SPECIAL ARTICLE

Changes in Practice among Physicians with Malpractice Claims

David M. Studdert, LL.B., Sc.D., Matthew J. Spittal, Ph.D., Yifan Zhang, Ph.D., Derek S. Wilkinson, Ph.D., Harnam Singh, Ph.D., and Michelle M. Mello, J.D., Ph.D.

ABSTRACT

BACKGROUND

Physicians with poor malpractice liability records may pose a risk to patient safety. There are long-standing concerns that such physicians tend to relocate for a fresh start, but little is known about whether, how, and where they continue to practice.

METHODS

We linked an extract of the National Practitioner Data Bank to the Medicare Data on Provider Practice and Specialty data set to create a national cohort of physicians 35 to 65 years of age who practiced during the period from 2008 through 2015. We analyzed associations between the number of paid malpractice claims that physicians accrued and exits from medical practice, changes in clinical volume, geographic relocation, and change in practice-group size.

RESULTS

The cohort consisted of 480,894 physicians who had 68,956 paid claims from 2003 through 2015. A total of 89.0% of the physicians had no claims, 8.8% had 1 claim, and the remaining 2.3% had 2 or more claims and accounted for 38.9% of all claims. The number of claims was positively associated with the odds of leaving the practice of medicine (odds ratio for 1 claim vs. no claims, 1.09; 95% confidence interval [CI], 1.06 to 1.11; odds ratio for ≥5 claims, 1.45; 95% CI, 1.20 to 1.74). The number of claims was not associated with geographic relocation but was positively associated with shifts into smaller practice settings. For example, physicians with 5 or more claims had more than twice the odds of moving into solo practice than physicians with no claims (odds ratio, 2.39; 95% CI, 1.79 to 3.20).

CONCLUSIONS

Physicians with multiple malpractice claims were no more likely to relocate geographically than those with no claims, but they were more likely to stop practicing medicine or switch to smaller practice settings. (Funded by SUMIT Insurance and the Australian Research Council.)

From the Departments of Medicine (D.M.S., Y.Z.) and Health Research and Policy (M.M.M.), Stanford University School of Medicine, and Stanford Law School (D.M.S., M.M.M.) — both in Stanford, CA; the Melbourne School of Population and Global Health, University of Melbourne, Melbourne, VIC, Australia (M.J.S.); and the Health Resources and Services Administration, Department of Health and Human Services, Rockville, MD (D.S.W., H.S.). Address reprint requests to Dr. Studdert at the Center for Health Policy/Center for Primary Care and Outcomes Research, 117 Encina Commons, Stanford, CA 94305, or at studdert@stanford.edu.

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A small group of physicians accounts for a disproportionately large share of all malpractice claims and patient complaints. This maldistribution has long been evident,[1-4] but studies in the past several years have brought it into sharper focus.[5-8] For example, our 2016 study of paid malpractice claims over a 10-year period estimated that 1% of physicians accounted for nearly one third of the claims and that 94% of physicians had none.[7]

Previous studies have described characteristics of physicians who have malpractice claims, typically by comparing them with physicians who have no claims.[9,10] However, physicians who accrue multiple claims are a distinctive subgroup. Despite concerns that these physicians pose a heightened risk of harm to patients,[11-13] few studies have focused on them,[1,5,7,8] and data are lacking on whether their legal difficulties prompt changes in clinical practice.

In a national cohort of physicians followed for up to 8 years, we examined associations between malpractice-claims experience and the incidence of four types of changes in clinical practice: leaving the practice of medicine, reducing clinical volume, relocating, and moving to a different-sized practice. We hypothesized that physicians who incurred paid malpractice claims would be more likely to make these changes than peers who did not and that their likelihood of doing so would increase with their number of claims. Physicians who incur claims — especially those with multiple claims — may encounter a variety of problems that prompt such changes, including actions against their licenses, difficulties maintaining hospital credentials, liability-insurance cancellation or price increases, and adverse reputational effects that reduce referrals and deter patients.

Methods

Data

We formed the study cohort by linking extracts of two U.S. data sets: the Medicare Data on Provider Practice and Specialty (MD-PPAS, version 2.2) and the National Practitioner Data Bank (NPDB). The MD-PPAS data set consists of annual, physician-level files beginning in 2008.[14] Physicians with a valid National Provider Identifier (NPI) who submit at least one Medicare Part B noninstitutional service for reimbursement in a calendar year enter the file for that year. Since 2008, billing physicians have been required to have an NPI, and approximately 90% of practicing physicians treat Medicare beneficiaries,[15-17] so each MD-PPAS file includes most physicians practicing that year.

We obtained MD-PPAS files for 2008 through 2015, which included physicians' sex, date of birth, and primary specialty; summary measures of clinical volume; and the geographic location and legal entity from which the physician billed the most services each year. The billing entity is defined by tax identification number. Location is defined by state and core-based statistical area (CBSA). CBSAs designate a county or counties anchored by at least one urban core with 10,000 or more residents, plus surrounding areas with strong socioeconomic ties to that core.[18,19]

The NPDB is a confidential repository of information on paid malpractice claims and other adverse professional actions against health care practitioners. It is operated by the Health Resources and Services Administration (HRSA). Because malpractice payments made on behalf of practitioners must be reported, the NPDB is considered the most comprehensive national source of information on paid claims.

We obtained an extract of the NPDB that covered all reports of paid claims from 2003 through 2015 against doctors of medicine and doctors of osteopathic medicine. The file contained information on injury severity, payment amount and date, and type of disposition (settlement or verdict).

We linked the MD-PPAS and NPDB files at the physician level using the NPI. Because the HRSA strictly protects identifiable information in NPDB records, HRSA employees (the fourth and fifth authors) performed the linkage and removed identifiers before sharing the combined data set externally. Additional details of the linkage are provided in Section II in the Supplementary Appendix, available with the full text of this article at NEJM.org.

Study Cohort

The study cohort was constructed at the physician-year level (Fig. S1 in the Supplementary Appendix). To reduce the frequency of practice changes that are unlikely to be related to physicians' claims experience, we excluded physicians younger than 35 or older than 65 years of age (117,525 physicians)

and those who billed fewer than 100 services in the first year they appeared in the cohort (164,810 physicians).

OUTCOME VARIABLES

We analyzed four outcomes: exits from medical practice, geographic relocation, shifts in practice-group size, and changes in clinical volume. The first three were specified as binary variables indicating whether or not a change was observed from 1 year to the next. Specifically, the variable for exits from medical practice indicated a physician who was present in the MD-PPAS in 1 year and absent the next. Relocation was examined as any change in CBSA, movement to another state, movement to a CBSA with a less populous urban core, and movement to a remote area. Change in practice-group size was examined as movement into a larger group, a smaller group, and solo practice. Clinical volume was specified as two linear variables: the number of Medicare services billed (i.e., the number of line items billed by the physician for services covered by Medicare) in the calendar year and the number of unique Medicare patients treated in the calendar year; both variables were log-transformed before analysis to address their skewed distribution.

We measured practice-group size using tax identification numbers. Physicians who bill under the same tax identification number share a financial organization, so grouping them according to tax identification number within an MD-PPAS annual file provides an estimate of the number of physicians working in the same practice.[20] The MD-PPAS was designed to facilitate this method of estimating practice size, and previous studies have applied it.[21,22] After grouping cohort members according to tax identification number and year, we classified them into four practice sizes: solo, small (2 to 10 physicians), medium (11 to 50 physicians), and large (>50 physicians). The proportion of cohort physicians in each of these categories was similar to estimates from other studies.[22-24]

To measure relocations, we classified CBSAs into four categories based on the population size of their largest urban core: large metropolitan (>1 million residents), medium-sized metropolitan (250,000 to 1 million residents), small metropolitan (25,000 to 249,999 residents), micropolitan (10,000 to 24,999 residents), and noncore (<10,000 residents). Noncore areas are those not assigned to a CBSA; for simplicity, we refer to them hereinafter as "remote." For details on our categorization of CBSAs, see Section III in the Supplementary Appendix.

EXPOSURE VARIABLE

The exposure variable was a time-varying, categorical variable indicating the cumulative number of paid malpractice claims a physician accrued since January 1, 2003. The claims count increased in the year in which a claim was paid. Hence, if a physician incurred a first paid claim in 2010 and a second in 2012, he or she was treated as a zero-claim physician in 2008 and 2009, a one-claim physician in 2010 and 2011, and a two-claim physician from 2012 until either the next claim, the last year he or she was observed in the data set, or the end of the study period, whichever came first.

STATISTICAL ANALYSIS

We conducted logistic-regression analysis and linear regression analysis at the physician-year level. The models used generalized estimating equations and corrected standard errors for clustering by physician across years. Estimates from these models represent population-averaged (or marginal) effects.[25] A rationale for our modeling approach is provided in Section IV in the Supplementary Appendix. The analyses were adjusted for physician sex, age (in 5-year bands), specialty, and year. All models except those examining relocation included state fixed effects, and all models except those examining clinical volume were adjusted for the number of Medicare services billed by the physician in the year (specified according to quintiles).

We conducted four sensitivity analyses, detailed in Section V in the Supplementary Appendix. Our design assumed that the exposure began in the payment year and did not have a half-life or fixed duration. Both assumptions are contestable accounts of how malpractice claims affect clinical practice, so we reran the analyses with two alternative specifications of the exposure. The first sensitivity analysis lagged the commencement of the exposure by a year, initiating it in the year before the payment year; for most claims, this is closer to when the claim was made. The second sensitivity analysis used a time-limited version of the exposure variable, specified as a rolling count of the number of paid claims during a moving 2-year window.

The third sensitivity analysis tested for possible biases due to the fact that we did not begin observing practice changes for claims incurred from 2003 through 2007 until 2008; this analysis adjusted for claims before 2008. The fourth sensitivity analysis used multiple imputation to probe the effect of missing data regarding age and sex on our estimates. All analyses were performed with the use of Stata software, version 14.2 (StataCorp).

RESULTS

SAMPLE CHARACTERISTICS

The cohort consisted of 480,894 physicians who had 68,956 paid malpractice claims (Table 1). Nearly three quarters of the physicians were men. More than half were in five specialty groups: internal medicine (17.1%), general practice or family medicine (15.1%), emergency medicine (7.2%), radiology (6.3%), and anesthesiology (5.7%). Most physicians' primary practices were in large metropolitan areas (55.9%) or medium-sized metropolitan areas (21.8%); only 3.2% were in remote areas. A total of 17.8% of the physicians were solo practitioners, and 33.1% worked in practices with more than 50 physicians.

Nearly one third of the claims related to patient deaths, and nearly half related to "major" or "significant" nonfatal injury. (For details of the severity scale, see Table S2 in the Supplementary Appendix.) Only 2.6% of claims ended in verdicts; the rest were settlements. The mean indemnity payment was $355,631 (in 2015 dollars).

DISTRIBUTION OF CLAIMS AND CHARACTERISTICS OF PHYSICIANS WITH MULTIPLE CLAIMS

A total of 89.0% of the physicians in the cohort had no paid malpractice claims and 8.8% had one (Table 2). The remaining 2.3% of the physicians (10,841), consisting of those with two or more claims, accounted for 38.9% of all claims accrued by cohort physicians. Physicians with three or more claims were more likely than their colleagues to be male, to be 50 years of age or older, and to work in surgical specialties (Table S6 in the Supplementary Appendix).

OVERALL FREQUENCY OF PRACTICE CHANGES

A total of 105,707 physicians stopped practicing medicine during the study period, at an average rate of 3.4 per 100 physicians per year (Table 2). There were 103,190 geographic relocations among cohort members (4.3 per 100 physicians per year), approximately half of which were interstate moves. There were 141,614 shifts to larger practices (5.6 per 100 physicians per year) and 84,617 shifts to smaller practices (3.3 per 100 physicians per year), nearly a third of which were shifts to solo practice.

CLAIMS EXPERIENCE AS A PREDICTOR OF PRACTICE CHANGES

In the multivariable analysis, physicians' odds of leaving the practice of medicine increased monotonically with the number of claims they accrued (Fig. 1A). Physicians with one claim had 9% higher odds of leaving than physicians with none (odds ratio, 1.09; 95% confidence interval [CI], 1.06 to 1.11), and physicians with five or more claims had 45% higher odds than those with none (odds ratio, 1.45; 95% CI, 1.20 to 1.74). Nonetheless, 92.8% of physicians with five or more claims continued to practice (Table S7 in the Supplementary Appendix).

The rest of our analyses estimated effects among physicians who continued to practice. There was no clear association between the number of claims and the number of services billed, but there was a modest and inconsistent association with the number of patients treated (Fig. 1B). Physicians with four claims treated 5% fewer Medicare patients than physicians with no claims (relative difference, –5%; 95% CI, –9 to –1), and physicians with five or more claims treated 11% fewer (relative difference, –11%; 95% CI, –17 to –4). There was no clear association between paid claims and any of the types of geographic relocation examined (Fig. 2).

Physicians' odds of switching to a larger practice were slightly higher among physicians with one to three claims than among those with no claims (Fig. 3). The odds of switching to a smaller practice were substantially higher among physicians with four claims (odds ratio, 1.46; 95% CI, 1.18 to 1.81) or five or more claims (odds ratio, 1.58; 95% CI, 1.24 to 2.01) than among those with no claims. Shifts into solo practice were also positively associated with claim counts. Physicians with two to four claims had odds of entering solo practice that were 50 to 60% higher than those of physicians with no claims, and physicians with five or more claims had odds that were nearly 2.5 times higher (odds ratio, 2.39; 95% CI, 1.79 to 3.20). For all types of practice changes shown in Figures 1, 2, and 3, we report their unadjusted probabilities at each claim level

in Tables S7 and S8 in the Supplementary Appendix.

SENSITIVITY ANALYSES

The four sensitivity analyses produced estimates that were consistent with the main results (Tables S9 through S28 in the Supplementary Appendix). However, there was one notable exception: in the analyses of clinical volume that were adjusted for claims before 2008, physicians with four claims and those with five or more claims billed significantly fewer services (relative difference vs. physicians with no claims, –7% and –12%, respectively) (Table S20 in the Supplementary Appendix).

DISCUSSION

This study showed that physicians' odds of leaving clinical practice increased with the number of paid malpractice claims they accrued. Physicians with multiple claims who continued to practice were more likely than colleagues without claims to switch to smaller practices or solo practice. However, there was no clear association between the number of claims and the propensity to relocate, within or between states.

A founding motivation for the NPDB was to restrict the ability of incompetent physicians to move across state lines to put poor track records behind them.[26,27] Reports abound of such jurisdiction hopping, although evidence is largely anecdotal.[11,28-30] Against this backdrop, our null finding is both surprising and reassuring. Our study was not designed to assess the extent to which this result is attributable to the greater availability of information about physicians' track records made possible by the NPDB, but this seems likely to have played a role. By requiring hospitals to query practitioners' records before granting them clinical privileges and encouraging physician groups, health plans, and professional societies to do the same, the NPDB has almost certainly increased the difficulty of relocation for physicians with medicolegal problems.

Many studies have examined the relationship between liability pressure and physician supply, with mixed results.[31-33] That literature chiefly examines the relationship between liability environments and counts of physicians at the state level. Only a few small studies of obstetrics have examined associations between physicians' personal claims experiences or liability-insurance

Table 1. Characteristics of Physicians and Malpractice Claims in the Study Sample.*

Characteristic	Value
Physicians — no. (%)	480,894 (100)
Sex — no. (%)	
Male	355,580 (73.9)
Female	123,885 (25.8)
Missing data	1,429 (0.3)
Age — yr†	48.6±9.1
Specialty — no. (%)	
Internal medicine	82,084 (17.1)
General practice or family medicine	72,559 (15.1)
Emergency medicine	34,637 (7.2)
Radiology	30,068 (6.3)
Anesthesiology	27,595 (5.7)
Cardiology	21,254 (4.4)
Orthopedic surgery	19,098 (4.0)
Other‡	193,599 (40.3)
Practice location — no. (%)§	
Large metropolitan	268,700 (55.9)
Medium-sized metropolitan	104,943 (21.8)
Small metropolitan	55,160 (11.5)
Micropolitan	36,792 (7.7)
Remote	15,299 (3.2)
Practice size — no. (%)¶	
Large: >50 physicians	159,053 (33.1)
Medium: 11–50 physicians	111,219 (23.1)
Small: 2–10 physicians	125,051 (26.0)
Solo: 1 physician	85,571 (17.8)
Paid malpractice claims — no. (%)	68,956 (100)
Severity of injury — no. (%)‖	
Fatal injury	21,271 (30.8)
Major physical injury	8,869 (12.9)
Significant physical injury	23,615 (34.2)
Minor physical injury	7,101 (10.3)
Emotional injury only	714 (1.0)
Unknown	7,386 (10.7)
Disposition by verdict — no. (%)	1,799 (2.6)
Indemnity payment — dollars**	
Mean	355,631
Median	201,240

* Plus–minus values are means ±SD. Percentages may not total 100 because of rounding.

† Age indicates the age of cohort physicians at the midpoint of the time interval in which they were included in the cohort. Data on age were missing for 7657 physicians (1.6%).

‡ The specialty variable that was used in the analyses included 19 categories. Counts within those categories are shown in Table S1 in the Supplementary Appendix.

§ Categories refer to the population size of the largest urban core of the core-based statistical area (CBSA) in which physicians' primary practice was located in the year they entered the cohort. "Large metropolitan" was defined as more than 1 million residents, "medium-sized metropolitan" as 250,000 to 1 million residents, "small metropolitan" as 25,000 to 249,999 residents, and "micropolitan" as 10,000 to 24,999 residents. "Remote" (or "noncore") areas had less than 10,000 residents in their largest urban core and had not been assigned a CBSA.

¶ Categories refer to the size of the practice group from which physicians billed the most services in the year they entered the cohort.

‖ For details of how these severity categories are defined, see Table S2 in the Supplementary Appendix.

** Payments are expressed in 2015 dollars.

Table 2. Malpractice-Claims Experience and Clinical-Practice Outcomes.

Variable	Value
No. of paid claims, 2003–2015 — no. of physicians (%)*	
0	427,944 (89.0)
1	42,109 (8.8)
2	7,867 (1.6)
3	1,897 (0.4)
4	628 (0.1)
≥5	449 (0.1)
Clinical-practice outcomes	
Stopped practicing medicine — no. of changes (annual rate/100 physicians)	105,707 (3.4)
Relocated primary practice — no. of changes (annual rate/100 physicians)	
To any new area	103,190 (4.3)
To another state	51,230 (2.0)
To area with smaller population	43,979 (1.7)
To remote area	19,466 (0.8)
Switched to different size of practice — no. of changes (annual rate/100 physicians)	
To a larger practice	141,614 (5.6)
To a smaller practice	84,617 (3.3)
To solo practice	25,082 (1.0)
Clinical volume — annual mean (median)/physician	
Medicare services billed†	1,575 (919)
Unique Medicare patients treated	520 (323)

* Although the analyses focused on practice changes occurring from 2008 through 2015, the exposure variable indicated the number of paid malpractice claims that cohort physicians accrued beginning on January 1, 2003. The distribution shown here indicates cohort physicians' total number of paid claims from January 1, 2003, through December 31, 2015. The denominator for percent of physicians is 480,894.

† "Medicare services billed" indicates line items billed by the physician for services covered by Medicare.

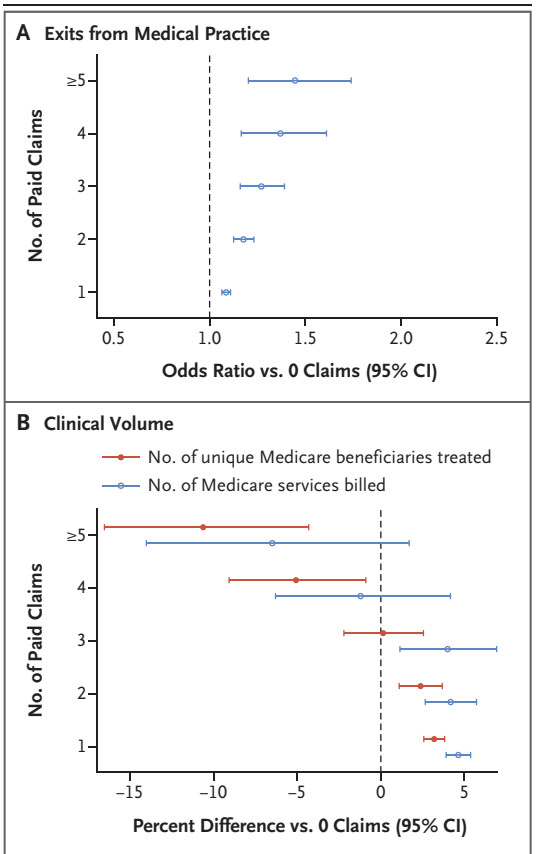

Figure 1. Adjusted Odds of Exits from Medical Practice and Adjusted Differences in Clinical Volume.

All comparisons are with physicians who had no paid malpractice claims. For exits from medical practice (Panel A), estimates were adjusted for physician sex, age, and specialty; the number of Medicare services billed; year; and state. For clinical volume (Panel B), estimates were adjusted for physician sex, age, and specialty; year; and state. "Medicare services billed" indicates line items billed by the physician for services covered by Medicare. Detailed results regarding exits from medical practice and clinical volume are provided in Tables S9 through S11 and Tables S19 through S21 in the Supplementary Appendix. CI denotes confidence interval.

costs and actual exits from medical practice or relocations[34-37]; again, the results are mixed. We found a clear dose–response relationship between claims experience and exits from medical practice. Nonetheless, even among physicians who had accrued five or more claims, more than 90% continued to practice.

Physicians' claims counts were positively associated with their propensity to switch to smaller practice settings, including solo practice. Shifts to smaller practices may become necessary if a hospital or practice group severs its ties with a claim-prone physician or imposes burdensome remedial actions as a condition of recredentialing. Physicians may also seek a new practice setting if they perceive that their reputation among their colleagues has become tarnished.

The relationship between practice size and quality of care is complex. In primary care, for example, where approximately one quarter of patients in the United States are treated by solo practitioners,[38] solo and small-group practices appear to score better than larger practices on some quality measures and worse on others.[39,40]

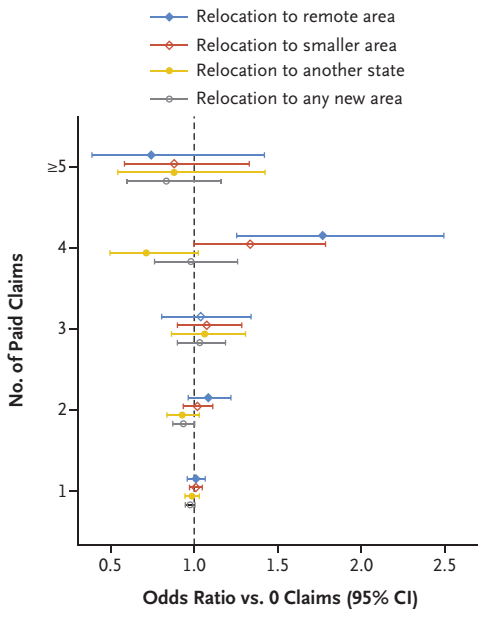

Figure 2. Adjusted Odds of Practice Relocation.

"Areas" consist of core-based statistical areas grouped according to the population size of their largest urban cores. (For details, see Section III in the Supplementary Appendix.) Estimates were adjusted for physician sex, age, and specialty; the number of Medicare services billed; and year. Detailed results regarding practice relocation are provided in Tables S12 through S15 and Tables S22 through S25 in the Supplementary Appendix.

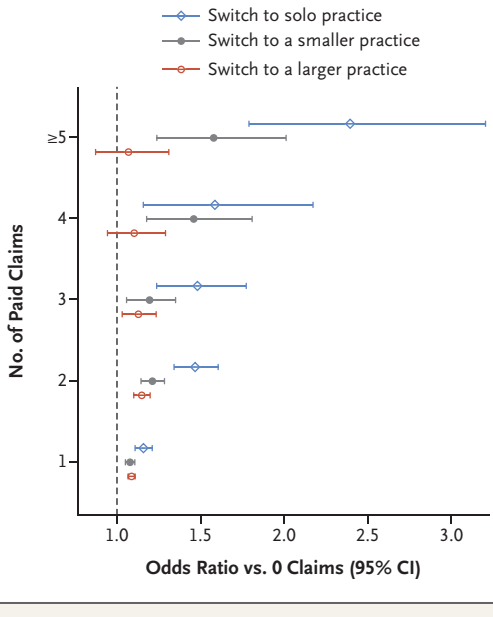

Figure 3. Adjusted Odds of Change in Practice-Group Size.

Practice-group sizes were defined according to four categories: solo, small (2 to 10 physicians), medium (11 to 50 physicians), and large (>50 physicians). Estimates were adjusted for physician sex, age, and specialty; the number of Medicare services billed; year; and state. Detailed results regarding change in size of practice are provided in Tables S16 through S18 and Tables S26 through S28 in the Supplementary Appendix.

However, it is generally more difficult for solo practitioners to adopt beneficial infrastructure improvements, implement processes to improve care, and access advice and information from peers and support staff.[41] The lack of institutional and peer support may be especially problematic for physicians with multiple claims, amplifying risks of additional claims and harms to patients. Malpractice insurers have the leverage and incentives to offer programs to help at-risk physicians in isolated practice settings improve their competence and address problem behaviors,[7] although such programs are not a replacement for appropriate support and oversight. Professional isolation — as both a consequence of and risk factor for malpractice claims — has not been well studied. It should be.

Our study has limitations. First, some specialists are underrepresented in the MD-PPAS because they treat few if any Medicare patients. The underrepresentation of obstetrician-gynecologists — who account for approximately 12% of malpractice claims reported in the NPDB[7,8] and only 2% of our sample — is noteworthy.

Second, some malpractice payments do not reach the NPDB. The extent of underreporting is unknown; however, the most serious concerns center on physicians whose names are "shielded" through settlements made in the name of an institutional codefendant.[42] To the extent that claims were underreported, we may have underestimated the number of physicians with multiple claims; the effects on our estimates of the relationship between claims experience and practice changes are unknown.

Third, we analyzed paid claims only. Approximately 70% of claims do not result in payments,[43] and unpaid claims may affect the outcomes we examined. However, paid claims are much more likely than unpaid claims to involve substandard

care[44] and to have deleterious professional consequences for physicians.

Fourth, some variables were measured imprecisely. For example, we observed the year (not the dates) in which exits from medical practice, relocations, and practice-group changes occurred, and we inferred exits and changes in clinical volume from services delivered to Medicare patients only.

Finally, our study design and results focused on testing for relative differences among physicians. From a policy perspective, however, the absolute number of some practice changes by high-risk practitioners is important too, regardless of how much that number conforms to or diverges from norms in the medical workforce. Most physicians with multiple claims in our cohort remained in practice and continued to deliver as much care as their colleagues did; 736 of them became solo practitioners and 711 moved to another state. Such activity warrants close attention, especially in light of evidence that the number of paid claims that physicians have accrued is strongly and positively associated with their risks of incurring more.[7]

The views expressed in this publication are solely the opinions of the authors and do not necessarily reflect the official policies of the Department of Health and Human Services or the Health Resources and Services Administration, nor does mention of the department or the agency names imply endorsement by the U.S. government.

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