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FACTORS ASSOCIATED WITH MEDICAL MALPRACTICE: RESULTS FROM A PILOT STUDY*

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The medical malpractice problem is not new. It can be traced through history from provisions in the Code of Hammurabi to acknowledgement by the ancient Egyptians, Greeks, and Romans, to doctrinal development in fourteenth century England.¹ The first reported English case occurred in 1375, and within fifty years, health care providers took out quasi-insurance policies on particular patients.² The first officially reported American case occurred in 1794, and the reporting of twenty-seven more cases in the next fifty years stimulated an early version of medical review panels, as well as the first physician exodus from practice in 1845.³ The "crisis" of the 1970's came and went, only to revive in the mid-1980's. Indeed, definitions for the "crises" seem to depend on one's perspective.⁴

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1. Abrams, *Medical Malpractice: An Overview of Legislative Reform and Judicial Response*, 2 *BIO*LAW 1, 9-10 (Supp. 1986).

2. *Id.* at 10 (citing *Statton v. Swanland*, Y.B. 48 Edw. 3, fo. 6, pl. 11 (1375)); Flemma, *Medical Malpractice: A Dilemma in the Search for Justice*, 68 *MARQ. L. REV.* 237, 239 (1985).

3. Abrams, *supra* note 1, at 10 (citing *Cross v. Guthrie*, 2 *Root* 90 (Conn. 1794)); Annas, Katz & Trakimas, *Medical Malpractice Litigation Under National Health Insurance: Essential or Expendable?*, 1975 *DUKE L.J.* 1335, 1336.

4. See, e.g., F. SLOAN & R. BOVBERG, *MEDICAL MALPRACTICE: CRISES, RESPONSE AND EFFECTS* (1989); Relman, *Changing the Malpractice Liability System*, 322 *NEW ENG. J.*

Commentators observe that information on medical malpractice is frequently limited quantitatively and generally consists of anecdotes, news reports, medical-legal composition, and descriptive research.⁵ The problem of medical malpractice is commonly associated with rapidly rising liability insurance premiums that reportedly change professional practice patterns by driving some practitioners from practice, by increasing defensive medicine, and by facilitating a questionably effective tort system. Medical malpractice "crises" are often defined in terms of premiums that increase in relation to higher frequency and severity of claims. Remedies have consisted primarily of legislative efforts aimed at reducing the incidence and severity of claims.

PREVIOUS RESEARCH

While legislative caps on awards appear to work as intended by reducing plaintiffs' recovery, reform efforts generally have not had a major impact on medical malpractice.⁶ Several studies have analyzed legal reforms comparatively across states over time.

Extending her earlier studies through 1984,⁷ Patricia Danzon found that shorter statutes of limitations and limits on discovery rules reduced claims⁸ frequency growth, and that offset of collateral benefits and caps on awards reduced claims severity.⁹ However, "none of the other reforms analyzed, including screening panels and limits on contingent fees, appears to have had any systematic impact on claim frequency or severity."¹⁰ Frank Sloan found

MED. 626 (1990); Saks, *In Search of the "Lawsuit Crisis,"* 14 LAW MED. & HEALTH CARE 77 (1986).

5. See generally Zuckerman, Koller & Bovbjerg, *Information on Malpractice: A Review of Empirical Research on Major Policy Issues*, 49 LAW & CONTEMP. PROBS. 85 (1986) (describing various levels of quantitative research) [hereinafter Zuckerman]. Compare Saks, *The Law Does Not Live by Eyewitness Testimony Alone*, 10 LAW & HUM. BEHAV. 279 (1986) (inviting studies concerning Tort Law and Medicine).

6. Zuckerman, *supra* note 5, at 111; see Zuckerman, Bovbjerg & Sloan, *Effects of Tort Reforms and Other Factors on Medical Malpractice Insurance Premiums*, 27 INQUIRY 167 (1990) [hereinafter *Malpractice Premiums*].

7. P. DANZON, *THE FREQUENCY AND SEVERITY OF MEDICAL MALPRACTICE CLAIMS* (1982) [hereinafter *FREQUENCY AND SEVERITY*]; P. DANZON & L. LILLARD, *THE RESOLUTION OF MEDICAL MALPRACTICE CLAIMS: RESEARCH RESULTS AND POLICY IMPLICATIONS* (1982) [hereinafter *DANZON & LILLARD*]; Danzon & Lillard, *Settlement Out of Court: The Disposition of Medical Malpractice Claims*, 12 J. LEGAL STUD. 345 (1983).

8. The definition of "claim" varies from study to study reflecting particular use by insurance companies. In this section, "claim" usually means "lawsuit."

9. Danzon, *The Frequency and Severity of Claims: New Evidence*, 49 LAW & CONTEMP. PROBS. 57, 78 (1986) [hereinafter *New Evidence*].

10. *Id.* But compare L. Morlock, *Malpractice Claims: The Maryland Experience, 1977-1985 Executive Summary* (National Technical Information Service Order No. PB90-101221, 1987) (pretrial screening in Maryland reduced the number of claims needing court adjudication and was associated with a three-month shorter time period for resolving a claim than the

that fourteen different legislative reforms had no individual or collective effect in reducing malpractice premiums for the years 1974 to 1977.¹¹

More recently, Sloan and colleagues analyzed the effects of tort reforms on the value of nearly all malpractice claims closed nationwide between 1975 and 1978, as well as for a random sample of claims closed nationwide in 1984.¹² Legislative caps on awards were the strongest reform as measured by impact on paid claim size. Payments per claim were also reduced by costs awardable provisions (court authority to make the losing party pay more than incidental court costs, e.g., winner's attorneys' fees) and by mandatory collateral offsets. They concluded that these results strengthened the empirical evidence for the effectiveness of some reforms but encouraged reformers to look elsewhere if the malpractice problem was conceived as excessive overhead and payment. "In sum, given some estimates of effects of the major statutory changes that have been enacted by the states, it is now appropriate to probe inside the 'black box' of settlement, litigation, and participants' behavior."¹³

The palliative nature of legislative remedies and the historical chronicity of the malpractice problem suggest that the approach should shift from the common premise of making it difficult to file claims and secure compensation to exploring the "field of error control" and reducing incidents of medical negligence.¹⁴ The 1973 Commission on Medical Malpractice observed

national average) (unpublished study available at Memphis State University for Health Services Research).

11. Sloan, *State Responses to the Medical Malpractice Insurance "Crisis" of the 1970s: An Empirical Assessment*, 9 J. HEALTH POL. POL'Y & L. 629, 643 (1985).

12. Sloan, Mergenhausen & Bovbjerg, *Effects of Tort Reforms on the Value of Closed Medical Malpractice Claims: A Microanalysis*, 14 J. HEALTH POL. POL'Y & L. 663 (1989) [hereinafter Sloan]. *Compare Malpractice Premiums*, *supra* note 6 (premiums lowered by cap on liability, reduction in time plaintiff has to initiate a claim, or state-required prior approval of premiums).

13. Sloan, *supra* note 12, at 682.

14. Shea & Sidley, *Coping With the Medical Malpractice Problem*, in LAW AND ETHICS: A GUIDE FOR THE HEALTH PROFESSIONAL 254 (N. Sidley ed. 1985); *see also* STAFF OF HOUSE COMM. ON WAYS AND MEANS, 101ST CONG., 2D SESS., REPORT ON MEDICAL MALPRACTICE 77-78 (Comm. Print 1990) (discussing federal government's detection of medical negligence through peer review organizations which monitor Medicare utilization); Leape, Brennan, Laird, Lawthers, Localio, Barnes, Hebert, Newhouse, Weiler & Hiatt, *The Nature of Adverse Events in Hospitalized Patients: Results of the Harvard Medical Practice Study II*, 324 NEW ENG. J. MED. 377 (1991) (high proportion of adverse incidents from medical management suggests many are preventable). Recent reductions in malpractice costs and insurance premiums are attributed in part to doctors tightening their procedures, acting aggressively to prevent injuries, and, according to Dr. James S. Todd of the American Medical Association, "increasing attention to what I would call lawsuit prevention." Shenon, *Costs of Medical Malpractice Drop After an 11-Year Climb*, N.Y. Times, June 12, 1989, at 1, col. 1; *see also* Pear, *Insurers Reducing Malpractice Fees for Doctors in U.S.*, N.Y. Times, Sept. 25, 1990, at 1, col. 6.

that patient injuries "are prime factors in the malpractice problem."¹⁵

Danzon estimated that only one malpractice claim was filed for every ten potentially valid claims in California, and only four claims were paid for every 100 injuries.¹⁶ A recent Harvard study concluded that only one of eight New York hospital patients suffering an injury from negligence filed a claim in 1984, and sixteen times as many patients suffered a negligent injury as received compensation from the tort system.¹⁷ In 1974 one in twenty hospital inpatients reportedly was injured in California, and one in 125 had a legal claim.¹⁸ The Harvard study found a 3.7% incidence of adverse events in New York hospitalizations, and a one percent rate of negligence.¹⁹ There were an estimated 6,860 deaths from negligent medical injury in New York in 1984.²⁰

While the cost of negligent injuries was estimated in 1984 at \$24 billion (ten times the cost of malpractice premiums), malpractice premiums were about one percent of the \$350 billion total national health care bill; 1985 premium costs of \$4.7 billion were one percent of the \$425 billion national health costs.²¹ Malpractice premiums were nine percent of average total expenses for physicians in 1984, and four percent of their \$211,200 average

15. U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, MEDICAL MALPRACTICE, REPORT OF THE SECRETARY'S COMMISSION ON MEDICAL MALPRACTICE 24 (1973).

16. P. DANZON, MEDICAL MALPRACTICE: THEORY, EVIDENCE, AND PUBLIC POLICY 24 (1985) [hereinafter DANZON].

17. HARVARD MEDICAL PRACTICE STUDY, PATIENTS, DOCTORS, AND LAWYERS: MEDICAL INJURY, MALPRACTICE LITIGATION, AND PATIENT COMPENSATION IN NEW YORK 7:1 (1990) [hereinafter HARVARD STUDY]. Compare Bovbjerg, *Legislation on Medical Malpractice: Further Developments and a Preliminary Report Card*, 22 U.C. DAVIS L. REV. 499, 510 (1989) (valid malpractice claims outweigh claims not brought "by a factor of perhaps five or ten to one").

18. Mills, *Medical Insurance Feasibility Study: A Technical Summary*, 128 W. J. MED. 360, 363-64 (1978).

19. HARVARD STUDY, *supra* note 17, at 3 (Introduction); Brennan, Leape, Laird, Hebert, Localio, Lawthers, Newhouse, Weiler & Hiatt, *Incidence of Adverse Events and Negligence in Hospitalized Patients: Results of the Harvard Medical Practice Study I*, 324 NEW ENG. J. MED. 370 (1991) (substantial amount of patient injury from medical management and standard care).

20. HARVARD STUDY, *supra* note 17, at 6:1-6:2. Compare Jack Cafferty *Newsline: New York: Hazards in Hospitalization* (statement of S. Dunlop, Feb. 28, 1990) (in 1984, 1,777 New Yorkers were murdered, 2,064 died in car accidents) (Transcript No. 28, Journal Graphics, Inc., New York, New York).

21. *Defensive Medicine and Medical Malpractice: Hearings on S. 2690 Before Senate Comm. on Labor and Human Resources*, 98th Cong., 2d Sess. 6-15 (1984) (testimony and statement of Patricia Danzon); see also Robinson, *Perspectives on Medical Malpractice and Tort Law Reform*, in MEDICAL MALPRACTICE-TORT REFORM 38 (J. Hamner & B. Jennings eds. 1987) ("Malpractice costs for physicians and hospitals have been estimated at \$4.7 billion for 1985, representing about 1 percent of the total expenditures for health care.").

gross practice income.²² In short, the cost of malpractice insurance seems relatively small; the incidence and cost of medical injuries are not at an irreducible minimum.

The August 1987 Department of Health and Human Services Report of the Task Force on Medical Liability and Malpractice observed: "It is often said that a small percentage of physicians account for most of the paid claims, and that the problem of harm to patients could be solved by identifying these few physicians and rehabilitating them or eliminating them from practice."²³ For example, in Florida, 0.7% of doctors accounted for 24% of claims—one doctor had thirty-one claims;²⁴ in Los Angeles, 0.6% of doctors in a four-year period accounted for 10% of all claims and 30% of all payments;²⁵ in Michigan, 19.3% of doctors accounted for 72.3% of claims;²⁶ in Chicago, 0.6% of practicing physicians were a named defendant from 10 to 36 times (greater than three standard deviations from the average frequency of 1.2 suits per physician sued), accounting for \$65 million in jury verdicts and settlements (less than 1% of this group practiced at university medical centers, and 48% were sued in conjunction with practice at hospitals without any accredited residency program);²⁷ the Pennsylvania Medical Society found that 1% of physicians were responsible for 25% of paid claims.²⁸

More recently published studies of Florida found similar results. Between 1975 and 1980, 3% of medical specialty physicians accounted for more than 85% of the group's payments, 6% of obstetrics-anesthesiology physicians accounted for more than 85% of the group's payments, and 7.8% of the

22. UNITED STATES GENERAL ACCOUNTING OFFICE, *MEDICAL MALPRACTICE: INSURANCE COSTS INCREASED BUT VARIED AMONG PHYSICIANS AND HOSPITALS* 28-29 (Sept. 1986). The Harvard Study found that the net losses by patients iatrogenically injured in New York hospitals in 1984 were a present discounted value of \$894 million—\$506 million in lost household production, \$285 million in lost wages and fringe benefits, \$103 million in uninsured medical costs—compared with \$1.15 billion paid by doctors and hospitals for malpractice insurance. HARVARD STUDY, *supra* note 17, at 8:1, 8:79.

23. Department of Health and Human Services, Report of the Task Force on Medical Liability and Malpractice 57-58 (unpublished study).

24. Florida Insurance Commissioner, Closed Claims Study of Medical Malpractice Insurance, 1975-82 (1983) (unpublished study available at Memphis State University Center for Health Services Research).

25. Schwartz & Komesar, *Doctors, Damages and Deterrence*, 298 NEW ENG. J. MED. 1282, 1287 (1978).

26. Michigan Report on the Liability Crisis 11 (1985) (unpublished study available at Memphis State University Center for Health Services Research).

27. N. Miller, R. Correia & J. Chill, *Medical Malpractice: Crisis of Litigation or Crisis of Negligence?* (Mar. 18, 1987) (unpublished study available through Health Resources, Inc., Chicago, Ill.).

28. *Medical Malpractice in Pennsylvania* (1985) (unpublished study available at Memphis State University Center for Health Services Research).

surgical physicians accounted for 75% of the group's payments.²⁹

For the period 1975 through 1986, the Florida Academic Task Force for Review of the Insurance and Tort Systems study found that the 4% of physicians having two or more paid claims were responsible for \$216.9 million in paid claims, 42.2% of total claims payments.³⁰ The authors suggested that "significant potential exists for reducing paid claims by controlling the losses generated by physicians with multiple claims,"³¹ either through a surcharge on such physicians or professional regulation. These alternatives should "provide substantial additional incentives to ensure quality care."³²

Insurance companies have separated medical malpractice from other liability coverage only in the past dozen years. Physician-owned insurance companies are a new product of the 1970's crisis in insurance availability. Insurance companies apparently have not systematically analyzed the demographic characteristics of their physician insureds. While behavioral science has generated demographic profiles of other significant legal actors,³³ profiles of physicians with lawsuits and claims are only recently being developed.

In their review of empirical research on malpractice, Zuckerman and colleagues concluded that relatively little is known about why claims arise in some circumstances but not in others.³⁴ Danzon found a greater likelihood of filing for permanent injuries than for temporary injuries and a decreasing likelihood of payment as persons age, suggesting that the expected award is a significant factor in determining whether a claim is filed.³⁵

In the absence, to date, of primary data concerning a set of injury situations, some resulting in lawsuits and some not, the majority of studies have looked at the incidence of claims. M.W. Reder formulated a theoretical and empirical structure for later analyses.³⁶ A 1979 state-level claims data study found higher rates of malpractice claims associated with higher per capita

29. Sloan, Mergenhagen, Burfield, Bovbjerg & Hassan, *Medical Malpractice Experience of Physicians: Predictable or Haphazard?*, 262 J. A.M.A. 3291, 3293 (1989) [hereinafter Sloan].

30. Nye, Gifford, Webb & Dewar, *The Causes of the Medical Malpractice Crisis: An Analysis of Claims Data and Insurance Company Finances*, 76 GEO. L.J. 1495, 1558 (1988) [hereinafter Nye].

31. *Id.*

32. *Id.* at 1560.

33. See generally J. MONAHAN & L. WALKER, *SOCIAL SCIENCE IN LAW: CASES AND MATERIALS* 279-454 (2d ed. 1990) (candidates for bail, parole, capital punishment, future dangerousness; illegal weapons, automobiles, aliens, drugs; rapists, battering parents).

34. Zuckerman, *supra* note 5, at 96.

35. DANZON, *supra* note 16, at 24.

36. See generally Reder, *An Economic Analysis of Medical Malpractice*, 5 J. LEGAL STUD. 267 (1976).

income, frequency of surgery, and lower attorney earnings.³⁷ Danzon could not confirm the relationship of lawyers to frequency of claims; she found that urbanization was the most significant and powerful predictor of the frequency of claims.³⁸ Her more recent evidence, confirming the significance of urbanization and concluding that the state surgery rate increased claim frequency and that the ratio of surgeons to medical specialists increased claim severity, could not confirm significant effects for per capita income, per capita attorneys, or unemployment rate.³⁹

Provider-level studies of the incidence of claims have analyzed provider characteristics rather than a state's environment. Katherine Langwell and Jack Werner studied self-report data from a 1977 national survey of physicians to predict whether individual physicians had claims.⁴⁰ They concluded: (i) that female physicians were less likely to be sued than males; (ii) that time in practice was related to claim incidence; (iii) that group practice physicians were at greater risk of having a claim than sole practitioners everywhere except the West; and (iv) that graduation from a foreign medical school was not a significant influence on claims.⁴¹ Using similar data, Kathleen Adams and Stephen Zuckerman found that average length of office visit was inversely related to liability claims frequency for physicians in obstetrics/gynecology and medical specialties.⁴²

More recently, Sloan and colleagues analyzed data from claims closed in Florida between 1975 and 1988,⁴³ merged with physician information from the American Medical Association's Physician Masterfile.⁴⁴ They found: (i) that surgeons from the top third of medical schools were less likely to have high payments against them; (ii) that older physicians were less likely to be sued; (iii) that the surgical specialty groups and obstetrics-anesthesiology groups with longer workweeks incurred more claims and higher payments; and (iv) that females in the medical specialties and obstetrics-anesthesiology groups had more favorable claims experience.⁴⁵ Physicians with less favorable claims experience were less likely to move to another state or quit

37. Feldman, *The Determinants of Medical Malpractice Incidents: Theory of Contingency Fees and Empirical Evidence*, 7 ATLANTIC ECON. J. 59, 62 (1979).

38. FREQUENCY AND SEVERITY, *supra* note 7, at 26-27.

39. *New Evidence*, *supra* note 9, at 79.

40. Langwell & Werner, *Regional Variations in the Determinants of Professional Liability Claims*, 5 J. HEALTH POL. POL'Y & L. 498, 509-10 (1980).

41. *Id.* at 507-11.

42. Adams & Zuckerman, *Variations in the Growth of Medical Malpractice Claims*, 9 J. HEALTH POL. POL'Y & L. 475, 485 (1984).

43. Sloan, *supra* note 29.

44. See Cherkin & Lawrence, *An Evaluation of the American Medical Association's Physician Masterfile as a Data Source—One State's Experience*, 15 MED. CARE 767 (1977).

45. Sloan, *supra* note 29, at 3294-95.

practice. Physicians with very high claims payments were more likely to have licensing complaints against them, but did not receive severe sanctions.⁴⁶ Payment and claims experience from incidents between 1975 and 1980 predicted payment and claims experience for incidents between 1981 and 1983.⁴⁷ Sloan and colleagues concluded that claims experience correlates with future claims but is "not . . . a valid indicator of physician quality."⁴⁸ They did suggest:

From an insurance perspective, it is important to know that the past predicts the future. This study shows considerable variation in expected losses within the groups commonly used for underwriting purposes by medical malpractice insurers.⁴⁹

Studies of claims suggest that a small percentage of physicians account for a large percentage of paid claims. Nonetheless, only a few studies have attempted to ascertain which physician characteristics are related to claim activity. Some of the exceptions, discussed above, are problematic in their use of self-report data. The extent to which claims experiences are misreported in the self-report data is unknown, and the reliability and validity of these data have not been assessed.

Other studies have used closed claims, instead of the physician, as the unit of analysis.⁵⁰ Although these data are probably more reliable, physicians who have no claims are not included in most of the analyses. This restriction in the variation of the dependent variable hinders the development of models that predict at-risk physicians and their degree of responsibility.

This article reports preliminary results from a pilot study. The purpose of this exploratory research is to assess the efficacy of an approach that assumes claims⁵¹ and lawsuit experiences of physicians are not at an irreducible minimum. To what extent is medical malpractice related to particular physician characteristics?

The hypotheses are:

46. *Id.* at 3297.

47. *Id.* at 3296.

48. *Id.* at 3297 ("[D]efinitively linking physicians' malpractice experience with their quality of care will require more information, such as data regarding patient-physician relationships and practice-specific information regarding procedure and patient mix.").

49. *Id.*

50. *E.g.*, DANZON & LILLARD, *supra* note 7.

51. For the purposes of this study, "claim" is defined as an incident vulnerable to a lawsuit. The data source, State Volunteer Mutual Insurance Company (SVMIC), encourages its policyholders to report any potentially troublesome incidents even if the physician does not feel he or she is legally liable. By doing so, SVMIC can investigate the incident, determine perceived risk for payout, and set aside loss reserves. *See also infra* note 53 and accompanying text.

1) There are demographic characteristics and practice patterns related to the number of claims and the number of lawsuits among physicians practicing in the State of Tennessee.

2) There are demographic characteristics, practice patterns, and incident-specific variables which are associated with claims that do result in a lawsuit, and claims that do not result in a lawsuit.

METHODS

Data were obtained from State Volunteer Mutual Insurance Company (SVMIC), the physician-owned principal malpractice insurer in Tennessee. The underwriting, claims, and lawsuit data provided considerable information about the demographic characteristics and practice patterns of the sampled policyholders, as well as additional information about any claims and lawsuits brought against these physicians. Physician and patient identity, and profit and loss data, are confidential and unavailable.

A stratified random sample of fifty-one active and forty-eight inactive physicians was drawn from the 8867 policyholders of record as of June 30, 1986.⁵² The sample was stratified on this variable because the active and inactive files were likely to be organized differently in the underwriting files. The inactive physicians (n=3226), who once carried malpractice coverage with SVMIC but have terminated that coverage, consist of physicians who: (1) have moved out of the state; (2) have changed coverage to another carrier; (3) were moonlighting residents; (4) have died; or (5) other. In addition to very detailed information about the ninety-nine policyholders, SVMIC provided pertinent univariate information, as well as bivariate crosstabulations, for the population of 8867 policyholders.

As of September 1986, SVMIC ("A plus" rated by A.M. Best Co.) insured 5641 of the approximately 8453 licensed physicians (including approximately 1400 medical residents) in Tennessee. It is estimated that SVMIC insures about eighty percent of the pool of non-federal, non-academic physicians in Tennessee, and St. Paul Fire and Marine Insurance Company about twenty percent. Licensed physicians not purchasing malpractice coverage like that provided by SVMIC and St. Paul are: academic physicians at Vanderbilt and Meharry Medical Schools, all of whom are self-insured; academic physicians at the state medical schools in Memphis and Johnson City

52. The intent was to randomly sample 50 inactive and 50 active policyholders from the computer records of SVMIC. However, one inactive physician had no information in his underwriting file because he had been approved for coverage but ended up not moving his practice to Tennessee, and one physician had reactivated his coverage by the time data collection began.

who are insured through the State Claims Commission Act; and federal physicians at the Veterans Administration Medical Centers.

The major objectives of this study are the multivariate analyses of the pilot data. There are two types of independent variables: those that characterize the physician and those specific to particular incidents that have resulted in a claim, a lawsuit, or both. Because of this bifurcation, two major analyses were conducted. In the first, the physician is the unit of analysis, and in the second, the incident (resulting in either a claim or a lawsuit) is the unit of analysis. The goal of the first major analysis was to determine the characteristics that predict the number of claims and the number of lawsuits for a physician.

In the second major analysis, the unit of analysis shifted from the physician to the claim. As noted above, each claim for a physician was an incident vulnerable to a lawsuit. The primary goal of this phase of the study was to determine which physician-specific characteristics, and which incident-specific characteristics, increase the likelihood that claims result in lawsuits. Also of interest were factors that predict the amount of money paid out by the insurance company for each claim. Because the unit of analysis was the claim, some physicians were represented more than once, depending upon the number of claims and lawsuits filed against him/her, and some physicians were not represented at all. To alleviate this bias, the number of claims filed against the physician was included as a control variable.

PROCEDURE

Multiple regression was used to obtain the best fitting linear equations for estimating the dependent variables from the set of independent variables. Because of the large number of potentially important predictors and the small number of cases in the pilot study, hierarchical regression with forced entry of all the predictors was not possible. Instead, control variables were forced to enter first, followed by forced entry of the most theoretically important variables and then the stepwise entry of exploratory independent variables that could potentially predict malpractice activity. A liberal significance criteria of .10 (two-tailed) to enter was used initially for this latter group of variables. (Arguably, when doing exploratory research it is better to include variables for consideration in future explanatory research than to omit potentially important determinants.) The equations were then rerun with forced entry, and all independent variables not reaching a significance probability level of .10 (two-tailed) were dropped. Further, control variables were dropped if their exclusion did not affect other coefficients in the equa-

tions. The exception, active status, was not dropped from any equation because the sample was stratified on this variable.

DESCRIPTION OF VARIABLES

The two dependent variables for the physician as unit of analysis equations were the natural log of the actual number of claims and the natural log of the actual number of lawsuits. Log transformation of these variables was necessary to avoid problems associated with heteroscedasticity and to ensure the validity of the significance tests.⁵³ Claims are established in the underwriting files of SVMIC whenever: (i) a suit is filed; (ii) an attorney for a patient requests medical records from a physician; or (iii) a physician voluntarily reports to SVMIC an incident which he or she feels is potentially litigious. As noted above, SVMIC encourages its policyholders to report any potentially troublesome incidents even if the physician contests liability. Thus, the claims files do not represent the entire pool of malpractice events vulnerable to lawsuit activity, but they do provide reasonable coverage of these incidents.

Four dependent variables are examined for the incident as unit of analysis models: (1) whether the claim resulted in a lawsuit; (2) the amount of loss paid; (3) the amount of LAE paid; (4) and the total paid. Loss paid refers to any money paid out as a settlement, judgment, or the like. LAE paid refers to the amount of money paid by SVMIC for this physician for all other costs associated with the incident, such as attorney fees, witness fees and expenses, and the like. Total paid is the sum of LAE and loss paid. Only equations for the presence or absence of lawsuit and total paid are shown since there were minimal differences in the LAE paid, loss paid, and total paid equations. Again, owing to the skewed distribution of the dependent variable, the natural log of the total paid was used instead of the actual total paid.

The control, explanatory, and exploratory variables include demographic characteristics of the physician, type of practice, practice environment, incident characteristics, and claimant information. Table 1 provides the means, standard deviations, and descriptions of these variables as used in the physician models. Table 2 provides descriptive information for additional variables used in the claims as unit of analysis equations.⁵⁴

53. See J. COHEN & P. COHEN, *APPLIED MULTIPLE REGRESSION/CORRELATION ANALYSIS FOR THE BEHAVIORAL SCIENCES* 52, 128-29 (1983).

54. Because the unit of analysis shifts, the means are not the same for the physician characteristics in the claims analysis. For brevity, they are not given in Table 2 but are available upon request.

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR VARIABLES IN THE
PILOT STUDY: PHYSICIAN CHARACTERISTICS

<u>Variable</u>	<u>Mean</u>	<u>SD</u>	<u>N</u>	<u>Description</u>
<u>Dependent Variables</u>				
@ Number of suits	.47	.96	99	total number of suits
@ Number of claims	1.24	2.06	99	total number of claims
<u>Control Variables</u>				
Active status	.49	.50	99	0 = active 1 = inactive
@ Months of exposure	62.65	44.92	99	total months insured
Average risk	3.10	1.94	99	average risk class
Age	46.98	11.91	98	age as of June 15, 1986
Sex	.91	.29	95	0 = female 1 = male
Loss seminar	.33	.47	99	ever attend loss seminar
Any prior claims	.14	.35	98	prior claims experience
<u>Explanatory Variables</u>				
FMG (foreign medical grad)	.18	.38	99	0 = no 1 = yes
Ever board certified	.48	.50	99	0 = no 1 = yes
Group practice	.42	.50	96	0 = no, solo 1 = yes
Urban practice	.40	.49	96	0 = no 1 = yes
Better med school	.44	.50	99	0 = no 1 = yes
Ever teach	.10	.30	99	0 = no 1 = yes
<u>Explanatory Variables</u>				
@ Average limits	7.10	6.63	99	in hundred thousands
* State licenses	2.08	1.51	99	number of state licenses
Loss seminar	.33	.47	99	ever attend loss seminar
* Capacity	.05	.22	98	ever had a chronic illness or physical defect
* Any salary	.57	.50	99	salaried when joined SVMIC
@* Time at practice	3.71	7.43	95	years at practice when joined SVMIC
@* Number of locations	.74	1.56	91	number of prior practice locations before SVMIC
* Peer groups	.19	.40	98	any peer group activity
* Number of medical associations	2.54	3.04	98	number of medical association memberships
* Emergency work	.58	.50	98	ER/ICU work when joined
Born in Tennessee	.23	.42	99	0 = no 1 = yes
1st residency in TN	.49	.50	88	0 = no 1 = yes
1st res. in South	.71	.46	88	0 = no 1 = yes
Interned in TN	.43	.50	97	0 = no 1 = yes
Interned in South	.67	.47	97	0 = no 1 = yes
+ Citizen	.89	.32	97	this MD a U.S. citizen
+ Years a doctor	20.70	11.99	99	number of years since graduated medical school

* Measures applicable at the time the physician joined SVMIC.

+ These variables dropped from subsequent analyses owing to high correlations with other independent variables.

@ The natural log of this variable was used in the multivariate analyses.

TABLE 2
 MEANS AND STANDARD DEVIATIONS FOR CLAIM-SPECIFIC
 VARIABLES IN THE PILOT STUDY: FOR CLOSED
 CLAIMS ONLY

<u>Variable</u>	<u>Mean</u>	<u>SD</u>	<u>N</u>	<u>Description</u>
<u>Dependent Variables</u>				
Claim resulted in a lawsuit	.40	.49	93	lawsuit filed pertaining to this claim
@ Loss paid	3588	31108	93	loss paid - this claim
@ LAE paid	1441	7417	93	LAE paid - this claim
@ Total paid	5029	38398	93	sum of loss & LAE paid
<u>Control Variables</u>				
Number of claims	5.01	3.96	93	total # of claims for this physician
Number of co-defendants	1.63	1.07	87	number of co-defendant physicians
Active status	.42	.50	93	0 = active 1 = inactive
@ Exposure in months	104.87	30.06	93	months covered by SVMIC
<u>Explanatory Variables</u>				
Primary physician	.44	.50	79	0=primary 1=referring
This MD responsible	.42	.50	91	0 = no 1 = yes
This MD caused most severe injury	.69	.47	90	0 = no 1 = yes
Hospital injury site	.84	.37	86	0 = no 1 = yes
Severity of injury	4.33	2.58	89	Numerical indicator of severity of injury
Sex-injured claimant	.43	.50	93	0 = female 1 = male
Age-injured claimant	.42	20.9	83	age in years

@ The natural log of this variable was used in the multivariate analyses.

PHYSICIAN AS THE UNIT OF ANALYSIS

Control variables included active status, the natural log of the number of months insured by SVMIC, gender and age of the physician, whether the physician had a claim prior to being insured by SVMIC, whether the physician had attended a loss prevention seminar, and average risk classification. The last variable is the average risk classification for all the years insured by SVMIC. SVMIC has seven main risk classifications (although they now have finer distinctions within each broad category) that are used for setting premiums. The risk classifications are based on a combination of specialty, expected risk, and whether (and which) types of surgery are performed. However, specialty is the most important factor in determining risk.

SVMIC conducts loss-prevention seminars at frequent intervals. The purpose is to educate physicians about medical malpractice and how to avoid lawsuits. Attendance is voluntary, but ten percent premium discounts are offered to policyholders who attend. This variable was expected to be positively related to the number of claims since SVMIC encourages policyhold-

ers to report any potentially litigious events. However, it was expected to be negatively related to the number of lawsuits, since malpractice management is a goal of the seminars. One problem with this measure is the issue of causal direction. A positive relationship may indicate that physicians decide to attend loss seminars after involvement in claim activity. Because of this problem, loss seminar is treated as a control variable and not an explanatory variable. A significant relationship would suggest that it should be considered in future research in which causal direction can be established.

Physician-specific independent variables are described in Table 1. Claim-specific independent variables are described in Table 2. Measures that were applicable at the time the physician joined SVMIC are indicated with an asterisk in the tables. Further, the most theoretically important variables are listed first, followed by potentially important variables that were included for exploratory purposes. To assure that the assumption of homoscedasticity was met for significance testing, independent variables with skewed distributions were transformed by taking the natural log. The operationalization of most of these variables is self-explanatory. Exceptions are discussed below.

Of the other independent variables, urban practice was coded 1 if the physician practiced in one of four large urban areas in Tennessee: Knoxville, Chattanooga, Nashville, and Memphis. "Average limits" refers to the physician's average individually determined liability limits during the entire time period of SVMIC coverage. This variable is included as a proxy to tap psychological dimensions of the physician. Having low limits may be an indicator of risk-taking behavior, or it may reflect accurate perceptions regarding the risk of having a lawsuit.

The variables "state licenses," "time at practice," and "number of locations," are proxies for moving behavior which may affect physician-patient relationships.

Five dummy variables were included as proxy measures for the physician's ability to establish rapport with patients in Tennessee. First residency in Tennessee and first residency in the South were tried as alternative measures in all equations, as were interned in Tennessee and interned in the South. The fifth variable was "born in Tennessee."

CLAIM-SPECIFIC VARIABLES

Number of co-defendants was included because some claims may result in lawsuits as a result of characteristics of the co-defendants, a confounding factor that should be controlled. Gender and age of the allegedly injured claimant are also included (Neil Vidmar and Regina Schuller suggest that certain demographic and personality characteristics predict whether people

will bring some types of legal claims⁵⁵).

Three additional variables were coded from brief descriptions of each case available in the underwriting files. The first variable, "MD responsible," was coded 1 if the physician appeared to be responsible concerning the primary cause of injury, such as misdiagnosis, failure to treat, procedure at wrong site, patient unattended, and so on. It was coded 0 if the physician did not appear to be responsible; this included the codes unknown, none, negligence of others, unexpected accident, and hazard of procedure. The second variable, "MD caused most severe injury," was coded 1 if the description indicated that the physician was alleged to have caused the most severe injury. It was coded 0 if the physician was involved in the treatment but was not alleged to have caused the most severe injury, or if the physician was just part of the group practice and was named in the claim for that reason.

The third variable, severity of alleged injury, was also coded from the descriptions provided in the underwriting files. This numerical scale and the assigned values were obtained from SVMIC. Temporary injuries were coded to include the following: (1) emotional only—fright, no physical harm; (2) insignificant—laceration, contusions, minor scars, rash—no delay in recovery; (3) minor—infections, mis-set fractures, fall in hospital—recovery delayed; (4) major—burns, surgical material left, drug side effect, brain damage—recovery delayed. Permanent injuries were coded as follows: (5) minor—loss of finger, loss or damage to organs, including non-disabling injuries; (6) significant—deafness, loss of limb, loss of eye, loss of one kidney or lung; (7) major—paraplegia, blindness, loss of two limbs, brain damage; (8) grave—quadriplegia, severe brain damage, life-long care, or fatal prognosis; (9) death. From previous research suggesting that awards are strongly related to the severity of the injury,⁵⁶ a positive relationship between severity and the likelihood of lawsuit and total paid was expected.

RESULTS FROM POPULATION DATA

Table 3 shows the number of policyholders with specified numbers of lawsuits. Seventy-seven percent (6793) have no lawsuits; 23% (2074) have one or more; 9.9% of the policyholders have two or more lawsuits, and account for 69.6% of all lawsuits. Only 2.7% (or 237) of the physicians have four or more lawsuits (four lawsuits is greater than three standard deviations from the mean); they are responsible for 31.7% (1248) of all lawsuits. The average number of lawsuits per physician is .44, and for those physicians having

55. Vidmar & Schuller, *Individual Differences and the Pursuit of Legal Rights: A Preliminary Inquiry*, 11 LAW & HUM. BEHAV. 299 (1987).

56. P. DANZON, *THE DISPOSITION OF MEDICAL MALPRACTICE CLAIMS* 30 (1980).

TABLE 3
NUMBER OF POLICYHOLDERS HAVING SPECIFIED NUMBERS
OF LAWSUITS

Number of Policyholders	Number of Suits*	Cumulative % of Suits
6793 (76.6%)	0	0%
1196 (13.5%)	1	30.4%
434 (4.9%)	2	52.5%
207 (2.3%)	3	68.3%
119 (1.3%)	4	80.4%
51 (.6%)	5	86.9%
24 (.3%)	6	90.5%
16 (.2%)	7	93.4%
11 (.1%)	8	95.6%
7 (.1%)	9	97.2%
1 (.0%)	10	97.5%
3 (.0%)	11	98.3%
0 (.0%)	12	98.3%
3 (.0%)	13	99.3%
2 (.0%)	14	100.0%

(N=8867) (N=3933)

* The average number of lawsuits per physician is .44. For physicians who have lawsuits, the average is 1.9.

lawsuits, the average number is 1.9. The association of a disproportionately few physicians with a disproportionately high number of lawsuits is consistent with the reports for other jurisdictions. The degree to which specialty is responsible, however, is rarely addressed.⁵⁷

Table 4 provides a crosstabulation of claims activity by specialty. The available data specify the number of physicians who had no claims and no lawsuits, who had one or more claims but no lawsuits, and who had one or more lawsuits. This table suggests that high risk specialties are partly responsible for the disproportionate number of lawsuits. The specialties are listed in rough order of risk. It is clear that certain specialties, such as obstetrics/gynecology and surgery, have higher risk—almost half of these physicians have lawsuits and only a third have no claims activity. Relatively low risk specialties include psychiatry, pathology, emergency medicine, and pediatrics. Internal medicine, general/family practice, radiology, and anesthesiology are all moderate risk specialties with approximately one-fourth of these physicians having lawsuits. Anesthesiologists tend to have more claims than the other three moderate-risk groups.

Table 5 shows a clear but moderate positive relationship between risk classification (as of September 1986) and claim activity. Risk groups 6 and 7 are

57. See, e.g., Sloan, *supra* note 29.

TABLE 4
CLAIMS ACTIVITY OF ALL POLICYHOLDERS BY SPECIALTY

Claim Activity	Specialty											Total	
	Psychiatry	Pathology	Emerg. Med	Pediatrics	Intern. Med.	Gen/Fam Practice	Radiology	Anesthesiology	Surgery	Ob/Gyn	Other		Not Coded*
0 claims, 0 suits	222 (78%)	184 (74%)	513 (77%)	302 (64%)	713 (58%)	651 (58%)	255 (57%)	176 (45%)	519 (33%)	153 (31%)	327 (66%)	1266 (87%)	5281 (60%)
1+ claims, 0 suits	31 (11%)	37 (15%)	69 (10%)	102 (22%)	266 (22%)	192 (17%)	78 (18%)	121 (31%)	354 (23%)	95 (19%)	80 (16%)	82 (6%)	1510 (17%)
1+ suits	30 (11%)	26 (11%)	88 (13%)	68 (14%)	255 (21%)	281 (25%)	112 (25%)	92 (24%)	690 (44%)	245 (50%)	88 (18%)	99 (7%)	2076 (23%)
Total	283	247	670	472	1234	1124	445	389	1563	493	495	1447	8867

* A number of inactive physicians who were insured prior to the 1982 computerization of SVMIC did not have risk categories coded. Lambda = .08

TABLE 5
CLAIMS ACTIVITY OF ALL POLICYHOLDERS BY RISK GROUPS

Claim Activity	Risk Category						
	1	2	3	4	5	6	7
0 claims, 0 suits	2085 (65%)	322 (50%)	936 (62%)	103 (41%)	297 (36%)	39 (32%)	234 (27%)
1+ claims, 0 suits	570 (18%)	135 (21%)	260 (17%)	56 (22%)	209 (25%)	24 (20%)	173 (20%)
1+ suits	559 (17%)	190 (29%)	314 (21%)	94 (37%)	316 (38%)	58 (48%)	447 (52%)
Total	3214	647	1510	253	822	121	854

gamma = .33 tau = .23

* 1446 inactive physicians who were insured prior to the 1982 computerization of SVMIC did not have risk categories coded, leaving a total N of 7421 for this table.

similar in claims and lawsuit activity, as are groups 4 and 5. Risk group 2 is more prone to claims and lawsuits than risk group 3. Current classification of risk based on specialty and types of surgery is adequate but perhaps not optimal.

RESULTS FROM THE PILOT STUDY

As discussed above, means, standard deviations, and the number of valid cases for each variable in the pilot study of ninety-nine physicians are found in Table 1, for the physician-specific variables, and in Table 2, for the claim-specific variables. The average number of claims is 1.24 and the average number of suits is .47, values similar to their corresponding population means.⁵⁸

The average length of coverage in 1986 was just over five years and the average age of sampled policyholders was forty-seven. Nine of the sampled physicians were female, and five reported ever having a chronic illness or physical defect. Only 18% reported prior claims, which may be a sign of underreporting, or it may indicate that SVMIC has provided coverage for a fairly large percentage of new practitioners. Nineteen percent of sampled policyholders engaged in any peer group activity, and ten percent ever taught in a medical school (most academic physicians currently receive other

58. The mean for dichotomous variables, coded 0 and 1, refers to the proportion in the 1 category. For example, the mean for FMG in Table 1 is .18, which means that 18%, or 18, of the physicians in the pilot sample are FMGs.

insurance coverage). The average limits for policyholders was \$700,000, with most carrying either \$500,000 or \$1,000,000 individual liability limits.

Examination of Table 2 shows that 40% of the closed claims in this study resulted in lawsuits. Further, the average total payout was \$5,029 for all claims and \$13,756 (not shown) for the thirty-four claims for which there was a payout. However, if the one claim for which there was a total payout of \$370,577 is deleted, the corresponding means are \$1,056 and \$2,944.

The sampled policyholder was the referring physician 44% of the time and was alleged to have caused the most severe injury in 69% of the claims. Nevertheless, interpretation of the descriptions associated with each claim suggests the physician was probably responsible in 42% of the cases. Most of the alleged injuries occurred in the hospital (84%), and the average severity was 4.33. The average age of the injured claimant was forty-two, and 43% of claimants were male.

The zero-order correlation matrix for the physician-specific variables is not shown. However, the correlation between number of claims and number of suits is high (.73). In addition, there are some moderately high intercorrelations (in the range of .4 to .6), but most of them (two exceptions) are among the control variables, between control variables and independent variables, or among alternative measures of similar constructs. Thus, by forcing the control variables into the multiple regression equations first and allowing them to contribute whatever they can to the explained variance of the models, rather conservative tests of the effects of the independent variables are generated, thus minimizing the impact of multicollinearity.⁵⁹

MULTIVARIATE RESULTS FOR PHYSICIAN MODELS

Final equations regressing the natural log of the number of claims and the natural log of the number of suits on the independent variables are presented in Table 6. Overall predictability of the models is quite good with R squares of .60 and .49 for the number of claims and number of suits equations respectively. Although the control variables are important predictors, the remaining independent variables contribute reasonable increments to the explained variance (.04 and .09 respectively), given that mutually explained variance is attributed to the control variables by forcing them into the equation first.

As expected, three of the seven control variables are positively related to number of claims. Policyholders in higher risk groups, who have been insured by SVMIC for longer periods of time, and who have attended a loss

59. COHEN & COHEN, *supra* note 53, at 115-16, 120-25.

TABLE 6
 MULTIPLE REGRESSION RESULTS FOR THE RELATIONSHIP
 BETWEEN SIGNIFICANT PREDICTORS AND NUMBER
 OF CLAIMS AND NUMBER OF SUITS:
 PHYSICIAN AS UNIT OF ANALYSIS

Variable	Log of Number of Claims			\underline{R}^2	Log of the Number of Suits			\underline{R}^2
	\underline{b}^*	\underline{B}^*	t		\underline{b}	\underline{B}	t	
<u>Control Variables</u>								
Active status	.15 ^{NS}	.11	1.41		.09 ^{NS}	.09	1.03	
Months of exposure (log)	.26	.35	4.31		.12	.25	2.55	
Average risk	.11	.31	4.08		.07	.31	3.48	
Attended loss seminar	.47	.33	3.55	.56				.40
<u>Independent Variables</u>								
Better med school	-.21	-.16	-2.04		-.16	-.18	-2.00	
1st residency in TN	-.16	-.12	-1.72					
Capacity					-.30	-.15	-1.79	
Any peer group activity				.60	.23	.20	2.40	.49

^{NS} All coefficients significant at the .10 level, two-tailed, with the exception of those indicated by ^{NS}

* \underline{b} denotes the unstandardized partial regression coefficient; \underline{B} denotes the standardized partial regression coefficient.

seminar, are likely to have more claims. Interestingly, active status, gender, and age of the physician, and having a prior claim, are not related to the number of claims when other variables are controlled.

Two independent variables are significantly related to the number of claims. Together they contribute four percent to the explained variance. With controls, graduates of the better medical schools (defined as the top 80% using the Cole-Lipton ranking of the perceived quality of American medical schools) have fewer claims than graduates of the United States medical schools ranked in the bottom 20%. In addition, physicians who completed their first residency in Tennessee have fewer claims than other physicians.

The control variables account for 40% in explained variance for the number of suits equation. Only two are significant predictors: the natural log of months of exposure and average risk. Each month of coverage by SVMIC increases the likelihood of a lawsuit, and physicians in the higher risk groups have more lawsuits than physicians in lower risk groups, net of other significant variables in the final equation. One explanatory and two exploratory variables are significant predictors of the number of lawsuits, and together, they contribute 9% to the explained variance after control

variables are entered. Policyholders who graduated from the top 80% of United States medical schools have fewer lawsuits on average than do graduates of other medical schools. The five physicians who have a chronic illness or physical defect were also less likely to have lawsuits than other physicians. Finally, policyholders who had any peer group activity upon joining SVMIC tended to have more lawsuits.

MULTIVARIATE RESULTS FOR CLAIMS MODELS

Final equations in which the presence or absence of a lawsuit and the total paid are regressed on the independent variables are presented in Table 7. As stated earlier, total paid was transformed by taking the natural log because of its skewed distribution and the presence of outliers.⁶⁰ The control variables were entered first, followed by explanatory variables suggested by prior research and claim-specific variables, while exploratory variables were entered last into the equations. Overall predictability of the models is reasonably good, given the distributions of the dependent variables, with R squares of .22 and .21 for the likelihood of a suit and total paid equations respectively.⁶¹ Again, the independent variables contribute respectable increments to the explained variance (.10 and .19 in the lawsuit and total paid equations respectively) above and beyond the variance accounted for by the control variables.

Two control variables were important predictors in the presence of lawsuit equation. Each additional co-defendant named in a claim increases the likelihood of a lawsuit by 14%, and active physicians are 30% more likely to have had a closed claim result in a lawsuit. Only one claim-specific variable influences the probability of having a lawsuit, but it contributed a healthy 4% to the R square. If the physician was allegedly responsible for the most severe injury, the claim was more likely to result in a lawsuit. The one ex-

60. Actually, alternative specifications of the total paid model were tested using logarithmic transform, square root transform, and untransformed versions of the dependent variable. Ultimately, a log transformed specification was utilized to alleviate problems associated with heteroscedasticity, although the untransformed specification with the one extreme outlier omitted displayed the best goodness-of-fit properties (R square) and provided more meaningful interpretation of the unstandardized partial regression coefficients.

61. Ordinary least squares multiple regression was used for the dichotomous dependent variable (presence or absence of lawsuit), instead of logistic regression, because a number of studies have demonstrated that when the proportions in the 0 and 1 categories are not markedly skewed, the results of the two procedures will be quite similar. See, e.g., Cleary & Angel, *The Analysis of Relationships Involving Dichotomous Dependent Variables*, 25 J. HEALTH & SOC. BEHAV. 334 (1984). Generally, a split that falls within the 20-80 range is not viewed as problematic. In this study, 40% of the claims resulted in lawsuits; however, the R square has a ceiling that can be much less than 1.00 with binary dependent variables, depending upon the number of, and the measurement of, the independent variables.

TABLE 7
 MULTIPLE REGRESSION RESULTS FOR THE RELATIONSHIP
 BETWEEN SIGNIFICANT PREDICTORS AND THE
 LIKELIHOOD OF A LAWSUIT AND TOTAL
 PAID: FOR CLOSED CLAIMS ONLY

Variable	Claim Resulted in a Lawsuit				Log of Total Paid			
	<u>b</u> *	<u>B</u> *	<u>t</u>	<u>R</u> ²	<u>b</u>	<u>B</u>	<u>t</u>	<u>R</u> ²
<u>Control Variables</u>								
Number of co-defendants	.14	.31	2.71		.74	.21	1.83	
Active Status	-.30	-.30	-2.91	.12	-1.10 ^{NS}	-.15	-1.40	.02
<u>Claim-Specific Variables</u>								
Caused severest injury	.24	.23	2.01		2.09	.26	2.28	
This MD responsible				.16	2.27	.30	2.95	.16
<u>Physician Characteristics</u>								
Capacity	-.48	-.24	-2.34	.18	-3.55	-.23	-2.21	.21

^{NS} All coefficients significant at the .10 level, two-tailed, with the exception of those indicated by ^{NS}.

* b denotes the unstandardized partial regression coefficient; B denotes the standardized partial regression coefficient.

ploratory physician characteristic that affects the probability of having a lawsuit is capacity. Having a chronic illness or physical defect decreases the likelihood of having a lawsuit.

Only one control variable is a significant predictor of the total payout for closed claims: co-defendants increase the likelihood of higher payouts. The two significant claim-specific variables contributed a 14% increment to the explained variance. Both variables are positively related to total paid. Claims in which the physician was determined to have been responsible in causing the injury resulted in higher average payouts than other claims. By the same token, if the physician named in the claim was alleged to have caused the most severe injury, the average total paid was higher than otherwise. The only significant physician-specific variable is, again, capacity. Physicians having a chronic illness or physical defect are less likely to have higher total payouts.

DISCUSSION AND CONCLUSIONS

The pilot results, along with the limited population data available, clearly demonstrate the overall efficacy of this study's approach. The filing of claims and lawsuits does not seem to be a random process. Physician characteristics, as well as claim-specific variables, appear to be important factors

in predicting medical malpractice outcomes, even when variables such as active status, months of exposure, gender, age, average limits, attendance at a loss prevention seminar, and prior claims activity are controlled. Demographic characteristics, such as medical school, residency experiences, and capacity, as well as practice pattern variables, such as specialty (as measured by the proxy variable, average risk) and involvement in peer group activity, seem to be important predictors of malpractice experience. Moreover, claim factors, such as whether the doctor was responsible and whether the doctor was responsible for the most severe injury, also seem to be important predictors of the outcomes of claims. Average risk (specialty) and months of exposure, however, are by far the most important determinants of claims and lawsuit activity.

The primary limitations of the study are the small sample size of the pilot study and the limited amount of population data available. In the pilot study, a number of potentially interesting interactions could not be tested, and subgrouping the analysis by specialty (a potentially fruitful avenue of research) was impossible. Regarding the population data, having only aggregate data available prohibited the use of controls, and thus the bivariate conclusions are tentative.

An additional limitation of this study is that it lacks national data. Nonetheless, the pilot sample represented approximately 80% of the licensed physicians in Tennessee. Some academic and other physicians were not included. However, this exclusion probably led to a conservative test of our hypotheses by restricting variation on the dependent variable to some degree.

Finally, some historical data were collected, but for purposes of this paper, historical effects could not be tested because of the small number of cases. Thus, the analysis is essentially cross-sectional in nature. For one variable, loss seminar attendance, there may be a problem with causal direction, which accounts for its inclusion as a control variable. However, the overall efficacy of the approach used in this article is supported by the pilot data.

The historical chronicity of medical malpractice crises suggests that efforts at reform have focused on symptoms (rising insurance premiums, insurance availability, claims incidence and severity) rather than the disease (iatrogenic injury). Political aspersions are cast at lawyers and patients for filing lawsuits, at insurance companies for charging too high premiums and limiting insurance availability, and at doctors for causing iatrogenic injuries in the first place. When emotion is set aside, the available empirical research identifies a number of quantifiable problems.

In the aggregate, patients file too few lawsuits. The medical malpractice tort system is a lottery of random, arbitrary compensation. At best, an unknown (and perhaps unknowable) amount of medical malpractice is deterred. The malpractice tort system promises compensation for injury but accomplishes it only in a token manner.

The administrative and transactional costs of awarding compensation are high when accomplished through an adversarial process rather than an inquisitorial process. The malpractice tort system serves third party interests (lawyers, insurance companies, expert physician witnesses, and the like) over the interests of injured patients (unless the process is valued (and desired) more than the outcome).

Insurance companies face the dilemma of minimizing costs while maximizing protection of insureds. The nature of insurance is to spread risk, but a disproportionately small number of doctors are responsible for a disproportionately large frequency and severity of lawsuits.

Physicians are one of the most highly trained and respected groups in society, but they do make mistakes. Unfortunately, mistakes by physicians can be very damaging and costly.

The available empirical research has begun to suggest the appropriate means to address the medical malpractice problem—too few injured patients receiving compensation and prohibitive transaction costs. These problems can be remedied with a no-fault system, derived from workplace accident and highway accident compensation schemes,⁶² or by facilitation of a national health insurance system. (An honoree of this dedicatory volume, Professor Josephine Y. King, is notably prescient: “[T]he acceptance of [a stable and even moderately effective no-fault reparations methodology] by the public and the insurance industry may lead to its extension to injuries from other sources, such as medical injuries.”⁶³)

62. See, e.g., The National Childhood Vaccine Injury Act of 1986, Pub. L. No. 99-660, 100 Stat. 3743 (codified at 42 U.S.C. §§ 300aa-1 to -33 (1990)); Florida Birth-Related Neurological Compensation Plan of 1987, FLA. STAT. ANN. §§ 766.301-766.303 (West 1990); North Carolina Child Vaccine Injury Compensation Fund, N.C. GEN. STAT. § 130A-434 (1989); The Virginia Birth-Related Neurological Injury Compensation Act, VA. CODE ANN. § 38.2-5000 (Supp. 1988); ABA COMMISSION ON MEDICAL PROFESSIONAL LIABILITY, DESIGNATED COMPENSATORY EVENT SYSTEM: A FEASIBILITY STUDY (1979); Havighurst & Tancredi, “Medical Adversity Insurance”—A No-Fault Approach to Medical Malpractice and Quality Assurance, 51 MILBANK MEMORIAL FUND Q. 125 (1973); Henderson, *The New Zealand Accident Compensation Reform*, 48 U. CHI. L. REV. 781 (1981); Law, *A Consumer Perspective on Medical Malpractice*, 49 LAW & CONTEMP. PROBS. 305 (1986); O’Connell, *Neo-No-Fault Remedies for Medical Injuries: Coordinated Statutory and Contractual Alternatives*, 49 LAW & CONTEMP. PROBS. 125 (1986).

Of course, these no-fault schemes must themselves withstand evaluation.

63. J. KING, NO FAULT AUTOMOBILE ACCIDENT LAW viii (1987).

The dilemma facing insurance companies might be better resolved by the use of experience or merit rating in medical malpractice insurance. There is not only a body of research presenting justification for experience rating,⁶⁴ it is also the subject of legislation and insurance regulation in two states.⁶⁵

As for physicians themselves, the incidence and cost of medical injuries are reducible. Some researchers suggest a surcharge on, or professional regulation of, physicians with excessive multiple claims.⁶⁶ Others find that risk management efforts, especially adverse medical event notification of the clinical chief, are associated with positive malpractice claims experience.⁶⁷ Dr. Morlock observed that claims experience was

significantly lower in hospitals that by 1980 had established a governing board oversight committee for quality assurance/risk management, included risk management information in regular reports sent to the governing board, and had a formal policy that clinical chiefs must be notified of adverse medical incidents. In addition, the rate of adverse panel decisions regarding provider liability was significantly lower for hospitals that had formal policies indicating whether patients or families should be informed of medical errors, and specifying who had responsibility for communicating such information.⁶⁸

The discovery of adverse events through review of medical records is re-

64. See Nye & Hofflander, *Experience Rating in Medical Professional Liability Insurance*, 55 J. RISK & INS. 150 (1988) (using claims experience in setting appropriate premium rates is valid, based on analysis of Pennsylvania malpractice data, and provides as much information as knowing physicians' medical specialty); Rolph, *Some Statistical Evidence on Merit Rating in Medical Malpractice Insurance*, 48 J. RISK & INS. 247 (1981) (analyses of Maryland and Los Angeles data indicate effect of four years of a physician's claims experience on expected claims rate is comparable to knowing physician's medical specialty); C. Phelps, *Experience Rating in Medical Malpractice Insurance* (June 1977) (interpreting Los Angeles data: "each of the good doctors contributed \$3,000 a year to the bad doctors"; criterion of four-plus suits in four years leads to seven-fold increase in insurance premiums "would probably catch all of the bad doctors") (unpublished manuscript issued by the Rand Corporation, No. P-5877).

65. Note, *The Applicability of Experience Rating to Medical Malpractice Insurance*, 38 CASE W. RES. L. REV. 255 (1987) (analyzing Massachusetts and New York). Compare Minnesota Department of Commerce, *Medical Malpractice Claim Study 1982-1987* (Feb. 1989) (reviews of all claims filed with two insurers in Minnesota, North Dakota, and South Dakota finds insurers overestimate exposure of pending claims by two to three times amount eventually paid, in part because data on the frequency of claims and severity are not available to competitors, making pricing difficult, and recommends that government agencies periodically collect and examine loss data so competing insurers can determine competitiveness of pricing) (unpublished study available at Memphis State University Center for Health Services Research).

66. See, e.g., Nye, *supra* note 30, at 1558-59.

67. See, e.g., Morlock, *supra* note 10.

68. *Id.* at 9.

portedly reliable and valid.⁶⁹ Claims data systems are utilized to assess health care outcomes and to identify (and presumably prevent) causes of medical injury.⁷⁰ While the good-bedside-manner or communication approach to reducing lawsuits, or even injuries, has not been empirically evaluated, preliminary research has occurred.⁷¹

Empirical research concerning medical malpractice should clearly continue. This study should be replicated with either a much larger sample, or with the entire population of physicians insured by SVMIC. By doing so, potentially interesting interactions can be tested, and simultaneous control of all relevant factors can be accomplished. Future research should include patient measures (some of whom bring lawsuits and some of whom do not). Some lawsuits may result from the interaction patterns of patient and physician.

Loss prevention seminars should incorporate the information from empirical research. The efficacy of loss prevention seminars in reducing iatrogenic injury and malpractice lawsuits should be evaluated.

Profiling physicians and claims associated with malpractice lawsuits and iatrogenic injury will facilitate the prediction of future injury and malpractice, the identification of present and past injury and malpractice, and the diminution of injury and malpractice to its irreducible minimum.

69. See generally Brennan, Localio & Laird, *Reliability and Validity of Judgments Concerning Adverse Events Suffered by Hospitalized Patients*, 27 MED. CARE 1148 (1989); Brennan, Localio, Leape, Laird, Peterson, Hiatt & Barnes, *Identification of Adverse Events Occurring During Hospitalization: A Cross-Sectional Study of Litigation, Quality Assurance, and Medical Records at Two Teaching Hospitals*, 112 ANNALS INTERNAL MED. 221 (1990).

70. See, e.g., Cheney, Posner, Caplan & Ward, *Standard of Care and Anesthesia Liability*, 261 J. A.M.A. 1599 (1989); Wennberg, Roos, Sola, Schori & Jaffe, *Use of Claims Data Systems to Evaluate Health Care Outcomes: Mortality and Reoperation Following Prostatectomy*, 257 J. A.M.A. 933 (1987).

71. See, e.g., Roter & Hall, *Studies of Doctor-Patient Interaction*, 10 ANN. REV. PUB. HEALTH 163 (1989); Comment, *Healing Angry Wounds: The Roles of Apology and Mediation in Disputes Between Physicians and Patients*, 1987 J. DISPUTE RESOLUTION 111.