

# The Use of Patient Satisfaction Surveys and Alternative Coding Procedures to Predict Malpractice Risk

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**Purpose:** Because costs associated with malpractice litigation draw substantial resources away from patient care, many health care organizations are seeking efficient methods to manage these risks. The purpose of this study was to identify methods by which commonly available patient satisfaction indicators could be used to identify potential malpractice litigation risks.

**Subject and Methods:** Using data from the risk management department of a large academic medical center, we combined yearly administrative records from 1998 to 2006 of malpractice-related litigation activity, with patient satisfaction scores related to attending physicians. We then applied 3 approaches to code patient satisfaction for each year: (1) calculating the overall mean, (2) assigning tertiles, and (3) identifying the minimum satisfaction response to any question. We then estimated 3 versions of random-effect logit models to examine which estimators predicted whether an attending physician was named in a lawsuit in a given year.

**Results:** Minimum satisfaction score was significantly associated with malpractice activity; the other analytic approaches did not yield significant associations. Although patient satisfaction explained little variation in an individual physician's contribution to malpractice risk, accounting for the minimum score explained more than a quarter of a department's contribution.

**Conclusions:** Findings suggest that minimum satisfaction score may provide a useful metric for identifying and prioritizing malpractice risks.

**Key Words:** medical malpractice, patient satisfaction, compliance  
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The current malpractice crisis has sparked increased fear and uncertainty in all areas of medicine, including providers, hospitals, and managed care organizations.<sup>1–4</sup> The average payment for a medical malpractice claim was \$327,000 in 2007,<sup>5</sup> and insurance premiums have continued

to increase. Several approaches to reduce litigation have been proposed, but with mixed results. Tort reform is often suggested, but evidence of actual reduction in cases is mixed in response to these reforms.<sup>6–8</sup> An alternative receiving attention more recently is the use of administrative health courts, similar to those used in Sweden, Denmark, and New Zealand.<sup>9</sup> As policymakers work to develop solutions at the state and national level, institutions need to develop systematic methods to identify and reduce risk at the micro level.

Although some may argue that malpractice suits affect all doctors, research suggests there are systematic differences in provider litigation risk.<sup>4,10</sup> For example, “negligent physicians,” as categorized by third party physician reviewers, have been found to be sued more frequently than the non-negligent,<sup>11,12</sup> and poor communication between patients and providers is also associated with higher risk.<sup>13</sup> Among surgeons, their tone of voice during routine visits has been associated with higher risk of lawsuits.<sup>14</sup> A national study found that some medical schools tended to have graduates with higher rates of lawsuits.<sup>15</sup> Hickson et al<sup>16</sup> found that physician gender, patient volume, and patient complaints were significantly associated with risk of lawsuits.

Physicians in certain specialties, such as orthopedic surgery, neurosurgery, and obstetrics/gynecology, are also at a higher risk compared with those in general practice.<sup>12,17,18</sup> Although the single strongest predictor of future malpractice cases are past malpractice claims,<sup>19</sup> a recent study showed that the average time between incident and the notice of intent to file a suit was 24.2 months.<sup>20</sup> The identification and acceptance of efficient prelitigation indicators of risk would be more useful from a prevention standpoint, particularly in light of the considerable lag time between an incident and the filing of a lawsuit.

Although improved complaint handling through new mediation models has diverted many suits and reduced costs,<sup>21–23</sup> it will not necessarily prevent future lawsuits. Hickson et al have used patient feedback as a mechanism to predict an individual physician's likelihood to be named in a malpractice suit. Unsolicited patient complaints (eg, telephone calls, letters, or e-mails to the hospital or physician by the patient or family) have been correlated with malpractice claims, providing a practical method for prospectively identifying providers who have a greater propensity for litigation that extends beyond simply the specialty or type of practice.<sup>16,24</sup>

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However, use of unsolicited complaints also poses some limitations. Complaints result in part from either poor practice or poor communication with the patient; ideally, our goal should ultimately be to efficiently target high-risk providers before an incident occurs. To address this limitation, Stelfox et al<sup>25</sup> examined whether routinely-collected patient satisfaction data could be used to augment unsolicited complaints to improve identification of providers at high risk for a malpractice claim. They found that physicians with average patient satisfaction scores in the lowest tertile were more likely to have at least one risk management issue compared with physicians with average scores in the highest tertile. After controlling for the number of unsolicited complaints, however, patient satisfaction scores were not independently associated with the occurrence of a risk management episode.

Given the widespread use of patient satisfaction surveys, it seems worthwhile to continue investigating whether other approaches to these data could be useful to risk management programs. In particular, the analytic approaches that have been used in the past with patient satisfaction data appear to have some important limitations. Traditionally, patient satisfaction scores are simply averaged across indicators per patient, then averaged across patients per physician.<sup>26</sup> Averages are of little use in differentiating between high and low performers, however, because the variation across indicators and across patients is low, with standard deviations (SDs) less than a single unit.

Furthermore, grouping physicians into ranked categories fails to provide an understanding of the variance structure of risk. The design of interventions to successfully reduce malpractice risk requires an appreciation of the proportion of risk due to the specialty, where interventions could be targeted at clinical departments, compared with the proportion of risk due to the physician, independent of specialty. Finally, using any grouping based on means, such as tertiles, make invalid assumptions about the statistical distribution of satisfaction scores, because satisfaction scores are generally skewed rather than exhibiting a normal distribution. Patients tend to rate their satisfaction at the higher levels of the rating scale to describe their health care experience. Properties of patient satisfaction survey data create problems for simple mean associations that often inhibit the detection of associations through linear analyses.

The present study sought to overcome these analytic limitations using 2 new approaches. The first approach capitalizes on the assumption that malpractice lawsuit risk is not equally distributed across patients and physicians, but is instead concentrated in anomalous, problematic service events. We accommodate this assumption by using an event-driven approach, in which we interpret individual satisfaction scores falling below the normal range as potentially indicative of the potential for lawsuit risk. Second, we use both department and physician level data to examine the proportion of variance in medical malpractice risk explained by physician specialty compared with the proportion explained by other physician-related factors.

## METHODS

The study was conducted at a large academic medical center in the Midwestern United States. Data included patient responses to a standardized patient satisfaction survey, internal administrative records regarding the presence of open and closed malpractice lawsuits, and practice-related information about the physician and his or her respective specialty. Data were aggregated such that the unit of analysis was the physician-practice year, rather than aggregating multiple years of data as has been done in previous research.

### Suit Implication

The study reviewed internal records regarding malpractice suits identifying specific hospital physicians. In the period of 1998 and 2006 there were a total of 2579 physicians named in lawsuits brought against the hospital and/or physicians of the hospital. These suits may have been ultimately won or lost by the plaintiffs, dropped, settled, or the outcome of the suit may still have been pending at the time of data collection. The outcome of the lawsuit was not studied in this analysis; instead, we measured whether a physician was named in a lawsuit. All legal actions involve a cost to the hospital and/or physician—financial or nonfinancial (eg, the emotional toll of being sued)—regardless of the outcome. Records from the legal affairs office of the medical center were coded into a physician list by year, noting whether the physician was named in either a pending or closed lawsuit. The earliest date noted in the administration's record, such as the encounter date, was also recorded. In 77% of the cases, the actual date of the encounter was determined and used rather than the date that the case was filed. When a lawsuit named more than one physician in the complaint, all physicians were coded as having a suit. The annual physician data were then linked to the survey data. A physician was coded as "1" for that year if they had been named in a suit, and "0" for the year if they had not. This coding was completed for each doctor for whom the medical center had survey data from patients discharged during that year. Another variable was created indicating whether the physician was named in a lawsuit during a previous year, including year preceding the available survey data.

### Patient Satisfaction Scores

Between 1998 and 2006, a random sample of inpatients were mailed a patient satisfaction survey by Press Ganey Associates, Inc., a vendor for patient, employee, and provider satisfaction surveys in the health care industry that provides satisfaction surveys to more than 7000 health care facilities.<sup>27</sup> Most of surveys were mailed between 5 and 14 days of a patient being discharged from the hospital. Of the patients receiving a survey during this time period, a total of 54,412 surveys were returned. Surveys with incomplete patient or physician information or with no responses to the provider satisfaction questions were excluded. Surveys were linked to the corresponding attending physician. Because the distribution of the number of surveys per physician was strongly positively skewed, 17 physicians out of 629 (represented by more than the 99th percentile of surveys) were excluded. The final sample included a total of 612 physicians representing

2331 practice-years and 23,449 surveys. Similar to Stelfox et al.,<sup>25</sup> we used 5 questions that specifically addressed the patient's experience with the health care provider.

Patients were asked to rate the services received in the following questions: time physician spent with you, physician's concern for your questions and worries, how well physician kept you informed, friendliness/courtesy of physician, and skill of physician. Each question was rated on the following 5-point scale: (1) very poor, (2) poor, (3) fair, (4) good, and (5) very good. All respondents who answered at least 1 of these questions had their responses included in the analysis.

We calculated 3 measures of satisfaction for each physician-practice year, resulting in 1 record per physician, per practice year. The first was a categorical method, grouping physicians into satisfaction score tertiles, consistent with the method used by Stelfox et al.<sup>25</sup> For the second method, we calculated the mean satisfaction score for each physician, then calculated the deviation between the physician's mean satisfaction score and the mean satisfaction score of all physicians for that year. The final measure was the minimum score for the physician-practice year. To calculate the minimum score, we simply found the lowest response to any question from any respondent for each physician. We then reverse coded the measure so that 0 = lowest score was very good, 1 = lowest score was good, 2 = lowest score was fair, 3 = lowest score was poor, and 4 = lowest score was very poor.

### Physician and Specialty Data

Both physician and department-level data were used in this study. Each physician was assigned to the department in which he or she was granted privileges during the practice year. All physicians had admitting privileges during the practice year for which they had survey data according to internal hospital records. To account for the influence of an individual physician's exposure period to the risk of a malpractice lawsuit, the number of discharges for that particular physician during the calendar year was included as an independent variable. Other demographic data were not available. Third, the calendar year of practice was included. Finally, research has shown that an important predictor of a malpractice claim is a history of malpractice claims.<sup>16</sup> To control for this, a dummy variable was used to indicate if the physician was named in one or more lawsuits between 1998 and the year before the analysis year. Again, the physician only needed to be named in a lawsuit, without a verdict against the physician or compensation being paid to the claimant. Lawsuits could be closed, with (1) compensation paid to the claimant, (2) no compensation paid to the claimant, or (3) the claim being dropped. The lawsuit could also be pending, with no resolution at the time of data collection.

### STATISTICAL MODELS AND HYPOTHESES

We used a repeated measures design with 1 record per physician, per practice year. Although evidence points to a lack of physician "learning" from malpractice suits (ie, the risk of being involved in a lawsuit decreases after the initial

lawsuit),<sup>24</sup> examining the relationship by calendar year allows us to control for differences in both satisfaction scores and other factors (eg, number of discharges) across time that we hypothesize may be associated with the risk of a lawsuit. The random effects regression models accounted for the clustering of physicians within departments and across time. We compared the goodness-of-fit of the 3 different specifications of patient satisfaction in predicting the risk of a malpractice claim. We also estimated a base model that included all independent variables (occurrence of a lawsuit in a previous practice year, surgical specialty, and number of discharges) except for patient satisfaction.

For each of the 3 specifications of patient satisfaction, we also tested 3 different approaches to modeling the variance structure of malpractice risk to estimate the proportion of variance explained by the department compared with other physician-related factors. Each model estimated the variance of the residuals after controlling for the base model variables. We then calculated the proportion of the variance explained by each method and calculated the percentage of risk associated with the department and physician, after accounting for satisfaction, by estimating the intraclass correlation coefficient of determination.

In total, we tested 3 patient satisfaction specifications, each with 3 types of variance structures and a base model for comparison, for a total of 10 estimated models. We used the STATA 9.1 XTLOGIT program to estimate the models with only 1 variance component (either department-fixed effects or physician-fixed effects). To estimate the models with 2 variance components (both physician and department fixed effects), we estimated both variance components and logistic regression coefficients, using Raudenbush and Bryk's<sup>28</sup> Hierarchical Linear Modeling Program.

### RESULTS

The sample consisted of 612 physicians, each with 3 to 4 practice years, representing 2331 practice year records. More than half of the respondents rated their care providers as "very good" in each of the 5 aspects of care, and between 87% and 97% rated their care as "good" or very good (Table 1). Less than 5% had poor or very poor responses.

Overall 11% of the physicians in the sample were implicated in at least 1 lawsuit during the study period. However, during each practice year, a physician had about a 3% chance of lawsuit implication, and 35% of the practice years were preceded by a previous lawsuit (Table 2). Per practice year, the average patient response was 4.51, where 5 represented very good and 1 represented very poor, and 95% of the cases fell between very good and above "fair" [mean = 4.51, SD = 0.45, 95% confidence interval (CI): lower bound 3.61, upper bound >5]. Averaging all practice years, the average of patient responses is even higher, with a lower distribution (mean = 4.78, SD = 0.35). The average lowest score, however, had a mean toward the center of the scale per practice year (mean = 3.2, SD = 1.3, 95% CI: 0.6, 5+) and also overall (mean = 2.52, SD = 1.34, 95% CI: -0, 5+). Thus, the minimum score had a much more normal distribu-

**TABLE 1.** Distribution of Responses for the 5 Satisfaction Questions, 1998–2006 (N = 54,412)

Response	Time Physician Spent With You		Physician Concern for Your Questions and Worries		How Well Physician Kept You Informed		Courtesy/Friendliness of Physician		Skill of Physician	
	N	%	N	%	N	%	N	%	N	%
Very poor	751	1.5	540	1.1	642	1.3	350	0.8	221	0.5
Poor	1161	2.4	701	1.4	845	1.7	318	0.7	166	0.4
Fair	4928	10.0	2911	6.0	3339	6.9	1783	3.9	1111	2.5
Good	16,028	32.6	13,615	27.8	13,118	27.0	11,292	24.8	8797	19.6
Very good	26,325	53.5	31,208	63.7	30,662	63.1	31,713	69.8	34,567	77.0
Total	49,193	100.0	48,975	100.0	48,606	100.0	45,456	100.0	44,862	100.0

**TABLE 2.** Descriptive Statistics by Physician and Physician-Practice Year, 1998–2006

	Mean	Standard Deviation
Overall (N = 612)		
Average practice yr per physician	3.81	2.09
Any lawsuit, 2001–2005	0.11	0.32
Average of satisfaction scores	4.78	0.35
Minimum satisfaction score	2.52	1.34
Surgical specialty	0.19	0.39
Average discharges per yr	56.31	70.95
Per physician-practice year (N = 2331)		
Any lawsuit	0.03	0.18
Previous lawsuit	0.35	0.48
Average of satisfaction scores	4.51	0.45
Minimum satisfaction score	3.20	1.30

**TABLE 3.** Distribution of Physicians by Lowest Satisfaction Score and Lawsuit Experience (N = 612)

Lowest Satisfaction Response 1998–2006	Any Lawsuit Implication 1998–2006	
	No	Yes
Total	543 (89%)	69 (11%)
Very poor	162 (81%)	39 (19%)
Poor	96 (87%)	14 (13%)
Fair	126 (92%)	11 (8%)
Good	107 (96%)	5 (4%)
Very good	52 (100%)	0 (0%)

Row percentages are in parentheses.

tion than the average of patient responses. Finally, about 20% of the study physicians were credentialed in a surgical specialty, with an average of about 56 patient discharges per year (95% CI: 0, 198). The distribution of lowest satisfaction scores differed substantially between physicians implicated in at least one suit compared with those who were not implicated (Table 3). Thirty percent of physicians who were not implicated in any lawsuits had “very poor” as their minimum satisfaction score, while 57% of those who were implicated in at least 1 lawsuit had very poor as their minimum score.

### Baseline Probability of Implication in a Malpractice Lawsuit

The estimates of all effects were highly robust to specification and variance structure. Estimates for the effects of past lawsuit experience, surgical specialty, and discharges were never more than 2 standard errors different from the estimates from the other models. For our baseline model that excluded a measure of patient satisfaction, we estimated that the change in experiencing a lawsuit during a practice year for a physician who had never experienced a suit, working in a nonsurgical department, with typical department discharge rates, was about 1%.

The risk of implication increased by 4.6 times in a practice year after a previous malpractice suit. Furthermore, the risk for a malpractice claim within a given practice year increased by 2.2 times for those in a surgical specialty. As consequence, the risk of implication for any given year for a surgical specialist, with typical discharge rates for their department, and with previous suits was 6.9%, compared with the base likelihood of 1.6%. There was some evidence of an exposure effect, but it was minimal; for every 10 discharges above the department mean, the risk of a lawsuit increased by 3.1%.

### Effects of Patient Satisfaction

Our first approach was to test the results of Stelfox et al<sup>25</sup> and determine if physician satisfaction tertiles were associated with the risk of a malpractice claim. While the lowest tertile was at the greatest risk compared with the highest tertile, the likelihood of a malpractice claim was not significantly different among the 3 tertiles (Table 4, model 1). The second specification using the deviance between a physician’s average satisfaction score and the average overall satisfaction had no effect, either in significance or magnitude, regardless of the variance structure used (Table 4, model 2).

The third specification using the lowest score per practice year was a significant predictor of malpractice risk (Table 4, model 3). We found that as the minimum response moves one category lower (eg, from “very good” to “good,” from “good” to “fair”), the risk of implication was estimated to increase by 21.7%.<sup>29</sup> Taking the previous example of the surgical specialist, already previously named with an average discharge rate for their department, their risk of malpractice implication was 6.9%, if their

**TABLE 4.** Logistic Regression Coefficients Predicting Risk of Lawsuit Implication During Practice Year (N = 2331)

	Base	Model 1 Satisfaction Tertiles	Model 2 Satisfaction Deviation from Mean	Model 3 Minimum Satisfaction Score
Suit during previous practice year	1.532* (0.264)	1.541* (0.264)	1.532* (0.264)	1.519* (0.264)
Surgical specialty	0.871* (0.304)	0.866* (0.304)	0.871* (0.304)	0.791* (0.303)
Average discharges per practice year–department mean <sup>†</sup>	0.043* (0.017)	0.040* (0.017)	0.042* (0.017)	0.031 (0.017)
Satisfaction score in lowest tertile	—	0.469 (0.309)	—	—
Satisfaction score in middle tertile	—	0.291 (0.302)	—	—
Deviance between average satisfaction and overall mean <sup>‡</sup>	—	—	-0.009 (0.282)	—
Lowest score on any question	—	—	—	0.196* (0.096)
Constant	-4.577* (0.263)	-4.838 (0.328)	-4.577 (0.263)	-4.909 (0.317)
Base probability	1.018%	0.786%	1.018%	0.732%

\*Denotes significant at the 0.05 level or better. Standard errors reported in parentheses; models estimated using the HLM Program.

<sup>†</sup>Coefficient multiplied by 10.

<sup>‡</sup>Values reverse coded, where 0 = highest score (very good) and 4 = lowest score (very poor).

Model 1, indicates patient satisfaction measured in tertiles; model 2, patient satisfaction measured as deviance between average satisfaction for physician and average satisfaction for all physicians; model 3, patient satisfaction measured as lowest score on any question.

**TABLE 5.** Comparison of Physician and Department Variance Explained by the Models (N = 2331)

	Department Random Effects			Physician Random Effects			Department and Physician Random Effects		
	(1A)	(2A)	(3A)	(1B)	(2B)	(3B)	(1C)	(2C)	(3C)
Satisfaction measure									
Tertiles	X	—	—	X	—	—	X	—	—
Deviation from mean	—	X	—	—	X	—	—	X	—
Minimum score	—	—	X	—	—	X	—	—	X
Physician variance	—	—	—	0.69	0.69	0.68	0.52	0.54	0.53
Reduction in variance (%)	—	—	—	0.48%	0.00%	1.27%	2.44%	0.00%	2.14%
Department variance	0.71	0.71	0.70	—	—	—	0.69	0.69	0.68
Reduction in variance (%)	0.40%	0.00%	27.51%	—	—	—	0.34%	0.00%	27.51%

All models controlled for the occurrence of a malpractice suit during the previous practice year, being credentialed in a surgical specialty and the standardized number of discharges per practice year (the physician’s number of discharges in the practice year—mean number of discharges in the practice year for all physicians in the department).

Model 1, indicates patient satisfaction measured in tertiles; model 2, patient satisfaction measured as deviance between average satisfaction for physician and average satisfaction for all physicians; model 3, patient satisfaction measured as lowest score on any question. A, department random effects only; B, physician random effects only; C, department and physician random effects.

minimum score was “very good.” If their lowest score was “good,” their chance of implication in a lawsuit would increase to 8.3% compared with 6.9%. If their lowest score was “fair,” their chance of lawsuit implication would increase to 9.9%. If that physician’s lowest score in a practice year was “poor” or “very poor,” their chance of a malpractice suit that year would increase to 11.8% and 13.8%, respectively.

As a test of the robustness of these results to estimation technique, the models were re-estimated using probit and logit models where random effects were suppressed. These models produced similar estimates, demonstrating the robustness of our models across variance structure, specification and estimation techniques.

**Variance Explained**

The average patient response to survey questions explained none of the residual variation in malpractice

risk. Examining the results from the model with both random effects (Table 5), we found that the minimum score variable explained 27% of the department random effect (ie, people with low scores are somewhat clustered in departments) and about 2% of the physician random effect (model 3C). Also, although not statistically significant, the model using tertiles to measure patient satisfaction explained a comparable amount of residual variation relative to the model using the minimum satisfaction score (model 1C). These results were generally consistent regardless of the variance structure modeled. Approximately 54% of malpractice risk was associated with the physician’s department, after controlling for surgical status. Conversely, regardless of department and discharge rate, 46% of the malpractice risk was associated with physician-specific characteristics, including satisfaction with the provider.

## DISCUSSION

The results support Hickson's approach of attending to individual patient complaints, and extend the source of these data to widely used patient satisfaction surveys. Hickson's program uses peer-to-peer counseling of physicians who receive patient complaints to reduce future risk. This method, however, is predicated on the physician experiencing a complaint. Receiving a complaint is still a relatively rare event—in a given year, most physicians probably receive no complaints. Stelfox et al,<sup>25</sup> for example, found that only 0.003% of the discharges from 1 academic medical center resulted in an unsolicited complaint.

By comparing the variance structure of risk, our results demonstrate that both the department and individual physician may have equal associations with risk, even after controlling for the oft-cited number of discharges and surgical specialty. In the present study, the number of discharges was not predictive of risk, after controlling for physician characteristics. Our results demonstrate that interventions to reduce malpractice risk should be targeted both at the department as well as the individual physician.

More research is needed to understand how to successfully reduce the risk of litigation based on the primacy of clear physician-patient communication. We suggest that a multistrategy approach in reducing litigation risk should be tested. First, hospitals should require training on effective patient communication for physicians applying for admitting privileges and provide this training for all physicians who request it. Second, physicians whose own feedback from unsolicited patient comments (eg, calls, letters, e-mails) and solicited comments (ie, patient surveys) suggest higher risk should be required to participate in communication improvement programs. Third, hospitals should hold routine department level training on the specific physician-patient communication issues for the departments at higher risk for lawsuits. This should involve all physicians, regardless of lawsuit history within the department. A review of the literature found no citations of such programs when in fact research suggests that departmental factors contribute as much risk as individual factors. Some departments are documented as having higher than average risk of lawsuits and for these departments, the training should focus on the physician-patient dynamic particular to the department. In other instances where a hospital determines that one of its department not usually associated with higher risk has a higher than anticipated malpractice risk, a communication program specific to the department within the particular hospitals setting can be developed. These are departments with practice culture issues not explained simply by prevailing national norms associated with the type of patient specialty.

As standardized patient surveys become more prevalent within health care organizations of all sizes, larger studies will become more feasible. The federally mandated "Consumer Assessment of Healthcare Providers and Systems" Hospital Survey<sup>30</sup> of the experience of inpatients could become the de facto source of patient feedback for individual physicians. In its initial rollout, the program only requires hospitals to collect a few hundred surveys annually—not

enough to provide individual feedback to physicians. Hospitals would have to expand their survey programs to provide an adequate number of surveys per physician to provide sufficient feedback.

Tools are now available to assess litigation risk in advance of patients bringing legal action. There are now a variety of programs with the aim of improving physician-patient communication<sup>31,32</sup> as well as a movement by the leaders in the field to standardize their definitions.<sup>33</sup> At the same time, a growing body of research is looking at the efficacy of these programs in improving communication and reducing risk over time.<sup>34–36</sup> This should help to determine the optimal program features (eg, length, format) and the extent to which programs must be tailored to the specific needs of different physicians and types of patients. Coupling risk assessment tools with empirically proven physician-patient communication programs holds the promise of significantly reducing occurrence of lawsuits and a better bond between patients and their physicians.

There are several important limitations of this study that should be kept in mind. Perhaps foremost among these is that all data originated from a single provider organization, an academic medical center. Although we do not believe the nature of the service delivery system is so different as to render the results unique to this institution, it still stands to reason that to the extent that this organization is not representative of other organizations, it could affect generalizability of the results. In addition, although the majority of the lawsuits were assigned to a practice year based on the date of service, we were unable to identify a specific date of service for a small proportion of the claims and used the date the lawsuit was filed to assign a practice year. We assumed that the claims with no identifiable date of service were randomly distributed across providers, but were unable to test this assumption.

Although these findings also reveal the importance of the department in predicting malpractice risk, the underlying reasons for this relationship are not clear. In particular, while we might assume that the quality of the patient-provider relationship is a key driver of satisfaction scores, they could also be driven by patients experiencing adverse events elsewhere in the system. In our study, we were unable to study the individual clinical patient records of those who gave their physicians a lower satisfaction rating to determine if these ratings were actually in response to adverse outcomes. This is a limitation of the current study, which should be addressed in future research in this field. Also, although at least a portion of this association is due to certain specialties performing higher risk procedures or treating higher risk patients, other factors, such as department culture, may also be at the root of malpractice risk. So, although greater risk can be established, the specific causes of that risk remain ambiguous. Further work is needed to understand the fundamental reasons for this relationship. Newly available and standardized data, coupled with more robust and complex estimation techniques, will allow us to pinpoint the mechanisms by which the department and physician are related to malpractice

patterns, eventually saving resources and improving the patient experience.

These limitations notwithstanding, results of our research do seem to suggest that analysis of low-score patient satisfaction data may be an efficient source of actionable information concerning litigation risks within specific physician practices. This approach may help overcome the generally low variation in satisfaction scores that are associated with many patient satisfaction surveys.

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