workup following a questionable chest x-ray screening for lung cancer. The relevant tradeoffs between levels of care, costs of care, nondetection of cancer probabilities, expected nondetection costs, and total nondetection costs of this clinical scenario are given below, with nondetection causing losses of 100,000:

Level of Care	Cost of Care	Nondetection of Cancer Probability	Expected Nondetection Costs	Total Nondetection Costs
Chest X-Ray Alone	1,000	15%	15,000	16,000
Chest X-Ray and Follow up in 6 months	2,000	10%	10,000	12,000
Immediate CT Scan	6,500	5%	5,000	11,500
Open Lung Biopsy	10,000	2%	2,000	12,000

Here, the optimal level of care is to immediately obtain the CT scan. Since the CT scan's marginal cost is only 4,500 but reduces expected nondetection costs by 5,000 and minimizes total nondetection costs, it is optimal to engage in this level of care. Open lung biopsy is not indicated because it costs an additional 3,500 but results only in a reduction of expected nondetection costs of 3,000.

Assuming that the court system has adjudicated the above levels of care such that the legal standard of negligence has been defined (i.e., due care), a physician would be negligent if he or she did not obtain the immediate CT scan. However, assuming the physician is ignorant of the common law's pronouncement of acceptable relative

percentages and decisions in this area (a scenario fully consistent with the results of this study), if the cost of the CT scan is high and the relative reduction in the physician's intuitive estimation of the expected nondetection costs is close to the cost of the immediate CT scan, he or she may not obtain the CT scan and decide only to follow up after chest x-ray based on his or her professional judgment.³³

More specifically, this result can be illustrated by a physician's potential "incorrect" (as defined by the malpractice system) assessment of the probabilities of nondetection. If the physician believes that the decrease from follow up to immediate CT scan is 10% to 5.51% (rather than 5%), then he or she would believe that the appropriate level of care would be follow up. Similarly, if the physician believed that open lung biopsy reduced the nondetection of lung cancer from 5% to 1.49% (rather than 2%), then biopsy would be the socially optimal level of care.³⁴ These marginal cases are arguably the most relevant for the vast majority of physicians; clear cases of appropriate and inappropriate care would be expected to be relatively simple for physicians to identify. Thus, without knowledge of the case law which defines the relevant negligence standards for physicians, there is a potential to take less or more care than is socially optimal. When this ignorance

³³Recall that there may be greater than one school of thought on obtaining the immediate CT scan and/or more than one definition of appropriate care in this area of medical practice. Thus, this decision could be fully consistent with accepted professional care judgments but *not* with jury-defined care judgments.

³⁴Further, when reporting results of clinical studies, medical researchers usually indicate a *range* of possible percentages. Thus, single values as may be defined (or relied upon) by juries may not be similarly interpreted by physicians who may treat them as representing a range. This substantive difference may result in "incorrect" *ex ante* estimated probabilities by physicians and subsequent assignment of negligence by juries.

preliminary matter, the tort system under this explanation must be presumed to have previously defined the relevant medical appropriateness standard in order for physicians to know to settle the case. However, in addition, even if the due care standard has been established by the courts, for the medical malpractice system to represent an “effective incentive structure,” physicians must have *ex ante* knowledge of those due care determinations. The results in this study have indicated that the presence of such *ex ante* knowledge may be questionable: recall that physicians in this study simply did not have any *ex ante* knowledge of case law, malpractice or otherwise. As well, recall that trial court malpractice judgments are usually not published increasing the likelihood that physician *ex ante* knowledge of the court-established due care standard, and thus the “effective incentive structure,” does not exist.⁴¹

Another possible explanation for the variance between physician and jury assessments is that juries deem actions to be negligent or nonnegligent on the basis of something other than the or a prevailing radiological standard of care (or on the basis of a misunderstanding of a standard of care). In other words, the mechanism by which juries

County, Illinois (Settlement Date 11/88) (myelogram); Clevenger v. Rovner, Case No. 88-3992-E, Dallas County, Texas (Settlement Date 6/90) (pregnancy sonogram); Clarazio v. Marciano, Case No. C-310-698, Los Angeles County, California (Settlement Date 4/84) (angiogram); Party Names Withheld, Tri-Service Reference No. 37-62, Pasadena County, California (Settlement Date 6/13/90) (angiogram); and Parties Names Withheld, Tri-Service Reference No. 28-62, Harris County, California (Settlement Date 10/19/89) (angiogram).

⁴¹Instead, it might also be argued that, in actuality, *attorneys* act as physician agents and they thus inform physicians as to the negligence (or not) of their actions based on their informed knowledge of the case law. However, this explanation supports the contention that the medical malpractice system does not represent an “effective incentive structure.” The physician will only be informed of the results of tort system adjudication of due care *after* the medical care in question is performed and *after* he or she is named in a suit. Thus, the tort system provides no *ex ante* deterrence incentive for physicians to avoid providing jury-defined negligent care.

determine negligence or nonnegligence may not be solely based upon medical appropriateness. This is hinted at in two findings in this study. First, recall that overall NP agreement with jury verdicts was significantly higher than that of physicians. If physicians are solely using medical appropriateness in their care assessments and NPs are not (due to their lack of information regarding it),⁴² NPs' greater predictive ability may be based on some *other* characteristic(s) that they and juries have in common which represents physician negligence to both (e.g., presence or severity of injury⁴³). Second, recall that

⁴²See *supra* note 15.

⁴³Note that researchers have reported that with increasing severity of injury, there is an increased possibility of malpractice litigation. See White, *supra* note 7. However, this has also been taken to mean that providers have an incentive to render nonnegligent and high "quality of care": "liability is strongly related to quality of care both because patients are more likely to receive a damage payment if care was negligent and because, when payments are made, they are higher if care was negligent. ... [T]he probability of the patient receiving a payment is higher ... for all severity levels." White, *supra* note 7, at 5-6, Table 2, citing H. S. Farber & M. J. White, *A Comparison of Formal vs. Informal Dispute Resolution in Medical Malpractice*, "National Bureau of Economic Research Working Paper, 1993 (presented to the Seminar in Law and Economics, Harvard Law School, October 26, 1993; paper on file at Harvard Law School). But at the outset it bears emphasizing that, in fact, there were plaintiff jury verdicts in cases where the care was *not* negligent (as defined by White) and this "nonnegligent" care also resulted in increasing damage awards as injury severity levels increased. Thus, these jury determinations of "negligence" in "nonnegligent" cases themselves raise the issue as to whether juries are using or misapplying the (or a) standard of care and/or are using other factors in their negligence determinations: for example, juries may be using the presence of injury as a proxy for negligence.

Further, to comment on White's statement regarding increasing jury verdict awards associated with increasing severity of injury means damage awards are a function of relative "quality of care": first, as found in this study, there appears to be disagreement amongst academic physicians regarding what is "the" standard of care that relates to high "quality of care." Second, certain similar procedures and/or treatments have associated risks of injuries that are more severe than others. Thus, assuming the ability to compare the relative "negligence" of physicians across specialties and procedures (itself a questionable proposition), a similar "degree" of negligence in say, a neurosurgery procedure (e.g., removal of an acoustic neuroma, i.e., brain surgery) *versus* a dermatologic procedure (e.g., surgical removal of a suspicious melanotic mole) will result in very different severities of injury: for example, loss of brain

seven of eleven cases were assigned significantly higher Likert values (i.e., relatively higher negligence) by NPs *cf.* physicians, indicating that NPs may have a *prima facie* propensity to assign negligence to physician actions. In combination, these results may indicate that juries may not be the *ab initio* neutral applier of the medical appropriateness standard that is generally assumed.⁴⁴

Although this explanation may be favored by the medical profession, and the disagreement of physicians with juries in this study supports it, note that the interphysician disagreement per case may cut against this explanation. Because some physicians *do* agree with juries in their deliberations, juries may thus have decided negligence versus nonnegligence on the basis of some appropriate standard of care. However, note that jury decisions that happen to agree with some physician definition of the appropriate standard

function *versus* an unsightly scar and decreased sensation. Thus, the progressively higher damage awards associated with greater injury severity may have little association with the relative "quality of care" and perhaps more to do with the medical specialty. Third, even within the same procedure, different severities of injury can occur as a function of the *patient*, not the physician. Anatomic and physiologic differences across individuals (e.g., patent foramen ovales in the heart, small communicating blood vessels, coagulation disorders for clotting) all contribute to potentially higher severities of injury when they occur and are not necessarily a function of the physician's "relative" negligence.

Finally, aside from these considerations, if the legal system's agents (judge or jury) believe that the physician's conduct has caused damage, they may simply be more likely to deem the defendant physician negligent. See Calfee & Craswell, *supra* note 8, at 987 n.50.

⁴⁴Juries have been considered previously to not be totally neutral in their malpractice adjudications. See, e.g., M. Roy Schwarz, *Liability Crisis: The Physician's Viewpoint*, in MEDICAL MALPRACTICE—TORT REFORM 24 (James Hammer & B.R. Jennings, eds., 1987) (juries cannot "separate[] their personal feelings from the evidence in the cases and instinctively wish to help the plaintiffs as they would want others to help them if they were in a similar situation.") Further, juries may also award malpractice plaintiffs greater amounts compared with other plaintiffs with similar injuries. See Randall R. Bovbjerg, et al., *Juries and Justice: Are Malpractice and Other Personal Injuries Created Equal?* 54 LAW & CONTEMP. PROBS. 5 (1991).

of care may only be coincidental to the standard of care itself if juries are using alternate factors in their negligence determinations.

The implications of this significant discordance between juries and physicians are broad. On one hand, if *ex ante* physicians have knowledge that there are substantive differences between physicians (who will later be the experts in litigation) regarding their perceptions of negligent care, physicians may not be able to determine what care will be considered legally negligent and what care will not.⁴⁵ Further, in addition to physician variance, if juries are responsive to alternate factors from which an indeterminate percentage will return a negligent verdict and an indeterminate percentage will return a nonnegligent verdict under the same set of facts, there will be little potential "teaching" accomplished by the tort system. More likely, a wholly unclear incentive structure may result.⁴⁶

Indeed, instead of providing "clear" incentives regarding what is socially optimal (i.e., due care), the impact of the tort system in this environment will be to induce

⁴⁵This variability phenomena has been noted in other contexts. For example, community-based physician radiologists may be more aggressive in their recommendations for followup of suspicious mammograms than are academic teaching hospital radiologists; see J.E. Meyer, et al., *Biopsy of Occult Breast Lesions: Analysis of 1261 Abnormalities*, 263 JAMA 2341 (1990). Further, for breast mammograms, it has been reported that radiologists can differ substantially in their interpretations and subsequent management recommendations; see Joann G. Elmore, *Variability in Radiologists' Interpretations of Mammograms*, 331 NEW ENG. J. MED. 1493 (1994). Finally, it has been found that radiologists differ significantly in terms of their estimates of radiologic procedure intraservice work as a function of practice site (community versus academic hospitals); see Bryan A. Liang, et al., *Analysis of the Resource-Based Relative Value Scale for Medicare Reimbursements to Academic and Community Hospital Radiology Departments*, 179 RADIOLOGY 751 (1991).

⁴⁶Other empirical studies have advocated continued scrutiny of the current medical malpractice system because of the significant and complex role the jury plays. See Thomas B. Metzloff, *Resolving Medical Malpractice Disputes: Imaging the Jury's Shadow*, 54 LAW & CONTEMP. PROBS. 43 (1991).

physicians to provide socially inoptimal care.⁴⁷ Because of the uncertainty in jury determination of negligence, physicians will have an incentive to attempt to provide treatment that would be considered nonnegligent *all* of the time so as to escape liability.⁴⁸

⁴⁷Shavell postulated that process-oriented systems, i.e., those based on the degree of care alone (as compared with the negligence rule which has both process-oriented and outcome-oriented characteristics), would have significant limitations. Notably, he indicated that:

[t]here are, however, important qualifications to be made about the case for a process-oriented system. ... [I]nformation may be inaccurate. If information about care is not precise, a physician who in fact takes the optimal level of care is subject to the risk of penalty since his observed level may appear too low. ... [T]he standard of care ... may not be correctly chosen or consistently applied under a process-oriented system. ... Therefore, the opportunities for error and for inconsistent application of standards by the agents of the incentive system [i.e., juries] are probably substantial.

Shavell, *supra* note 35, at 47-48. This study confirms these qualifications about at least the process-oriented aspects of the negligence system.

⁴⁸Assuming of course that the relevant costs associated with providing nonnegligent care are less than the benefits generated. Shavell has indicated that uncertainty over the finding of negligence by the legal system would lead to an excess level of care:

The disadvantage to a party of being found negligent by mistake [e.g., courts may err in assessing a party's true level of care] is that he will have to pay the victim's losses. This disadvantage will often dominate in importance the savings in the cost of care that the party could obtain by reducing his level of care somewhat and hoping that he would erroneously escape liability if an accident occurred. [¶] The reader should not be surprised, then, to learn that a general consequence of uncertainty over the assessment of true levels of care is that parties will tend to be led to take more than due care--and thus to take socially excessive levels of care (presuming that due care is set at socially optimal levels).

Thus, as in the situation of incomplete and inaccurate perceptions of negligence, physicians may be induced to provide care in excess of what is defined to be due care:

Example 2. Assume that a female patient has had a questionable lump on her breast and has obtained a mammogram which is equivocal for malignant microcalcifications. The radiologist is considering what additional level of care, if any, is required. The following represents the tradeoffs between levels of care, costs of care, expected nondetection costs, and total nondetection costs associated with a nondetection that would cause a loss of 100,000:

Level of Care	Cost of Care	Nondetection of Cancer Probability	Expected Nondetection Costs	Total Nondetection Costs
Mammogram Alone	800	9%	9,000	9,800
Mammogram Plus Follow Up Mammogram in 1 year	2,100	7%	7,000	9,100
Ultrasound of the Mass	3,000	4%	4,000	7,000
Biopsy	4,900	3%	3,000	7,900

Here, the optimal level of care (defined as due care) is to obtain an ultrasound of the patient's suspicious lump. The marginal cost of obtaining the ultrasound is only 900 compared with a reduction of expected nondetection costs of 3,000 while minimizing total nondetection costs. Biopsy is not indicated since its marginal cost is 1,900 but reduces expected nondetection costs by only 1,000.

STEVEN SHAVELL, PRINCIPLES OF ECONOMIC ANALYSIS OF LAW §16.1 (draft, September 11, 1993; on file with author). *See also* STEVEN SHAVELL, ECONOMIC ANALYSIS OF ACCIDENT LAW §§ 4.3, 4A.3 (1987) (providing examples of jury uncertainty calculations resulting in excess levels of care).

However, suppose that juries will impose liability 50% of the time⁴⁹ even if the physician performs an ultrasound of the mass (i.e., the physician will be deemed negligent even if he or she exercised due care). Then the expected cost to the physician for performing only the level of care of ultrasound becomes:

$$\begin{aligned} \text{Cost}_{\text{ultrasound}} = & \text{cost of care} + \\ & (\% \text{ time jury finds liability}) \times \\ & (\text{expected nondetection costs}); \end{aligned}$$

$$\text{Cost}_{\text{ultrasound}} = 3,000 + (0.50) \times (4,000) = \underline{5,000}.$$

The relevant tradeoffs become:

Level of Care	Cost of Care	Nondetection of Cancer Probability	Expected Nondetection Costs	Total Nondetection Costs
Mammogram Alone	800	9%	9,000	9,800
Mammogram Plus Follow Up	2,100	7%	7,000	9,100
Mammogram in 1 year				
Ultrasound of the Mass	5,000	4%	4,000	9,000
Biopsy	4,900	3%	3,000	7,900

Thus, when the jury will find liability 50% of the time even when the socially optimum level of care is performed, the physician will have an incentive to perform the highest level of care (biopsy) since it reduces the chance of being found negligent due to the uncertainty of the jury verdict and minimizes the cost (to the physician) of care as well as total

⁴⁹Others have found on retrospective review of insurance company records that approximately 50% of medical malpractice claims that were categorizable as *not* due to negligent care resulted in claims payment. See Cheney et al., *supra* note 7.

nondetection costs. There is therefore an incentive to provide an excessive level of care due to the uncertainty of jury determinations of negligence. This factor (in combination with physician ignorance and misperception of the definition of negligence as identified above) thus provides an additional impetus for physicians to practice defensive medicine. Note again that each additional level of care is not costless: additional care is associated with additional risks of harm to the patient. These risks and expected procedure losses may not be great enough to counter the incentives to overtreat, particularly when the primary potential disorder (e.g., cancer) has a nondetection loss value much greater than a *relatively* minor procedure loss value and expected procedure loss cost. Thus, the incentive to expose patients to additional, nonoptimal risks of harm due to negligence misperception is exacerbated by the uncertainty of jury verdict determinations of negligence.

However, even a level of care more than that which is optimal can also be found to be negligent. If the biopsy level of care in Example 2 is deemed negligent 50% of the time, then the relative cost of care at that level is the following:

$$\text{Cost}_{\text{biopsy}} = \text{cost of care} + (\% \text{ time jury finds liability}) \times (\text{expected nondetection costs});$$

$$\text{Cost}_{\text{biopsy}} = 4,900 + (0.50) \times (3000) = \underline{6,400}.$$

The relevant tradeoffs become:

Level of Care	Cost of Care	Nondetection of Cancer Probability	Expected Nondetection Costs	Total Nondetection Costs
Mammogram Alone	800	9%	9,000	9,800
Mammogram Plus Follow Up	2,100	7%	7,000	9,100
Mammogram in 1 year				
Ultrasound of the Mass	5,000	4%	4,000	9,000
Biopsy	6,400	3%	3,000	9,400

Thus, under these assumptions, if the physician is faced with a 50% chance of liability when taking due care (ultrasound) and when taking more than due care (biopsy), he or she will take due care since the cost of care to the physician at ultrasound as well as total nondetection costs are minimized at this level.⁵⁰

⁵⁰Of course, with different probabilities, these results may change. For example, if the probability of being found liable when performing a biopsy is reduced to only 1%, then the expected cost would be:

$$\text{Cost}_{\text{biopsy}} = 4,900 + (0.01)X(3000) = \underline{4,930}.$$

The resulting tradeoffs would become:

Level of Care	Cost of Care	Nondetection of Cancer Probability	Expected Nondetection Costs	Total Nondetection Costs
Mammogram Alone	800	9%	9,000	9,800
Mammogram Plus Follow Up	2,100	7%	7,000	9,100
Mammogram in 1 year				
Ultrasound of the Mass	5,000	4%	4,000	9,000
Biopsy	4,930	3%	3,000	7,930

Since the cost of care and total nondetection costs of biopsy with 1% jury error is less than that of ultrasound with a 50% chance jury error, obtaining the biopsy would thus be "optimal." See also *infra* notes 51-60 and accompanying text for a formal discussion of jury error.

IV. FORMAL MODELS

On the basis of the empirical findings regarding physician misperceptions and divergence of physician—jury determinations of negligence, several formal models are now presented.

1. Modeling the Incorrect Negligence Knowledge of Physicians

In formal terms, the incomplete and inaccurate formulations of negligence offered by physicians can be modeled and the resultant effects on taking care indicated. Let the following be the relevant levels of care, costs of care, probability of disease, expected disease costs, and total disease costs of a patient incurring costs of L for the disease:

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	a	r	rL	$a + rL$
Due Care	$a + b$	$r - s$	$(r - s)L$	$(a + b) + (r - s)L$

Assume that due care is due care as defined by the courts which is socially optimal, that this level in turn is defined by professional standards of care, and that providing this due care results in no negligence liability for the physician.

Under basic determinations of negligence, the physician will take due care if the total nondetection costs of due care are less than some care:

$$(a + b) + (r - s)L < a + rL;$$

$$(a + b) - a < rL - (r - s)L;$$

$$b < rL - rL + sL; \text{ simplifying:}$$

$$b < sL. \text{ [equation 1].}$$

Equation 1 simply means that if the marginal cost of performing due care is less than the decrease in expected disease cost losses from due care, the physician will take due care.

If, however, we define N as the increase or decrease in liability due to physician incomplete or incorrect information regarding the tort system, the relevant scenario becomes:

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	$a + N$	r	rL	$a + N + rL$
Due Care	$a + b$	$r - s$	$(r - s)L$	$(a + b) + (r - s)L$

Physicians will then take due care if:

$$(a + b) + (r - s)L < (a + N) + rL$$

$$(a + b) - (a + N) < rL - (r - s)L;$$

$$b - N < sL;$$

$$b < sL + N. \text{ [equation 2].}^{51}$$

When comparing equation 2 with equation 1, it is apparent that if physicians' misperceptions regarding the negligence system are deemed to increase liability (a positive N value), then the cost of taking due care is *decreased* by N ; similarly, if physicians' misperceptions regarding the negligence system are taken to decrease liability (a negative N value), the cost of taking due care is *increased* by N . However, since it is most likely that physician incomplete and incorrect perceptions will be deemed to increase liability (as evidenced by some of the empirical data reported here), in most situations, a misperception of negligence reduces the cost to physicians of taking due care.

If we assume that there are three levels of care (some care, due care, and excess care) and that providing some care is always deemed negligent, socially optimal due care and excess care are deemed not negligent, how will misperceptions regarding the negligence system affect the decision on whether to increase care? First, assuming

⁵¹Thus if $b > sL + N$, a physician would have an incentive to provide only some care.

complete and accurate physician knowledge and no jury error, the physician will encounter the following scenario:

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	a	r	rL	a + rL
Due Care	a + b	r — s	(r — s)L	(a + b) + (r — s)L
Excess care	a + b + c	r — s — t	(r — s — t)L	(a + b + c) + (r — s — t)L

Physicians will provide only due care if the total disease costs associated with due care is less than that of excess care:

$$(a + b) + (r - s)L < (a + b + c) + (r - s - t)L;$$

$$0 < c - tL. \text{ [equation 3].}$$

However, if physicians have misperceptions regarding the negligence system, the physician will be presented with the following situation when deciding on the level of care:

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	a	r	rL	a + rL
Due Care	a + b + N	r — s	(r — s)L	(a + b + N) + (r — s)L
Excess care	a + b + c	r — s — t	(r — s — t)L	(a + b + c) + (r — s — t)L

Here, physicians will take only due care if the costs of doing so minimizes total disease costs *cf.* excess care:

$$(a + b + N) + (r - s)L < (a + b + c) + (r - s - t)L;$$

$$N < c - tL;$$

$$0 < c - tL - N. \text{ [equation 4].}^{52}$$

⁵²This may also be expressed as the following: if $c > tL + N$, then physicians will take only due care; or, if $c < tL + N$, physicians will take excess care. Thus, with an increasing value of negligence factor N, there will be an increasing tendency for physicians to take excess care.

Equation 4 represents the determination of taking only due care when negligence misperceptions exist. Comparing this equation with equation 3, there is a decrease in the cost of physicians of taking excess care by N , assuming N represents physician misperceptions that the negligence system will increase liability.

2. Modeling the Divergence of Jury and Physician Perceptions of Negligence

When actors consider to what level of activity to engage, the presence of uncertainty in legal liability may induce socially inoptimal levels of care.⁵³ In health care, this can result in defensive medicine as indicated above.

Assume the following scenario with a disease cost of L :

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	a	r	rL	$a + rL$
Due Care	$a + b$	$r - s$	$(r - s)L$	$(a + b) + (r - s)L$
Excess Care	$a + b + c$	$r - s - t$	$(r - s - t)L$	$(a + b + c) + (r - s - t)L$

Further assume that taking the some care level of care always results in negligence liability; socially optimal due care is considered by juries as some care with a probability of E ; and excess care does not result in liability. The cost of due care with jury error taken into account is:⁵⁴

⁵³This is even true in the most favorable case for liability in the legal system: when uncertainty probability centers around the socially optimal level of care. See Calfee & Craswell, *supra* note 8, at 974, who argue that even when uncertainties have been centered around the socially optimal level of behavior, potential defendants will still have incentives to behave suboptimally and the mere presence of uncertainty about legal outcomes can cause even risk-neutral defendants to take excess or suboptimal care. See also Shavell *supra* notes 47, 48.

⁵⁴From Shavell, *supra* note 48.

$$\begin{aligned}\text{Cost}_{\text{due care with error}} &= \text{Cost of Due Care} + (\text{jury error \%}) \times (\text{expected disease loss at due care}); \\ &= a + b + E[(r - s)L].\end{aligned}$$

Thus, total disease costs with error would be:

$$\begin{aligned}\text{Total Disease Costs}_{\text{due care with error}} &= \text{Cost}_{\text{due care with error}} + \text{expected disease loss at due care}; \\ &= a + b + E[(r - s)L] + (r - s)L.\end{aligned}$$

In this situation, the physician will take only due care if the total disease cost of due care with error is less than the total disease cost of excess care:

$$\begin{aligned}(a + b) + (r - s)L + E[(r - s)L] &< a + b + c + (r - s - t)L; \\ (r - s)L + E[(r - s)L] &< c + rL - sL - tL; \\ (r - s)L + E[(r - s)L] &< c + (r - s)L - tL; \text{ or} \\ E[(r - s)L] &< c - tL; \text{ or} \\ 0 &< c - tL - E[(r - s)L]. \text{ [equation 5].}^{55}\end{aligned}$$

Equation 5 thus indicates that the decision to take due or excess care is a function of jury error (the $E(r - s)L$ term), the expected due care costs and the net marginal benefit of taking excess care. Comparing equation 5 with equation 3, it is apparent that since by assumption, $c - tL$ is greater than zero (otherwise, excess care would be due care), by introducing jury error there is a concomitant decrease of equation 3 (by $E(r -$

⁵⁵In other words, if $0 > c - tL - E(r - s)L$, then physicians will take excess care. Alternatively, if

$$c < tL + E(r - s)L,$$

then any increase in the sum of $tL + E(r - s)L$ will increase the likelihood that the physician will take excess care. Since E represents the probability of (incorrect) jury assignment of negligence under due care, the greater the error, the greater the reduction of costs for physicians to take excess care.

s)L)⁵⁶ which brings value of the right hand side of equation 3 closer to zero and thus closer to a point of taking excess care. Thus, jury error at the due care level reduces the cost of taking excess care.

However, if we extend this analysis and relax the assumption that excess care does not result in liability and instead impose liability with a probability of E (i.e., excess care is considered some care with probability E), and we continue to assume that due care will also be considered some care and result in liability with a probability of E, then physicians will take only due care if the total costs associated with due care with error are less than that associated with excess care with error. The cost of excess care with jury error E taken into account is:

$$\begin{aligned} \text{Cost}_{\text{excess care with error}} &= \text{Cost of Excess Care} + (\text{jury error \%}) \times (\text{expected disease loss at excess care}); \\ &= a + b + c + E[(r - s - t)L]. \end{aligned}$$

Thus, total disease costs with error would be:

$$\begin{aligned} \text{Total Disease Costs}_{\text{excess care with error}} &= \text{Cost}_{\text{excess care with error}} + \text{expected disease loss at excess care}; \\ &= a + b + c + E[(r - s - t)L] + (r - s - t)L. \end{aligned}$$

Here, the physician will take only due care if the total disease cost of due care with error is less than the total disease cost of excess care with error:

⁵⁶Note that according to the results reported in this study, there may be a significant predilection for jury adjudication of negligence as indicated by the responses of NP's. This could mean that juries (made up of NP's) could be biased in favor of negligence determinations even if physicians exercised due care. Thus, the factors representing jury error could be quite high and significantly decrease the cost to physicians of taking excessive care.

$$\begin{aligned}
(a + b) + (r - s)L + E[(r - s)L] &< a + b + c + E[(r - s - t)L] + \\
&\quad (r - s - t)L \\
(r - s)L + E[(r - s)L] &< c + (r - s)L - tL + E[(r - s)L] - EtL; \text{ or} \\
0 &< c - tL - EtL. \text{ [equation 6].}
\end{aligned}$$

When comparing this result with equation 3, note that the introduction of jury error at the excess care level *reduces* the cost of taking excess care by the factor EtL .

Note also that this result is independent of due care expected disease costs and relies only on marginal values of *excess* care. Recall from equation 5 that under situations of only jury error under due care, the decision to provide excess care relied heavily on expected disease costs of *due* care (amongst others). However, under these assumptions, due care factors defining the social optimum disappear when juries find negligence equally under a socially optimum level of care and an excessive level of care and depend only on excess care values. Since physicians need only look to the highest level of care variables, there may be a rough incentive to simply perform the highest level of care, particularly if they have knowledge (or a perception) of NP predilection toward negligence verdicts and thus high E values.⁵⁷ This may be an additional explanation for the extent of defensive medical practice as well as the tendency of many U.S. physicians to render the most advanced treatments although of only marginal benefit.

If we relax the assumption of equivalent percentages of negligence liability under due care and excess care levels and assume due care is considered some care with probability E and excess care is considered some care with probability F , then this results in the following determination of when physicians will exercise only due care:

$$\begin{aligned}
(a + b) + (r - s)L + E[(r - s)L] &< a + b + c + (r - s - t)L + \\
&\quad F[(r - s - t)L]; \\
E(r - s)L &< c - tL + F(r - s)L - FtL;
\end{aligned}$$

⁵⁷ See *supra* note 24 and accompanying text.

$$0 < c - tL - E(r - s)L + F(r - s)L - FtL; \text{ or}$$

$$0 < c - tL - FtL - (E - F)[(r - s)L]. \text{ [equation 7]}^{58}$$

Equation 7 shows that, compared with equation 6, under different probabilities of jury error as a function of level of care, there is again a relative decrease in cost from taking due care to taking excess care. Note that since FtL in this situation is equivalent to EtL in equation 4, the further decrease in cost to exercise care by adding different jury error probabilities is $(E - F)[(r - s)L]$. Thus, the greater E is relative to F , the cheaper it becomes to exercise excess care, i.e., the more errors that are made by juries under the lower standard of due care, the less expensive it becomes for physicians to provide the highest level of excess care. Of course, if E and F are equal, then equation 5 reduces to equation 4 and again the function is independent of due care cost considerations.

3. Combining Physician Misperceptions Regarding Negligence and Divergence of Physician and Jury Determinations of Negligence

Assume a situation where physicians have misperceptions regarding the negligence system (N) and the expected loss from a disease is L . Assume further that at some care, juries will always deem the physician negligent, at due care, juries will adjudge physician care as some care (and thus negligent) with a probability of E , and at excess care juries will not adjudge physicians negligent. The physician who is considering whether to increase care past due care with jury error and negligence misperceptions to excess care is thus presented with the following scenario:

⁵⁸Physicians will exercise excess care if $0 > c - tL - FtL - (E - F)[(r - s)L]$. As above, we can rearrange the equation such that

$$c < tL + FtL + (E - F)[(r - s)L].$$

Since E and F represent jury errors in assigning negligence to physicians who provide socially optimal due care and socially excessive care, increasing jury error decreases the cost of providing excess care.

Level of Care	Costs of Care	Probability of Disease	Expected Disease Costs	Total Disease Costs
Some Care	a	r	rL	a + rL
Due Care	a + b + N + E[(r - s)L]	r - s	(r - s)L	(a + b + N) + (r - s)L + E[(r - s)L]
Excess Care	a + b + c	r - s - t	(r - s - t)L	(a + b + c) + (r - s - t)L

The physician will take only due care if the total disease costs of due care with jury error and negligence are less than that of excess care:

$$(a + b + N) + E[(r - s)L] + (r - s)L < (a + b + c) + (r - s - t)L;$$

$$N + (r - s)L + E[(r - s)L] < c + (r - s)L - tL; \text{ or}$$

$$0 < c - tL - E[(r - s)L] - N. \text{ [equation 8].}^{59}$$

Comparing equation 8 with equation 5, note that adding physician misperceptions of negligence further decreases the cost of taking excess care by N, assuming physician misperception of increased liability. Thus, in combination with an increasing jury error rate under due care, with greater physician misperception there may also be a greater incentive to provide excess care.

Similarly, if we relax the assumption that excess care has no probability of being deemed some care (and hence negligent) and assign this probability the same probability as due care (i.e., E), then physicians will take only due care if the total cost of due care with jury error and negligence misperceptions is less than that of excess care with jury error:

⁵⁹Thus, if $0 > c - tL - E[(r - s)L] - N$, physicians will take excess care. Rearranging, if

$$c < tL + E[(r - s)L] + N,$$

then the physician will take excess care. Note again, with increasing jury error and physician negligence misperception, there is a decrease in cost associated with taking excess care.

$$\begin{aligned}
& (a + b + N) + (r - s)L + E[(r - s)L] < a + b + c + (r - s - t)L + \\
& \quad E[(r - s - t)L]; \\
& N + (r - s)L + E[(r - s)L] < c + (r - s)L - tL + E[(r - s)L] - EtL; \text{ or} \\
& \quad \underline{0 < c - tL - EtL - N.} \text{ [equation 9].}^{60}
\end{aligned}$$

Again, we see that a decision to take excess care is independent of expected disease costs of due care as in equation 8. Further, analogous to equation 4, if physicians misperceive liability as increasing negligence determinations, the cost of excess care is decreased by N.

Similarly, if we relax the assumption of equal probabilities of negligence under due and excess care situations such that due care continues to be considered some care with a probability of E and excess care is considered some care with a probability of F, physicians will take only due care if the total cost of due care with jury error and negligence misperceptions is less than that of excess care with jury error:

$$\begin{aligned}
& (a + b + N) + (r - s)L + E[(r - s)L] < a + b + c + (r - s - t)L + \\
& \quad F[(r - s - t)L]; \\
& N + (r - s)L + E[(r - s)L] < c + (r - s)L - tL + F(r - s)L - FtL; \\
& \quad \underline{0 < c - tL - FtL - (E - F)[(r - s)L] - N.} \text{ [equation 10].}
\end{aligned}$$

A comparison of equation 10 with equation 7 indicates that, similar to the above analysis, introducing a physician misperception of negligence factor further decreases the cost of taking excess care. As well, an increase in the relative probability that juries will assign negligence at the lower due care level as compared with the higher excess care level will further decrease the cost of taking excess care.

⁶⁰As above, if $0 > c - tL - EtL - N$, then the physician will take excess care. Again, noting that

$$c < tL + EtL + N,$$

any increase in E and/or N will decrease the cost to the physician of taking excess care.

V. SUMMARY AND CONCLUDING REMARKS

Overall, when considering the classic tort system's incentive effects on injurers, jurists and researchers assume injurer knowledge regarding the system's (hoped-for) social incentive function and a single, commonly understood judgment standard. However, these assumptions may be questionable for medical malpractice at least for the physicians in this study. These physicians were ignorant regarding the common law of tort and their perceptions regarding the legal definition of negligence were clearly incomplete and incorrect. Further, the divergence of negligence assessments by juries and this study's physicians by ~50% (i.e., physicians and juries agree approximately as frequently as would be predicted by chance) implies that the negligence system may not (or cannot⁶¹) be adjudicating medical malpractice cases solely on the basis of medical appropriateness. As well, the possible bias shown by NPs when assigning physician actions as relatively more negligent as well as NPs' greater concordance with jury verdicts in the absence of medical appropriateness and legal knowledge is consistent with this contention. Finally, exacerbating these aforementioned difficulties, interphysician discordance of negligence determinations may indicate that the medical appropriateness standard in certain cases may *not* represent a single, uniform professional standard as is generally assumed: there may be significantly different perspectives of what is acceptable care, at least in the specialty of radiology.

The observation of multiple appropriate standards of medical care in combination with the possibility that juries are using alternate adjudicatory standards and are not strictly neutral would support the contention that there is some care that is being adjudged negligent that is not. Further, these factors in addition to negligence misperceptions by

⁶¹Due to the multiple standards of care as defined by the profession and seen in this study. See also *supra* note 45 and accompanying text.

physicians may result in physician incentives to provide excess care (i.e., defensive medicine) while concomitantly increasing patient risk. Thus, the “clear” physician incentives provided by the accepted tort system model to “avoid providing substandard [i.e., negligent] care” may be significantly muddled by reality and lead to socially excessive levels of care and increased patient injury.

Building on this empirical data, models incorporating these factors show that physician misperceptions of negligence as well as erroneous jury assignment of negligence under socially optimal due care alone as well as under both due and excess care appear to decrease the cost of providing excess care. Indeed, because of the potential tendency for NP’s to assign negligence to physician care found in this study, jury error may represent a particularly prominent factor in malpractice litigation and hence provide physicians with additional incentives to render excessive care. Again, it bears emphasizing that there is a concurrent increase in patient risk of injury due to the excess care.

Note that under the situation where the probability of jury assignment of negligence is equal under both due and excess care, the decision to provide excess care is theoretically determined by excess care factors alone. Thus, because physicians may only look to excess care variables in determining their level of care, a knowledge *or perception* that NP’s are significantly inclined to adjudge physicians negligent may result in physicians making possibly inflated estimates of E (i.e., close to 1) and thus providing excess care even in situations where it would not be rational to do so. This tendency of overestimation of jury error probability,⁶² in addition to misperceptions of negligence and physician—jury divergence in negligence determinations, may represent a significant source of defensive medicine. Of course, this result is socially not optimal due to the inappropriate allocation

⁶²Recall the overestimation by physicians of the incidence of malpractice claims by a factor of three reported in *supra* note 36.

of risks and resources to the patient by the physician and the decrease in patient/consumer welfare associated with injury and/or potential injury imposed by the excess care.

Hence, the negligence system in tort law has been presumed by researchers to provide clear incentives for providers to practice nonnegligent care. However, the implicit assumptions that physicians are knowledgeable regarding the tort law system and that there is a common standard of medical appropriateness used by both juries and physicians in assessing negligence have not been supported at least for the physicians in this study.

Indeed, if the results of this inquiry could be extended to most physicians, ignorance of the tort system and its standards itself would be enough to question the effectiveness of the incentive structures assumed by legal researchers. But even if physicians were theoretically knowledgeable regarding the existence of the common law, how to find it, and how to analyze it using strict negligence definitions, as well as had the leisure time to accomplish these tasks, the finding that physicians do not assess care negligent or nonnegligent care as defined by juries (for whatever reason) undermines any "teaching" role that the tort system could provide. In fact, as was found here, the only "clear" incentive is to take *excess* care due to *unclear* jury determinations of negligence.

Similarly, even if physicians could be "taught" by the common law of tort through an ability to differentiate negligent versus nonnegligent care as defined by juries, their lack of knowledge regarding the existence, case law, and standards of the malpractice system also undermines any "teaching" role. However, without *either* knowledge or differentiation ability, it would appear that any chance of providing physicians with "clear" incentives to practice socially optimal medicine is dim indeed. Thus, if these results are applicable to the general physician population, a fundamental reexamination of the tort system and its presumptive effects on physicians would be in order to assess how to actually encourage physicians to deliver efficient and appropriate levels of care and how to limit the provision of excessive care so that only the suitable amount of risk is incurred by patients.

A system that could accomplish such goals cannot be adequately designed without additional information regarding the physicians who are affected by the malpractice system and negligence rule. If physicians are or can be taught to be responsive to incentive structures as defined by the legal system, then there would be some role for using the traditional tort system in attempting to establish effective physician incentives to provide socially optimal care. Thus, a massive educational effort of physicians regarding the tort system, common law, defenses and so on would be required. In addition, cross-professional communication channels for previously unpublished and settled cases would necessarily need to be established so as to provide physicians with information regarding the current standards that are deemed socially acceptable and thus optimal. The costs of such a system would appear to be prohibitive, however, at least in theoretically complete form.⁶³

Alternatively, if physicians could not be educated regarding the legal incentive structure, either because of an inherent aversity of physicians to legal matters or due to the subject matter itself (e.g., binary (negligent versus nonnegligent) definitions of care are too crude to encompass the majority of medical practice), then it becomes important to attempt to design an incentive system that need not take into account determinations of negligence. However, it would then behoove the system designer to have a fundamental understanding of the nature of physician behavior and reactions to proposed incentives in order to affect the provision of medical care optimally. Lamentably, there is at present little information on these issues. This may thus be an important area for exploration in

⁶³“[E]ven an uncertain rule can be adjusted, in theory, to produce the optimal level of compliance by those subject to the rule. However, the information needed to calculate and implement the proper adjustment appears to be at least as complex as that required to calculate the cost-effective level of care.” See Calfee & Craswell, *supra* note 8, at 1001.

future studies so as to provide potential alternatives to the current system if the results from this study are confirmed.

Although the current level of knowledge regarding the decisionmaking processes of physicians in their care determinations and juries in their negligence determinations is "rudimentary,"⁶⁴ this study has shown that at least on a preliminary level the assumed knowledge possessed by physicians regarding the malpractice system may be a considerable overestimation. Further, it appears that juries may be deeming physician care as negligent on some basis other than or in addition to their understanding of (one or more) professional, customary standards. Overall, as in many initial empirical studies of this type, the results raise more questions than they answer. In any event, in order to effectively examine the tort system and assess its impact on physician behavior, researchers must build on empirical determinations of how actors in the system actually perform rather than assert as self-evident or hope with childlike simplicity that their fundamental assumptions regarding the medical malpractice system are true.

⁶⁴"Even the most rudimentary facts about the legal system are unknown or misunderstood."
Derek C. Bok, *A Flawed System of Law Practice and Training*, 33 J. LEGAL EDUC. 570, 581 (1983).

APPENDIX: MALPRACTICE CASES

The following text represents the cases given to surveyed radiologists and NP's for assessment of agreement with jury verdicts. The administered survey follows directly after the case text.

CASE 1: FACTS: On 10/21/87 plaintiff, a 37-year-old food service manager, presented to [medical group] for diagnosis of a left breast lump, approximately 2 x 2 cm and of 8 months duration. She had a prior history of TMJ, Xanax and Halcion ingestion, and psychiatric and psychological treatment. Plaintiff had a company physical earlier that day, given by her former family physician. Plaintiff was seen first by Defendant internist Dr. H, of [medical group], at which time Plaintiff was examined and the lump palpated. Dr. H ordered a mammogram for diagnostic purposes, which was automatically approved per the group policy. The mammogram films were returned to defendant [Hospital] on 10/26. Upon receipt of the films, the medical technician was to review the patient's chart and place on her pre-report any pertinent clinical information. The pre-report form and films were sent for interpretation to defendant radiologist Dr. R. The pre-report form, however, was devoid of any clinical information regarding the lump. Since there was no clinical information, the patient was only 37 years old and there were only 4 films, Dr. R interpreted the request as a screening mammogram and read the films as normal. This was conveyed to Dr. H by way of a report. She in turn told plaintiff at her follow-up visit that the mammogram was normal and that she should return at age 40. She was allegedly told by Dr. H that the lump was a milk duct which sometimes get larger and not to worry about it (disputed). Relying on this advice, plaintiff did nothing for 2 years, despite the fact that the lump continued to increase in size. During this period she had 2 company physicals and saw psychologists and psychiatrists for other problems. In 10/89, plaintiff presented at [medical group]; and on examination, was found to have a breast mass that palpated at 10 x 15 cm. She underwent a modified radical mastectomy and was diagnosed as Stage III cancer. Late in 1/90 a distant metastasis was discovered in the right axillary nodes and her staging was changed from III to IV. Even with a question of further distant metastasis, all physicians testified that plaintiff is terminal. Defendant radiologist Dr. R was sued.

PLAINTIFF contended that defendant radiologist Dr. R misread the mammogram; that he failed to obtain clinical information which would have disclosed the existence of a mass; that he failed to require the clinician to correlate the mammogram with her own findings; and that as a result of Dr. R's breaches of the standard of care, plaintiff's cancer progressed such that while she was in Stage I when she presented in 10/87, she was in Stage IV by the time of her mastectomy in 1989.

DEFENDANT contended that he did not misread the mammogram; that in any event, 20% of negative mammograms are false; that he read the mammogram as a screening mammogram since there was no clinical information available, that 4 films were exposed, and the patient was only 37 years old; that his actions were within the standard of care; that if there was a mass, he would expect the clinician to call back, which she did not do; that he did not have to include in his report a caveat for the clinician to correlate the report with the clinical findings, as this was the clinician's job. Defendant radiologist further claimed that plaintiff was in Stage II and not Stage I at the time of her visit in 10/87; and thus the change in her survival rate was not significant; and that the plaintiff was contributorily negligent for waiting two years before seeking treatment despite seeing other health care providers.

DEFENDANT VERDICT: WALKER v. SAN GABRIEL VALLEY MEDICAL GROUP, Case No. GC 000 224, L.A. County, California, November 6, 1991.

CASE 2: FACTS: On 12-6-83, plaintiff (79) underwent a barium enema performed by defendant radiologist Dr. S at defendant [Hospital]. Following the test, the plaintiff returned to her hospital room. Upon complaints of severe abdominal pain, she was examined by her treating physician, Dr. M. A call was made to the Radiology Department to review the films. Upon review, extravasation of barium was found and a diagnosis of a tear in the rectum made. General surgeon, Dr. D, was called in for consultation. A decision was made not to operate but to let the perforation heal on its own if possible. The plaintiff was put on a large and continuous regimen of antibiotics, including Tobramycin. The plaintiff experienced rectal incontinence for three to four months and permanent urinary incontinence, which has required her to wear a diaper for the rest of her life.

PLAINTIFF alleged that the insertion and inflation of the barium enema catheter with inflatable balloon was done improperly. Plaintiff's expert stated that the inflatable balloon was overinflated causing the rectum to rupture. Further, it was alleged that the insertion and inflation should have been performed by the defendant radiologist under fluoroscopic examination. Plaintiff further alleged insertion and inflation was done blindly by a technician and the radiologist came into the room thereafter. Plaintiff, almost totally deaf, testified that she felt agonizing pain upon insertion and inflation of the balloon; it was disputed that a female technician was involved and plaintiff's claim that "some man" performed the entire test. Plaintiff also claimed deafness due to the use of Tobramycin.

DEFENDANT contended there were 2 ways of performing this test one of which is recognized--the recognized method was performed therefore the defendant was not responsible. Defendant further contended that it was within the standard of care to allow a technologist to insert the tip and inflate the balloon without fluoroscopic evaluation by a physician. As well, it was alleged that overinflation of the balloon on the tip could not have been the cause of the laceration as there was no evidence of extravasation until late into the test. The defense denied that the balloon could seal such a laceration until deflation. Defendant claimed that the cause of the laceration of the rectum was due to diminished mucosal elasticity due to age and long term Prednisone use of the plaintiff for arthritis.

DEFENDANT VERDICT: FITZPATRICK v. (1) R. A. SILVEIRA, M.D. AND (2) ST. JUDE RADIOLOGY MEDICAL GROUP, Case No. 427793, Orange County Court, California, April 10, 1986.

CASE 3: FACTS: A 36-year-old male car assembly plant worker died of a pulmonary embolism hours after being tested for an embolism. Following open reduction surgery to his leg the decedent experienced chest pains. The defendant internist ordered tests to check for pulmonary emboli. The defendant radiologist reported that there was 'no good evidence for pulmonary embolism' and the defendant internist therefore took no action. The decedent died a few hours after being tested.

PLAINTIFF claimed that the defendant radiologist provided the internist with an unclear report and the defendant internist failed to clarify the report. The plaintiff contended that given the decedent's symptoms the defendant internist should have administered the anti-clotting drug Heparin.

DEFENDANT internist asserted that based on the defendant radiologist's report administering Heparin was not indicated. The defendants contended that Heparin would prevent the formation of new clots but the clot that killed the decedent was already formed at the time of the radiologist's testing.

PLAINTIFF VERDICT: SMITH, ET AL. v. CHRISTIAN HOSPITAL NORTHEAST-NORTHWEST, ET AL., 1987 WL 234033.

CASE 4: FACTS: On 10/12/84, a 33-year-old part-time teacher's helper underwent a myelogram that left her partially paralyzed. For many years in her life, plaintiff experienced back pain. After two episodes in which she experienced sharp pains following physical activity, plaintiff, who was married to a member of the Air Force, sought treatment at [Hospital]. Plaintiff was admitted to the hospital on 10/2/84, with a diagnosis of a herniated disc. Lumbar spine x-rays and a CT-scan did not indicate a herniated disc. Plaintiff was given Valium as a muscle relaxer. On 10/6, the Valium was discontinued because plaintiff was not responding as expected. Robaxin, another muscle relaxer, was prescribed instead. On 10/8, plaintiff developed a rash on her abdomen, chest, back and upper arms. The origin of the rash was unknown. The physicians at the hospital recommended a myelogram; a diagnostic procedure in which part of the back is anesthetized, a needle is inserted into the spine and some fluid is withdrawn. The fluid is replaced by a dye, and the back is x-rayed. The dye used for plaintiff was Amipaque, a brand name of the contrast medium metrizamide. On the night before the myelogram was scheduled to be performed, the defendant radiologist who performed the procedure testified that he met with the patient and explained the procedure to her in detail, including the common and unusual risks. Plaintiff denied that the defendant radiologist ever explained the procedure. On the morning of the next day, plaintiff signed an informed consent form and underwent the procedure. Plaintiff's back was anesthetized with a small needle, approximately 1.5 cm. in length. At some point after the Amipaque was injected into plaintiff's spine, plaintiff allegedly stated that she wondered if her legs were in the air, because she could not feel them. The defendant radiologist denied that plaintiff made this statement. In any case, the procedure was continued. After the procedure was completed, plaintiff experienced a weakness in both legs, a tingling sensation in both feet and she was unable to stand or void. She remains partially paralyzed from the waist down.

PLAINTIFF alleged that the defendant radiologist never obtained plaintiff's informed consent because the risks of the procedure were never disclosed and plaintiff signed the form while she was on Valium. It was also alleged that the myelogram should not have been performed; that plaintiff had an allergic reaction to Valium that indicated a heightened sensitivity to metrizamide, and that the doctors did not utilize tests that would have shown that an Amipaque myelogram was contraindicated. The plaintiff claimed that the positioning of the spinal needle during the procedure was improper. Plaintiff also contended that the procedure should have been stopped once the patient stated that she could not feel her legs, and that the defendant radiologist should have immediately withdrawn the metrizamide from plaintiff's spine and given her massive doses of Decadron to reverse the adverse effects of metrizamide. Finally, it was alleged that the follow-up care was inadequate.

DEFENDANT contended that the standard of care was met in all respects. Defendant argued that the cause of plaintiff's injuries was the contrast dye and not the needle inserted into the spinal column.

DEFENDANT VERDICT: AVAKIAN V. UNITED STATES, No. 85-CV-706 (N.D. N.Y., Syracuse, June 12, 1990).

CASE 5: FACTS: Plaintiff, a 69-year-old school teacher, experienced a single episode of rectal bleeding. She was referred to defendant [imaging center] for an air contrast barium enema. Defendant radiologist ruptured plaintiff's transverse colon while performing the procedure. As a result, plaintiff required emergency surgery and had to wear a colostomy bag for eight months. She also required additional surgery for closure of the colostomy. Plaintiff had an excellent recovery.

PLAINTIFF alleged that defendant radiologist was negligent in inserting too much air into her colon, causing a rupture of an otherwise healthy colon.

DEFENDANTS contended that plaintiff had a pre-existing disease of the colon which weakened it or predisposed it to perforation or rupture during the barium enema procedure.

PLAINTIFF VERDICT: LINDQUIST V. YORK X-RAY & OSTEOPOROSIS CENTER, INC. AND SAI B. YOON, M.D., Case No. 178998, Cuyahoga County, Ohio, July 30, 1990.

CASE 6: FACTS: In December 1986, the plaintiff underwent a mammogram at the defendant [imaging center] which was interpreted as normal by the defendant radiologist. Approximately 13 months later, the plaintiff's treating ob/gyn detected a lump in the plaintiff's right breast. The lump was biopsied and a diagnosis of advanced multifocal invasive carcinoma was made. The plaintiff's mammography expert testified that the initial mammogram performed in December 1986 was misinterpreted by the defendant radiologist as normal. The plaintiff's expert maintained that the mammogram depicted micro-calcifications indicative of breast cancer. The plaintiff's expert maintained that had the microcalcifications been noted and a proper diagnosis been made at this early stage, the plaintiff would have had the opportunity to undergo a lumpectomy rather than the mastectomy procedure which she was required to undergo 13 months later. The defendant's radiology expert testified that microcalcifications vary greatly in size from those which are clearly detectable to those which are so small as to be virtually undetectable. The defendant's expert maintained that although microcalcifications were undisputedly noted in the initial mammogram upon retrospective review of the film, the defendant's failure to note the calcifications at the time of the initial interpretation was reasonable and did not constitute a deviation from the standard of care. The defendant's expert oncologist testified that even if the defendant had interpreted the initial mammogram as positive for breast cancer, the outcome would have been the same due to the aggressive and invasive nature of the particular cancer from which the plaintiff suffered; further, a mastectomy would likely have been required even with early diagnosis. The defendant's expert oncologist additionally testified that the location of the breast lump was different than the site of the microcalcifications depicted upon retrospective review of the mammogram, leading to his conclusion that the lump was not the advanced progression of the cancer from the initial site, but cancer which developed from a completely separate site.

PLAINTIFF contended that as a result of the negligence of the defendant radiologist in failing to properly interpret a routine mammogram, breast cancer which was depicted on the mammogram was permitted to progress undiagnosed and untreated; that the defendant's alleged deviation caused a delay in treatment of 13 months which effectively deprived her of having the more conservative lumpectomy treatment.

DEFENDANT indicated that defendant's failure to note the calcifications at time of initial interpretation was reasonable and did not deviate from the standard of care.

DEFENDANT VERDICT: LAROCHELLE V. NEW ENGLAND MAMMOGRAPHY, INC., ET AL., Case No. 89-C-054, Strafford County, New Hampshire, Sept. 28, 1992.

CASE 7: FACTS: On 12/21/87, Plaintiff, who was 14 to 15 weeks pregnant, experienced mild vaginal bleeding. At that point she had not received any prenatal care for this pregnancy. Plaintiff called the [Clinic] where she had received prenatal care for two of her three prior pregnancies, notified them she was pregnant and had experienced bleeding. Plaintiff was told to lie down, elevate her legs, and rest. If the bleeding continued, she was instructed to go to [Medical Center] to be examined by a physician. Later that day plaintiff passed an additional clot of blood. Following the advice of [Clinic], she presented to the ER at [Medical Center] where she was seen by an ER physician who conducted a physical examination. The ER physician told her everything appeared fine but that she should return the following day for a pelvic sonogram which he would schedule for her. The following day, plaintiff returned to [Medical Center] where she was seen in the radiology department and a pelvic sonogram performed. The sonogram was interpreted by defendant radiologist Dr. W and interpreted as normal for a pregnancy of 14 to 15 weeks gestation. Later that day, Plaintiff presented at the [Clinic] where she registered for her prenatal care. She continued to be seen at the clinic periodically for prenatal checkups throughout the course of her pregnancy. In 5/88, an observation was made by one of the staff gynecologists at [Clinic] that plaintiff appeared to be larger than her gestational date would indicate. At that point a determination was made to refer her for a follow up sonogram to rule out the existence of twins. Plaintiff was referred to the High Risk Clinic because of the possibility of hydramnios (too much amniotic fluid). On 5/23/88, a follow up sonogram was done at [Medical Center] which revealed massive hydrocephalus. On 6/2/88, Plaintiff underwent a Cesarean section at [Medical Center] at which time a baby boy CG, was delivered. As allegedly demonstrated on the sonogram, the child was born with massive hydrocephalus. Since birth, CG has been hospitalized on numerous occasions for shunt revisions and replacements. CG was born with massive brain damage as a consequence of the hydrocephalus. As a consequence of the brain damage attributable to hydrocephalus, CG's physical impairments are considerable. He is unable to speak, walk, hold his head up, perform fine motor movement, feed himself, crawl, and requires the use of a child's seat in order to sit up. Given the profound nature of CG's physical and mental impairment his life expectancy is believed to be no more than a few years, at best.

PLAINTIFFS alleged defendant radiologist Dr. W failed to properly interpret the sonogram studies performed on 12/22/87 at [Medical Center]. Plaintiffs also alleged the sonogram films demonstrate: (1) the existence of hydrocephalus; and (2) the existence of polyhydramnios. Plaintiffs contend that based upon the information contained in the 12/87 sonogram, defendant radiologist Dr. W should have requested a repeat or follow up sonogram be performed within 4 to 6 weeks. Had this been done, hydrocephalus would have been diagnosed. Plaintiff testified that, if she had been made aware of the existence of congenital fetal defects prior to 26 weeks, she would have had an abortion.

DEFENDANT Dr. W denied liability and alleged that the 12/87 sonogram which he interpreted was normal and did not demonstrate either hydramnios or hydrocephalus.

DEFENDANT VERDICT: AIDA TORRES and MIGUEL GINES as parents and natural guardians of CELSO GINES, a minor vs. A. PAUL WENDEL, M.D., NORTH BROWARD RADIOLOGISTS, P.A., f/k/a N. BROWARD RADIOLOGISTS OSTERMAN CICERIC RAIA, P.A., Docket No. 90-3976 03, Broward County, Florida, October 15, 1992.

CASE 8: FACTS: Plaintiff, 61 year old male, consulted a general practitioner for complaints of intermittent claudication and history of syncope. Plaintiff was referred to a vascular surgeon who recommended arch and abdominal angiography, which was performed by defendant radiologist. There were no problems or complications during the procedure but approximately 5 hours following the procedure plaintiff complained of difficulty focusing. At the time of trial, plaintiff was blind and complained of brain damage and memory loss. Plaintiff could not remember the angiography or his hospitalization. Plaintiff claimed he would not have consented to the procedure had he understood what was being studied, as he had had cerebral angiography several years before and was told he had a narrowing of an artery in the brain and nothing could be done for that condition. On cross-examination, plaintiff's expert acknowledged he could not say without speculating whether plaintiff's damage was the result of vasospasm (a known complication of the procedure) or a drop in blood pressure.

PLAINTIFF contended defendant should have ordered prior studies and blood pressure monitoring during the procedure which could have been corrected had it been detected.

DEFENDANT radiologist claimed plaintiff never told his doctors about the prior procedure, and in any event the procedure was indicated given the symptoms. Defendant radiologist also claimed blood pressure monitoring with blood pressure cuff not required by the standard of care. There was not a fall in blood pressure during the procedure and any significant fall in blood pressure would have been apparent clinically; also defendant claimed he discussed the procedure thoroughly with the plaintiff who consented to have it done. PLAINTIFF VERDICT: FRY vs. BLOCK, Case No. SEC-47 181, Norwalk County, California.

CASE 9: FACTS: In 4/88, Plaintiff, a 40 year old female member of defendant [health group] through her employer, went to the [health group] clinic to be examined for a lump in her right breast. Plaintiff's initial diagnosis was fibrocystic changes and she was referred to defendant [imaging facility] for a mammogram. On 5/3/88, defendant radiologist Dr. S advised plaintiff that there was no suspicion of malignancy on the bilateral mammography and recommended an annual follow-up. In early 1989, Plaintiff returned to Defendant [health group] clinic with the same complaint of a lump in her right breast. Plaintiff's was still diagnosed with fibrocystic disease. On 3/28/89, Plaintiff underwent a mammogram at defendant [imaging facility] which indicated a high probability of an infiltrating scirrhous carcinoma in the right breast. On 4/11/89, a biopsy was performed which indicated a moderately differentiated infiltrating duct with intraductal carcinoma in the right breast, and only fibrocystic changes in the left breast. Plaintiff had Stage II disease, with growth extending to the lymph nodes in the lower axillary nodes. On 4/19/89, Plaintiff underwent a modified radical mastectomy or removal of the right breast and had to undergo extensive chemotherapy and radiation therapy after surgery.

PLAINTIFF contended Defendants were negligent in failing to timely diagnose the breast cancer and in failing to perform a surgical biopsy on 5/3/88. Plaintiff also contended the diagnosis should have been made 11 months earlier than when the 4/11/89 biopsy was performed and that the delay has reduced her treatment options and survivability.

DEFENDANTS denied negligence and denied that any presumed delay altered the course and events of Plaintiff's condition.

DEFENDANT VERDICT: LYNDIA VAUGHAN vs. SYLVAN SARASOHN, M.D., MILLER, SARASOHN, WALDMAN, HILLMAN, FABIAN & STOKES, M.D., CIGNA HEALTHPLAN OF FLORIDA, INC., CARROLLWOOD RADIOLOGY & BREASTCARE CENTER, and DRS. SHEER, AHEARN & ASSOCIATES, P.A., Docket No. 90-14787, Hillsborough County, Florida, 1992.

CASE 10: FACTS: Plaintiff decedent presented to [Hospital ER] complaining of a sore shoulder. An X-ray was taken of the shoulder. Plaintiff was told that it was a sprain and sent home. Later, the defendant radiologist reviewed the x-ray taken while plaintiff was in the hospital and sent a report to the hospital and emergency room advising that the plaintiff had a potential malignancy. No one ever notified the plaintiff, who later died of the malignancy.

PLAINTIFF contended that the defendant radiologist was negligent in failing to ensure that the decedent was notified of the fact that the x-ray depicted a possible malignancy, thereby causing a delay in treatment which deprived the decedent of the 5% chance of survival he otherwise would have had.

DEFENDANT radiologist contended that he fulfilled his obligations with regard to reporting the x-ray findings by notifying via report both the hospital and the emergency room that the x-ray depicted potential cancer.

DEFENDANT VERDICT: MCKAIN V. CHARLES MOORE, M.D., Case No. A86-1219-NM, Kalamazoo, Michigan.

CASE 11: FACTS: Plaintiff female decedent presented to the defendant general practitioner in 12/86 with symptoms of a palpable lump in her breast. The defendant family practitioner sent her to the codefendant radiologist for a mammogram which was read as negative by the codefendant radiologist. There was a factual dispute as to whether the plaintiff was told to return for a follow-up exam and mammogram. The plaintiff's evidence indicated that the lump in the decedent's breast continued to progress in size and she developed a lump under her arm, eventually prompting her to seek another opinion. In 7/88, the decedent was diagnosed with breast cancer. Although she was immediately started on therapy including surgery and chemotherapy, she expired in 2/90. The plaintiff's expert radiologist contended that the co-defendant radiologist deviated from the standard of care in reading the 1986 mammogram as normal when, in fact, suspicious microcalcifications were depicted. The plaintiff's experts additionally maintained that both defendants were negligent in failing to ensure that the plaintiff return for a follow-up mammogram. The plaintiff's expert oncologist opined that the decedent would have had a significant chance of cure had the breast cancer been diagnosed in 12/86 at the time of the initial mammogram. Defendants alleged that the plaintiff was told to return for follow-up care and did not. Defendants' expert maintained the type of cancer from which the plaintiff suffered was not the type which would have responded to chemotherapy and radiation and that therefore the outcome would have been the same regardless of when the cancer was diagnosed.

PLAINTIFF contended that the defendant general practitioner and codefendant radiologist negligently failed to diagnose breast cancer at the time the plaintiff presented to the defendant.

DEFENDANTS denied that the mammogram was improperly read and asserted that the plaintiff was specifically advised to return for a mammogram after her next period and was overwhelmingly contributorily negligent in failing to return for follow-up testing.

PLAINTIFF VERDICT: DARNELL V. ULRICH, ET AL., Case No. CV92-06-2245, Summit County, Ohio, Feb. 26, 1993.

FACTS: On 10/21/87 plaintiff, a 37-year-old food service manager, presented to [medical group] for diagnosis of a left breast lump, approximately 2 x 2 cm and of 8 months duration. She had a prior history of TMJ, Xanax and Halcion ingestion, and psychiatric and psychological treatment. Plaintiff had a company physical earlier that day, given by her former family physician. Plaintiff was seen first by Defendant internist Dr. H, of [medical group], at which time Plaintiff was examined and the lump palpated. Dr. H ordered a mammogram for diagnostic purposes, which was automatically approved per the group policy. The mammogram films were returned to defendant [Hospital] on 10/26. Upon receipt of the films, the medical technician was to review the patient's chart and place on her pre-report any pertinent clinical information. The pre-report form and films were sent for interpretation to defendant radiologist Dr. R. The pre-report form, however, was devoid of any clinical information regarding the lump. Since there was no clinical information, the patient was only 37 years old and there were only 4 films, Dr. R interpreted the request as a screening mammogram and read the films as normal. This was conveyed to Dr. H by way of a report. She in turn told plaintiff at her follow-up visit that the mammogram was normal and that she should return at age 40. She was allegedly told by Dr. H that the lump was a milk duct which sometimes get larger and not to worry about it (disputed). Relying on this advice, plaintiff did nothing for 2 years, despite the fact that the lump continued to increase in size. During this period she had 2 company physicals and saw psychologists and psychiatrists for other problems. In 10/89, plaintiff presented at [medical group]; and on examination, was found to have a breast mass that palpated at 10 x 15 cm. She underwent a modified radical mastectomy and was diagnosed as Stage III cancer. Late in 1/90 a distant metastasis was discovered in the right axillary nodes and her staging was changed from III to IV. Even with a question of further distant metastasis, all physicians testified that plaintiff is terminal. Defendant radiologist Dr. R was sued.

PLAINTIFF contended that defendant radiologist Dr. R misread the mammogram; that he failed to obtain clinical information which would have disclosed the existence of a mass; that he failed to require the clinician to correlate the mammogram with her own findings; and that as a result of Dr. R's breaches of the standard of care, plaintiff's cancer progressed such that while she was in Stage I when she presented in 10/87, she was in Stage IV by the time of her mastectomy in 1989.

DEFENDANT contended that he did not misread the mammogram; that in any event, 20% of negative mammograms are false; that he read the mammogram as a screening mammogram since there was no clinical information available, that 4 films were exposed, and the patient was only 37 years old; that his actions were within the standard of care; that if there was a mass, he would expect the clinician to call back, which she did not do; that he did not have to include in his report a caveat for the clinician to correlate the report with the clinical findings, as this was the clinician's job. Defendant radiologist further claimed that plaintiff was in Stage II and not Stage I at the time of her visit in 10/87; and thus the change in her survival rate was not significant; and that the plaintiff was contributorily negligent for waiting two years before seeking treatment despite seeing other health care providers.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u> <u>Negligent</u>	<u>Can't Tell*</u>	<u>Most Likely</u> <u>Not Negligent</u>	<u>Not Negligent</u>
5	4	3	2	1

*Please indicate why:

FACTS: On 12-6-83, plaintiff (79) underwent a barium enema performed by defendant radiologist Dr. S at defendant [Hospital]. Following the test, the plaintiff returned to her hospital room. Upon complaints of severe abdominal pain, she was examined by her treating physician, Dr. M. A call was made to the Radiology Department to review the films. Upon review, extravasation of barium was found and a diagnosis of a tear in the rectum made. General surgeon, Dr. D, was called in for consultation. A decision was made not to operate but to let the perforation heal on its own if possible. The plaintiff was put on a large and continuous regimen of antibiotics, including Tobramycin. The plaintiff experienced rectal incontinence for three to four months and permanent urinary incontinence, which has required her to wear a diaper for the rest of her life.

PLAINTIFF alleged that the insertion and inflation of the barium enema catheter with inflatable balloon was done improperly. Plaintiff's expert stated that the inflatable balloon was overinflated causing the rectum to rupture. Further, it was alleged that the insertion and inflation should have been performed by the defendant radiologist under fluoroscopic examination. Plaintiff further alleged insertion and inflation was done blindly by a technician and the radiologist came into the room thereafter. Plaintiff, almost totally deaf, testified that she felt agonizing pain upon insertion and inflation of the balloon; it was disputed that a female technician was involved and plaintiff's claim that "some man" performed the entire test. Plaintiff also claimed deafness due to the use of Tobramycin.

DEFENDANT contended there were 2 ways of performing this test one of which is recognized--the recognized method was performed therefore the defendant was not responsible. Defendant further contended that it was within the standard of care to allow a technologist to insert the tip and inflate the balloon without fluoroscopic evaluation by a physician. As well, it was alleged that overinflation of the balloon on the tip could not have been the cause of the laceration as there was no evidence of extravasation until late into the test. The defense denied that the balloon could seal such a laceration until deflation. Defendant claimed that the cause of the laceration of the rectum was due to diminished mucosal elasticity due to age and long term Prednisone use of the plaintiff for arthritis.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

*Please indicate why:

FACTS: A 36-year-old male car assembly plant worker died of a pulmonary embolism hours after being tested for an embolism. Following open reduction surgery to his leg the decedent experienced chest pains. The defendant internist ordered tests to check for pulmonary emboli. The defendant radiologist reported that there was 'no good evidence for pulmonary embolism' and the defendant internist therefore took no action. The decedent died a few hours after being tested.

PLAINTIFF claimed that the defendant radiologist provided the internist with an unclear report and the defendant internist failed to clarify the report. The plaintiff contended that given the decedent's symptoms the defendant internist should have administered the anti-clotting drug Heparin.

DEFENDANT internist asserted that based on the defendant radiologist's report administering Heparin was not indicated. The defendants contended that Heparin would prevent the formation of new clots but the clot that killed the decedent was already formed at the time of the radiologist's testing.

CIRCLE ONE:

Negligent

5

Most Likely
Negligent

4

Can't Tell*

3

Most Likely
Not Negligent

2

Not Negligent

1

*Please indicate why:

FACTS: On 10/12/84, a 33-year-old part-time teacher's helper underwent a myelogram that left her partially paralyzed. For many years in her life, plaintiff experienced back pain. After two episodes in which she experienced sharp pains following physical activity, plaintiff, who was married to a member of the Air Force, sought treatment at [Hospital]. Plaintiff was admitted to the hospital on 10/2/84, with a diagnosis of a herniated disc. Lumbar spine x-rays and a CT-scan did not indicate a herniated disc. Plaintiff was given Valium as a muscle relaxer. On 10/6, the Valium was discontinued because plaintiff was not responding as expected. Robaxin, another muscle relaxer, was prescribed instead. On 10/8, plaintiff developed a rash on her abdomen, chest, back and upper arms. The origin of the rash was unknown. The physicians at the hospital recommended a myelogram; a diagnostic procedure in which part of the back is anesthetized, a needle is inserted into the spine and some fluid is withdrawn. The fluid is replaced by a dye, and the back is x-rayed. The dye used for plaintiff was Amipaque, a brand name of the contrast medium Metrizamide. On the night before the myelogram was scheduled to be performed, the defendant radiologist who performed the procedure testified that he met with the patient and explained the procedure to her in detail, including the common and unusual risks. Plaintiff denied that the defendant radiologist ever explained the procedure. On the morning of the next day, plaintiff signed an informed consent form and underwent the procedure. Plaintiff's back was anesthetized with a small needle, approximately 1.5 cm. in length. At some point after the Amipaque was injected into plaintiff's spine, plaintiff allegedly stated that she wondered if her legs were in the air, because she could not feel them. The defendant radiologist denied that plaintiff made this statement. In any case, the procedure was continued. After the procedure was completed, plaintiff experienced a weakness in both legs, a tingling sensation in both feet and she was unable to stand or void. She remains partially paralyzed from the waist down.

PLAINTIFF alleged that the defendant radiologist never obtained plaintiff's informed consent because the risks of the procedure were never disclosed and plaintiff signed the form while she was on Valium. It was also alleged that the myelogram should not have been performed; that plaintiff had an allergic reaction to Valium that indicated a heightened sensitivity to Metrizamide, and that the doctors did not utilize tests that would have shown that an Amipaque myelogram was contraindicated. The plaintiff claimed that the positioning of the spinal needle during the procedure was improper. Plaintiff also contended that the procedure should have been stopped once the patient stated that she could not feel her legs, and that the defendant radiologist should have immediately withdrawn the Metrizamide from plaintiff's spine and given her massive doses of Decadron to reverse the adverse effects of Metrizamide. Finally, it was alleged that the follow-up care was inadequate.

DEFENDANT contended that the standard of care was met in all respects. Defendant argued that the cause of plaintiff's injuries was the contrast dye and not the needle inserted into the spinal column.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

*Please indicate why:

FACTS: Plaintiff, a 69-year-old school teacher, experienced a single episode of rectal bleeding. She was referred to defendant [imaging center] for an air contrast barium enema. Defendant radiologist ruptured plaintiff's transverse colon while performing the procedure. As a result, plaintiff required emergency surgery and had to wear a colostomy bag for eight months. She also required additional surgery for closure of the colostomy. Plaintiff had an excellent recovery.

PLAINTIFF alleged that defendant radiologist was negligent in inserting too much air into her colon, causing a rupture of an otherwise healthy colon.

DEFENDANTS contended that plaintiff had a pre-existing disease of the colon which weakened it or predisposed it to perforation or rupture during the barium enema procedure.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely Negligent</u>	<u>Can't Tell*</u>	<u>Most Likely Not Negligent</u>	<u>Not Negligent</u>
5	4	3	2	1

*Please indicate why:

FACTS: In December 1986, the plaintiff underwent a mammogram at the defendant [imaging center] which was interpreted as normal by the defendant radiologist. Approximately 13 months later, the plaintiff's treating ob/gyn detected a lump in the plaintiff's right breast. The lump was biopsied and a diagnosis of advanced multifocal invasive carcinoma was made. The plaintiff's mammography expert testified that the initial mammogram performed in December 1986 was misinterpreted by the defendant radiologist as normal. The plaintiff's expert maintained that the mammogram depicted micro-calcifications indicative of breast cancer. The plaintiff's expert maintained that had the microcalcifications been noted and a proper diagnosis been made at this early stage, the plaintiff would have had the opportunity to undergo a lumpectomy rather than the mastectomy procedure which she was required to undergo 13 months later. The defendant's radiology expert testified that microcalcifications vary greatly in size from those which are clearly detectable to those which are so small as to be virtually undetectable. The defendant's expert maintained that although microcalcifications were undisputedly noted in the initial mammogram upon retrospective review of the film, the defendant's failure to note the calcifications at the time of the initial interpretation was reasonable and did not constitute a deviation from the standard of care. The defendant's expert oncologist testified that even if the defendant had interpreted the initial mammogram as positive for breast cancer, the outcome would have been the same due to the aggressive and invasive nature of the particular cancer from which the plaintiff suffered; further, a mastectomy would likely have been required even with early diagnosis. The defendant's expert oncologist additionally testified that the location of the breast lump was different than the site of the microcalcifications depicted upon retrospective review of the mammogram, leading to his conclusion that the lump was not the advanced progression of the cancer from the initial site, but cancer which developed from a completely separate site.

PLAINTIFF contended that as a result of the negligence of the defendant radiologist in failing to properly interpret a routine mammogram, breast cancer which was depicted on the mammogram was permitted to progress undiagnosed and untreated; that the defendant's alleged deviation caused a delay in treatment of 13 months which effectively deprived her of having the more conservative lumpectomy treatment.

DEFENDANT indicated that defendant's failure to note the calcifications at time of initial interpretation was reasonable and did not deviate from the standard of care.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

***Please indicate why:**

FACTS: On 12/21/87, Plaintiff, who was 14 to 15 weeks pregnant, experienced mild vaginal bleeding. At that point she had not received any prenatal care for this pregnancy. Plaintiff called the [Clinic] where she had received prenatal care for two of her three prior pregnancies, notified them she was pregnant and had experienced bleeding. Plaintiff was told to lie down, elevate her legs, and rest. If the bleeding continued, she was instructed to go to [Medical Center] to be examined by a physician. Later that day plaintiff passed an additional clot of blood. Following the advice of [Clinic], she presented to the ER at [Medical Center] where she was seen by an ER physician who conducted a physical examination. The ER physician told her everything appeared fine but that she should return the following day for a pelvic sonogram which he would schedule for her. The following day, plaintiff returned to [Medical Center] where she was seen in the radiology department and a pelvic sonogram performed. The sonogram was interpreted by defendant radiologist Dr. W and interpreted as normal for a pregnancy of 14 to 15 weeks gestation. Later that day, Plaintiff presented at the [Clinic] where she registered for her prenatal care. She continued to be seen at the clinic periodically for prenatal checkups throughout the course of her pregnancy. In 5/88, an observation was made by one of the staff gynecologists at [Clinic] that plaintiff appeared to be larger than her gestational date would indicate. At that point a determination was made to refer her for a follow up sonogram to rule out the existence of twins. Plaintiff was referred to the High Risk Clinic because of the possibility of hydramnios (too much amniotic fluid). On 5/23/88, a follow up sonogram was done at [Medical Center] which revealed massive hydrocephalus. On 6/2/88, Plaintiff underwent a Cesarean section at [Medical Center] at which time a baby boy CG, was delivered. As allegedly demonstrated on the sonogram, the child was born with massive hydrocephalus. Since birth, CG has been hospitalized on numerous occasions for shunt revisions and replacements. CG was born with massive brain damage as a consequence of the hydrocephalus. As a consequence of the brain damage attributable to hydrocephalus, CG's physical impairments are considerable. He is unable to speak, walk, hold his head up, perform fine motor movement, feed himself, crawl, and requires the use of a child's seat in order to sit up. Given the profound nature of CG's physical and mental impairment his life expectancy is believed to be no more than a few years, at best.

PLAINTIFFS alleged defendant radiologist Dr. W failed to properly interpret the sonogram studies performed on 12/22/87 at [Medical Center]. Plaintiffs also alleged the sonogram films demonstrate: (1) the existence of hydrocephalus; and (2) the existence of polyhydramnios. Plaintiffs contend that based upon the information contained in the 12/87 sonogram, defendant radiologist Dr. W should have requested a repeat or follow up sonogram be performed within 4 to 6 weeks. Had this been done, hydrocephalus would have been diagnosed. Plaintiff testified that, if she had been made aware of the existence of congenital fetal defects prior to 26 weeks, she would have had an abortion.

DEFENDANT Dr. W denied liability and alleged that the 12/87 sonogram which he interpreted as normal and did not demonstrate either hydramnios or hydrocephalus.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

*Please indicate why:

FACTS: Plaintiff, 61 year old male, consulted a general practitioner for complaints of intermittent claudication and history of syncope. Plaintiff was referred to a vascular surgeon who recommended arch and abdominal angiography, which was performed by defendant radiologist. There were no problems or complications during the procedure but approximately 5 hours following the procedure plaintiff complained of difficulty focusing. At the time of trial, plaintiff was blind and complained of brain damage and memory loss. Plaintiff could not remember the angiography or his hospitalization. Plaintiff claimed he would not have consented to the procedure had he understood what was being studied, as he had had cerebral angiography several years before and was told he had a narrowing of an artery in the brain and nothing could be done for that condition. On cross-examination, plaintiff's expert acknowledged he could not say without speculating whether plaintiff's damage was the result of vasospasm (a known complication of the procedure) or a drop in blood pressure.

PLAINTIFF contended defendant should have ordered prior studies and blood pressure monitoring during the procedure which could have been corrected had it been detected.

DEFENDANT radiologist claimed plaintiff never told his doctors about the prior procedure, and in any event the procedure was indicated given the symptoms. Defendant radiologist also claimed blood pressure monitoring with blood pressure cuff not required by the standard of care. There was not a fall in blood pressure during the procedure and any significant fall in blood pressure would have been apparent clinically; also defendant claimed he discussed the procedure thoroughly with the plaintiff who consented to have it done.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u> <u>Negligent</u>	<u>Can't Tell*</u>	<u>Most Likely</u> <u>Not Negligent</u>	<u>Not Negligent</u>
5	4	3	2	1

*Please indicate why:

FACTS: In 4/88, Plaintiff, a 40 year old female member of defendant [health group] through her employer, went to the [health group] clinic to be examined for a lump in her right breast. Plaintiff's initial diagnosis was fibrocystic changes and she was referred to defendant [imaging facility] for a mammogram. On 5/3/88, defendant radiologist Dr. S advised plaintiff that there was no suspicion of malignancy on the bilateral mammography and recommended an annual follow-up. In early 1989, Plaintiff returned to Defendant [health group] clinic with the same complaint of a lump in her right breast. Plaintiff's was still diagnosed with fibrocystic disease. On 3/28/89, Plaintiff underwent a mammogram at defendant [imaging facility] which indicated a high probability of an infiltrating scirrhous carcinoma in the right breast. On 4/11/89, a biopsy was performed which indicated a moderately differentiated infiltrating duct with intraductal carcinoma in the right breast, and only fibrocystic changes in the left breast. Plaintiff had Stage II disease, with growth extending to the lymph nodes in the lower axillary nodes. On 4/19/89, Plaintiff underwent a modified radical mastectomy or removal of the right breast and had to undergo extensive chemotherapy and radiation therapy after surgery.

PLAINTIFF contended Defendants were negligent in failing to timely diagnose the breast cancer and in failing to perform a surgical biopsy on 5/3/88. Plaintiff also contended the diagnosis should have been made 11 months earlier than when the 4/11/89 biopsy was performed and that the delay has reduced her treatment options and survivability.

DEFENDANTS denied negligence and denied that any presumed delay altered the course and events of Plaintiff's condition.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

*Please indicate why:

FACTS: Plaintiff decedent presented to [Hospital ER] complaining of a sore shoulder. An X-ray was taken of the shoulder. Plaintiff was told that it was a sprain and sent home. Later, the defendant radiologist reviewed the x-ray taken while plaintiff was in the hospital and sent a report to the hospital and emergency room advising that the plaintiff had a potential malignancy. No one ever notified the plaintiff, who later died of the malignancy.

PLAINTIFF contended that the defendant radiologist was negligent in failing to ensure that the decedent was notified of the fact that the x-ray depicted a possible malignancy, thereby causing a delay in treatment which deprived the decedent of the 5% chance of survival he otherwise would have had.

DEFENDANT radiologist contended that he fulfilled his obligations with regard to reporting the x-ray findings by notifying via report both the hospital and the emergency room that the x-ray depicted potential cancer.

CIRCLE ONE:

Negligent

5

Most Likely
Negligent

4

Can't Tell*

3

Most Likely
Not Negligent

2

Not Negligent

1

*Please indicate why:

FACTS: Plaintiff female decedent presented to the defendant general practitioner in 12/86 with symptoms of a palpable lump in her breast. The defendant family practitioner sent her to the codefendant radiologist for a mammogram which was read as negative by the codefendant radiologist. There was a factual dispute as to whether the plaintiff was told to return for a follow-up exam and mammogram. The plaintiff's evidence indicated that the lump in the decedent's breast continued to progress in size and she developed a lump under her arm, eventually prompting her to seek another opinion. In 7/88, the decedent was diagnosed with breast cancer. Although she was immediately started on therapy including surgery and chemotherapy, she expired in 2/90. The plaintiff's expert radiologist contended that the co-defendant radiologist deviated from the standard of care in reading the 1986 mammogram as normal when, in fact, suspicious microcalcifications were depicted. The plaintiff's experts additionally maintained that both defendants were negligent in failing to ensure that the plaintiff return for a follow-up mammogram. The plaintiff's expert oncologist opined that the decedent would have had a significant chance of cure had the breast cancer been diagnosed in 12/86 at the time of the initial mammogram. Defendants alleged that the plaintiff was told to return for follow-up care and did not. Defendants' expert maintained the type of cancer from which the plaintiff suffered was not the type which would have responded to chemotherapy and radiation and that therefore the outcome would have been the same regardless of when the cancer was diagnosed.

PLAINTIFF contended that the defendant general practitioner and codefendant radiologist negligently failed to diagnose breast cancer at the time the plaintiff presented to the defendant.

DEFENDANTS denied that the mammogram was improperly read and asserted that the plaintiff was specifically advised to return for a mammogram after her next period and was overwhelmingly contributorily negligent in failing to return for follow-up testing.

CIRCLE ONE:

<u>Negligent</u>	<u>Most Likely</u>	<u>Can't Tell*</u>	<u>Most Likely</u>	<u>Not Negligent</u>
	<u>Negligent</u>		<u>Not Negligent</u>	
5	4	3	2	1

*Please indicate why:

Table 1 Physician Demographics and Number of Negligence Identified

Physician #	Yrs Post Training	Academic Title	Served As Expert Witness?	Source of Info for Malpractice	Legal Background	Factors of Negligence Identified
AR1	24	Professor	7	annual 40 minute hospital conference by nonattorney	0	3
AR2	32	Professor	0	newspaper, rarely the New England Journal of Medicine	0	0
AR3	19	Professor	0	annual 40 minute hospital conference by nonattorney, journals	0	3
AR4	5	Assistant Professor	2	annual 40 minute hospital conference by nonattorney	0	1
AR5	23	Professor	27	television, attorneys who consult MD as an expert witness	0	2
AR6	1	Assistant Professor	0	newspapers, unsolicited journals	sister	0
AR7	8	Associate Professor	0	peers, newsletter (SCVIR, ACR)	0	0
AR8	20	Professor	0	newspapers, scientific meetings	son	1
AR9	14	Associate Professor	0	unsolicited journals, insurance company seminar, colleagues	0	0
AR10	10	Assistant Professor	0	was named in suit, colleagues, family who are physicians	0	1
AR11	7	Assistant Professor	1	newspapers, journals	cousin	3
AR12	20	Professor	4	insurance companies	0	1
AR13	3	Assistant Professor	0	peers who have been named in suits, expert witness experience	0	2
AR14	7	Associate Professor	3	unsolicited journals	0	1
AR15	3	Assistant Professor	6	newspapers, journals	0	2
AR16	6	Assistant Professor	0	staff meetings, quality assurance activities	0	3
AR17	17	Associate Professor	7	peers, newspapers, lectures	0	1
AR18	7	Associate Professor	0	annual 40 min hosp conf by nonatt, peers, unsolicited newsletters, American College of Radiol	0	0
AR19	10	Assistant Professor	0	journals, risk management course required for state license	0	2
AR20	5	Assistant Professor	0	"my main knowledge comes from rumor"	husband	1
Mean	12.05		2.85		Mean	1.45
Standard Deviation	9.54		6.20		Standard Deviation	1.05

Table 2 Agreement with Jury Verdicts By Physicians

Physician #	Case 10		Case 20		Case 30		Case 40		Case 50		Case 60		Case 70		Case 80		Case 90		Case 100		Case 110		MD Agreement Average
	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	Agreement	Libert Value	
ARI1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.17
ARI2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.25
ARI3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.50
ARI4	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.60
ARI5	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.67
ARI6	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.86
ARI7	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.25
ARI8	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.50
ARI9	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.32
ARI10	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.28
ARI11	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.58
ARI12	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.30
ARI13	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.30
ARI14	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.42
ARI15	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.32
ARI16	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.70
ARI17	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.87
ARI18	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.32
ARI19	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.40
ARI20	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0.40
Mean	0.78	2.38	0.47	2.00	0.33	2.40	0.75	2.30	0.18	2.16	0.50	3.05	0.79	2.55	0.05	1.80	0.40	2.70	0.41	3.00	0.47	2.85	
Standard Deviation	0.43	1.42	0.81	1.40	0.49	1.23	0.45	1.15	0.36	1.04	0.52	1.28	0.44	1.10	0.23	0.77	0.52	1.03	0.51	1.82	0.52	1.18	
TOTAL MD AGREEMENT AVERAGE																							0.44

Agreement With Jury: 0 = No, 1 = Yes; comparing 4, 5 or 1, 2 v. Jury Verdict
Libert Scale: 0 = Negligent, 4 = Most Negligent, 2 = Can't Tell, 2 = Most Negligent, 1 = Not negligent

Table 3 Agreement with Jury Verdicts by Nonphysicians

[illegible]

