Malpractice Environment vs Direct Litigation: What Drives Nursing Home Exit?

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Abstract

An ongoing concern about medical malpractice litigation is that it may induce provider exit, potentially affecting consumer welfare. The nursing home sector is subject to substantial litigation activity but remains generally understudied in terms of the effects of litigation, due perhaps to a paucity of readily available data. In this article, we estimate the association between litigation and nursing home exit (closure or change in ownership), separating the impact of malpractice environment from direct litigation. We use 2 main data sources for this study: Westlaw's Adverse Filings database (1997-2005) and Online Survey, Certification and Reporting data sets (1997-2005). We use probit models with state and year fixed effects to examine the relationship between litigation and the probability of nursing home closure or change in ownership with and without adjustment for malpractice environment. We examine the relationship on average and also stratify by profit status, chain membership, and market competition. We find that direct litigation against a nursing home has a nonsignificant effect on the probability of closure or change in ownership within the subsequent 2 years. In contrast, the broader malpractice environment has a significant effect on change in ownership, even for nursing homes that have not been sued, but not on closure. Effects are stronger among for-profit and chain facilities and those in more competitive markets. A high-risk malpractice environment is associated with change of ownership of nursing homes regardless of whether they have been directly sued, indicating that it is too blunt an instrument for weeding out low-quality nursing homes.

> **What do we already know about this topic?**
> The nursing home sector is subject to substantial litigation activity as well as changes in ownership or closure.
> **How does your research contribute to the field?**
> The broader malpractice environment has a significant effect on change in ownership, regardless of whether a facility is directly sued, but not on closure. Direct litigation has no significant effect on change in ownership or closure of nursing homes.
> **What are your research's implications toward theory, practice, or policy?**
> Because high-risk malpractice environment is associated with change of ownership of nursing homes regardless of whether a facility has been directly sued, malpractice environment may not be an optimal instrument for weeding out low-quality nursing homes.

Background

Researchers and policymakers have long debated the effects of medical malpractice litigation on health care providers and consumers. The potential beneficial roles of litigation include compensating victims of substandard care, providing a deterrent that encourages providers to provide better quality care, and "weeding out the bad apples" by identifying and penalizing low-quality providers. The potential costs to health care providers include litigation costs, lawsuit payouts, and potentially rising liability insurance which may threaten the financial viability of health

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care organizations and the quality of care they are able to provide. In addition, litigation may lead to disruption that affects resident care and access to care. The evidence on these factors is mixed and incomplete, with a particular dearth of evidence on litigation in the nursing home sector.

Although detailed data on the extent of litigation activity in the nursing home sector are hard to come by, the number of general/professional liability claims filed annually per nursing home bed more than tripled from the early 1990s to the early 2000s, with more dramatic increases in a handful of states.[1] The mid-1990s saw the beginning of high rates of litigation growth especially in Florida and Texas, but other states followed. In response, several states passed tort reform measures that included or focused on nursing homes, but limited empirical work has evaluated these policies, perhaps due to a paucity of readily available data.

In some cases, large national nursing home chains have cited concerns about the malpractice environment as a reason for selling off facilities.[2] However, rigorous empirical work has not examined to what extent the malpractice environment is really responsible for these behaviors. In this article, we fill an important gap by (a) examining the effects of litigation in the nursing home sector on provider exit in terms of closure or change in ownership; and (b) separating the effects of direct litigation against a nursing home from the broader effects of the malpractice environment. The effect of litigation on closure or change in ownership of facilities is important to assess because, while it may reflect a weeding out of the bad apples, it may also result in constrained access to health care on the part of residents. In particular, nursing home closure may have important consequences in the nursing home sector, where care is ongoing, sometimes for years, such that closure means relocation of residents. Even in the case of a change in ownership, nursing home residents may face increased stress due to transitions of management, staff, and care policies. Furthermore, it is important to know whether these effects stem mainly from direct litigation against a nursing home or from the broader malpractice environment because the implications are quite different. If the effects are limited to those nursing homes that are actually sued, then exit may be beneficial and/or efforts to avoid litigation should have a direct payoff to nursing homes. If, however, the effects are driven mainly by the broader malpractice environment, then potential solutions involve state policies such as tort reform.

Much of the existing evidence on the effects of malpractice litigation in health care generally stems from studies of physician behavior. Research has shown that the perceived threat of malpractice litigation may push physicians to practice defensively, ordering diagnostic tests and prescribing treatments that are of no value or marginal value in improving patient outcomes so that patients cannot point to failures to provide care in the case of bad outcomes.[3-6] The studies on physicians that address patient outcomes to assess whether litigation acts as a deterrent to bad quality tend toward absence of a meaningful, consistent effect on quality.[7,8] Thus, these 2 related streams of literature are consistent.

Studies of the effects of the malpractice environment on market exit have also focused mainly on physicians. Fear of lawsuits and, especially for obstetricians/gynecologists and surgeons, costly malpractice insurance premiums, have raised the prospect of physicians being driven out of the profession or into other specialties. A number of studies have examined the relationship between malpractice threat and the supply of physicians with mixed results.[9-11] Mello and colleagues looked at the relationship between malpractice premiums and the behavior of physicians in high-risk specialties in Pennsylvania. They found that high-risk specialists stopped practicing in Pennsylvania at a slightly higher rate, while the greatest effect was seen in the specialty of obstetrics/gynecology.[9] Polsky and colleagues[10] showed that rising malpractice premiums increased the rate at which practicing obstetricians dropped their practice and simultaneously reduced the rate of entry for new obstetricians. In contrast, a survey of Michigan obstetricians/gynecologists and family physicians showed no significant impact of malpractice burden on physicians' likelihood of continuing obstetric care.[11]

It is unclear whether these findings from studies of physician markets apply to nursing home providers, who operate within a different industry structure and treat populations with high rates of cognitive impairment on a long-term basis. One recent study showed that the cost of malpractice claims is high enough to affect the financial performance of nursing homes.[12] However, economic damages constitute a much smaller proportion of damage awards than in other types of medical malpractice because nursing home residents are generally older and not employed.[13] Because these differences were thought to inhibit access to the legal system, some states passed resident right-of-action legislation in the 1990s to make it easier for nursing home residents and their families to sue and to shift some of the burden to nursing homes to prove that there was no negligence. Studdert and Stevenson argue that states considering tort reform should continue to consider nursing homes separately from other medical malpractice, which has historically been the case.[13] Thus, both the conceptual and practical issues around nursing home litigation make it a somewhat unique setting. In addition, in contrast to individual physicians, nursing homes have the option of selling instead of closing (assuming a buyer can be found), which may affect the quality of care that the facility provides but may not have a major impact on access to care.

A few relevant studies of the effects of malpractice litigation have been conducted in the nursing home sector. Several of them focused on the relationship between litigation and quality. The cross-sectional relationship between poor quality and the probability of a lawsuit has not been found to be strong, indicating that lawsuits are a potentially weak tool for punishing quality deficits.[14-16] These results were consistent across several data sources and time periods. Another way in which litigation might affect quality is through deterrence,

whereby nursing homes improve quality to avoid lawsuits. In terms of deterrence, several studies found that nursing homes do not increase quality to a meaningful extent when faced with increasing malpractice pressure.[17,18] Across these studies, there is little evidence that litigation serves as an effective tool to encourage quality or to identify and punish low quality.

More directly related to exit, an analysis of newspaper articles on the reasons for nursing home closures found that 5% of the closures were reported to be related to litigation.[19] In the most rigorous study of litigation and nursing home exit to date, a paper by Brickley and colleagues examines the impact of the malpractice climate, measured at the state level, on the asset-shielding behavior of nursing homes and finds that large chains were more likely to sell homes in high-litigation states and less likely to brand their homes with the names linked to them.[20] A key limitation of their study is that they lack data on which nursing homes are actually sued. Thus, they assess the effects of the malpractice climate but cannot tease out whether it is the climate or the direct effects of litigation that are responsible for their findings.

Conceptual Framework

We conceptualize nursing homes as profit-maximizing firms that decide to stay in the market or exit in any given period, drawing on models of entry and exit commonly used in prior studies of health care organizations.[21-25] The nursing home industry is dominated by for-profit facilities,[26] but even nonprofit nursing homes must be concerned with maintaining financial viability, similar to organizations in the hospital sector, which is dominated by nonprofit facilities.[27,28] We assert that nonprofit nursing homes also include profits in their objective function as well as quality or quantity, because we assume that the marginal decision around exit is analogous. This assumption is not crucial to the results but it simplifies exposition of a nursing home's decision-making process.

We based our model of the decision to exit or sell a nursing home loosely on Castle[29] and Bowblis.[30] A simple model posits that a nursing home decides to remain in a market as long as the net present value of expected profits remains greater than or equal to zero, where profits (π) are given by

$$\pi = R(Q;L) \times P(Q;L) - C(Q;L;I;X),$$

where R represents the number of residents and P the payment per resident such that $R \times P$ equals total revenues. C is a convex cost function that depends on current quality Q, out-of-pocket costs L from current and past malpractice claims, liability insurance premiums I (which are generally not experience-rated), and other resident and facility characteristics X. The number of residents R may respond to actual quality Q or to perceived quality through publicized lawsuits included in L. Nursing homes depend largely on payment through administratively set prices from Medicare and Medicaid, but private-pay prices may also respond to Q or indirectly through L. Costs associated with malpractice litigation could include out-of-pocket settlements, jury awards, insurance premiums, and litigation costs that are not covered by insurance as well as nonmonetary costs, such as time, reputation, and staff morale. Costs are expected to increase with increased malpractice litigation. Experiencing a lawsuit may lead nursing home owners into a financial situation where they decide to sell (i.e., transfer of ownership) or no longer provide services (i.e., closure). A nursing home will remain in the market if revenues can cover costs, including direct and indirect costs associated with its litigation experience.

Castle posits that the external environment, such as competition or the malpractice environment, affect closure or sale of nursing homes by altering the expected costs.[29] Empirical analyses in the nursing home litigation literature, although limited, showed that the cost of malpractice claims was strongly negatively associated with financial performance of nursing homes,[12] and malpractice litigation induced nursing homes to restructure to protect assets from liability.[20] Consequently, increased malpractice litigation may impact individual providers' closure or market area exit decisions. Thus, we hypothesize that litigation against a nursing home will increase the probability of that nursing home closing or changing ownership. We also hypothesize that the impacts would be stronger among for-profit and chain facilities and those in more competitive markets, as empirical evidence of nursing home conversion and closure implies the decision is more likely to be based on expected profits among those facilities.[29,30]

Under certain situations, nursing homes may close or be sold without experiencing litigation directly. In particular, we posit that nursing homes take into account expected future litigation which is a function of the malpractice environment (market-level aggregate litigation risk). Facilities in high-risk malpractice environments may close or sell even in the absence of prior litigation, as the possibility of litigation in the future affects the net present value of profits. Thus, we hypothesize that a high-risk malpractice environment will increase the probability of closure or sale of a nursing home. Which effect is larger—the direct litigation effect or the environment effect—is an empirical question.

In this article, we assess the impact of malpractice litigation on the probability of nursing home closure or change in ownership in the nursing home industry. We complement the results of Brickley and colleagues[20] by capitalizing on nursing-home-level data on lawsuits filed and aggregating these data to calculate state-level risk as a proxy for malpractice climate. Thus, we are able to parse out the direct effects of litigation against a nursing home from the effects of the

malpractice climate, a distinction that is critical to assessing whether litigation plays a role in weeding out poor-performing providers or imposes costs across the board.

Methods

Data

We use a unique merged panel data set of Westlaw data, Online Survey Certification and Reporting (OSCAR) data from 1997-2005, and Medicaid reimbursement information from LTCfocus.org. The OSCAR database is publicly available through the Center for Medicare and Medicaid Services and contains facility-level measures on case-mix, ownership status, occupancy, payer mix, and staffing variables. Westlaw's Adverse Filings database, a proprietary legal database, was used to obtain data on malpractice claims filed against nursing homes. Because there are no publicly available databases that collect comprehensive nursing home claims information, it is not feasible to conduct a truly national study at the nursing home level using readily available data. However, the Westlaw data contain comprehensive (for some states) records of state law claims categorized into different case types.

To balance the resource requirements of intensive data collection, we chose to study a limited number of states, focusing on those with complete coverage in Westlaw while maintaining variation on other factors. Because data collection required manual searches on each nursing home in a state, we estimated that our budget would allow data extraction for 6 states. Coverage by state was assessed through multiple conversations with the publisher to identify those that include all claims filed for included counties (generally, all urban counties). Among those with sufficient coverage in Westlaw, we selected Delaware, Florida, Illinois, Missouri, New Jersey, and Wisconsin as study states to account for heterogeneity in geography and litigation rates. This was thus a purposeful sample. A manual facility-by-facility search was conducted in Westlaw using nursing home names and addresses from OSCAR to capture the relevant claims during the study period. Hospital-based nursing homes were excluded from the search, as they have different legal structures from the more typical freestanding homes. We extracted claims filed under the categories of malpractice, negligence, and personal injury/wrongful death. Because the extraction was done manually, even within those categories, we were able to isolate claims against the nursing home pertaining to resident care, excluding those that pertained to vendors or labor issues.

For one control variable, the average damage amounts per claim in the county, data were obtained from an additional database maintained by Jury Verdict Research, which is also available via Westlaw. Inclusion in Jury Verdict Research is dependent on location as well as legal and financial significance, so not all claims identified in Westlaw's Adverse Filings eventually appear in Jury Verdict Research. Although it is not comprehensive, the most important cases resulting in settlements or jury verdicts are likely to be included. Thus, these data serve as a reasonable proxy for county-to-county variation, and variation over time, in average damage amounts that might result from a claim.

The final merged data set includes repeated observations on 2246 facilities from 6 different states for a total of 15 914 facility-year observations. These facilities represent approximately 14% of all certified nursing home facilities as of 2005 and are, as a whole, similar to US facilities on common characteristics.[17]

Dependent Variables

The main dependent variables of interest are nursing home closure and change in ownership. Change in ownership information is reported in OSCAR. A change in ownership may or may not be associated with a change in proprietary status. Although our panel ends in 2005, a nursing home is considered to have closed only if the nursing home has no further OSCAR observations through 2011. This is consistent with how nursing home closure has been defined in the literature.[29,30] Because it can take several years for the effects of the claim to translate into reputational or financial impacts on the nursing home, we measure the dependent variable over a 2-year period following the presence or absence of a claim.

Key Independent Variables

We focus on 2 key independent variables, one representing direct litigation against a nursing home and the other representing the malpractice environment. Direct litigation is measured by whether a nursing home was sued or not during a particular year, calculated directly from the claims. Because few facilities had multiple claims within a single year, modeling a count of claims would add little to the analysis and we use a simple dichotomous measure. We define malpractice climate that a given facility faces as an annual average of litigation claims in the state, calculated across all facilities in the state other than the given facility (*state minus facility claims*) per 1000 nursing home beds in the state. We exclude the given facility to avoid endogeneity of the measure in states/years with few claims. This variable represents changes in the general malpractice climate in the state, which may be affected by tort laws (e.g., tort reform passed in Florida in 2001), the number of malpractice lawyers, perceptions of the attitudes of the public and potential jury members, and other indicators of the potential returns from filing a claim. It also likely captures state-level increases in malpractice premiums, which during this period were generally not experience-rated for each facility; in other words, increasing malpractice threat may lead to increased malpractice premiums, but premiums did not change differentially

for facilities that were sued. Changes in malpractice premiums may therefore be one mechanism through which the malpractice environment influences exit. To ensure the temporal precedence of the independent variables, we measure malpractice litigation and climate during the current year and dependent variables over the subsequent 2 years.

Covariates

Several time-varying factors at the nursing home and county levels that could affect the decision to change ownership or exit the market are included as controls. To control for the expected payout for a claim, we adjust for average damage amount per claim in the county (in $10 000's). The resident case-mix of the nursing home may influence the probability of lawsuits and the level of resources needed to operate a given facility; thus, we control for average functional impairment as measured by an activities of daily living index, and for the complexity of care as measured by a special treatment index.[31]

Some studies have identified staffing as well as Medicare/Medicaid reimbursements as potential factors associated with nursing home closure/litigation.[17,29,30] We control for 3 different measures of staffing in a nursing home: registered nurse (RN) hours per resident-day, licensed practical nurse (LPN) hours per day, and total nurse aides hours per resident-day. Minimum staffing requirements were instituted in Wisconsin (2000), Florida (2001), and Delaware (2001, 2002, and 2003) and we conduct a robustness check adjusting for these variables in our main analyses,[17] although this adjustment is not possible in all subanalyses due to collinearity. Furthermore, changes in reimbursements for nursing homes may also affect the decision to close or change ownership. We include a measure that accounts for the Medicare reimbursement change in 1998/1999 using a "Medicare bite" variable that is a product of baseline Medicare percentage and year dummies.[17] We also include a measure for Medicaid reimbursement in one sensitivity analysis using data obtained from LTCfocus.org.

Several other measures are also adjusted in our analyses including proprietary status, the percentage of Medicaid and Medicare residents in the facility, whether the facility is part of a chain, urban location, total beds in the facility (in 100s), and nursing home beds in the county (in 1000s), and market concentration. Although there are different ways to calculate the nursing home market concentration in the literature,[32,33] we estimate nursing home market concentration at the county level using the Herfindahl-Hirschman Index (HHI) defined as the sum of the squares of market shares of all nursing homes in terms of total residents.[34]

Main Specification

For our base model, we estimate the relationship between direct litigation and the outcome variables (either nursing home closure or change in ownership) using probit models with state dummies to control for time-invariant differences across states and year dummies to account for secular time trends common to all states. We chose this approach because it correctly models our outcomes as binary variables and allows for tractable calculation of marginal effects while controlling for the main sources of potential bias, but we conduct robustness checks using other approaches. In our primary specification using probit models, we model nursing home closure or change in ownership separately as a function of whether a facility had a malpractice claim filed against it (litigation), other time-varying controls, and year and state dummies:

$$Pr(Y_{ft+1,t+2} = 1) = \Phi \begin{pmatrix} \beta_0 + Litigation_{ft}\beta + X_{ft}\gamma \\ + Year_t + State_f \end{pmatrix},$$

where Φ is a cumulative normal distribution, $Y_{ft+1,t+2} = 1$ if a facility changed ownership (or closed) between time t and $t + 2$, ie, in the next 2 years, 0 otherwise; $Litigation_{ft} = 1$ if a facility was sued at time t, 0 otherwise; X_{ft} is a vector of exogenous county-level and facility-level controls; $State_f$ are state fixed effects and $Year_t$ control for universal secular trends. We then add malpractice climate as an additional independent variable to assess whether it has a differential effect from direct litigation. If direct litigation has no significant impact in the model with the malpractice climate, it would imply that litigation in itself is not a significant determinant of change in ownership or closure. Instead, if the malpractice climate is significant in our models, it implies that facilities are influenced by broader expectations about the probability of future litigation when making a decision to sell or close.

We provide average marginal effects from the probit models. Standard errors for the marginal effects are clustered at the facility level to account for repeated observations on facilities over time.

Secondary Specifications

We estimate a number of models to assess whether our findings from the base models hold in alternative scenarios. To understand the impact of malpractice environment better, we estimate its impact on facilities that never had litigation during our study period. If the malpractice environment is a significant determinant of change in ownership or closure among facilities that are never sued, it would indicate that the malpractice environment constitutes a separate pathway to the possible closure or sale of nursing homes above and beyond the direct effects of litigation.

To understand whether the impact of litigation and malpractice environment may be heterogeneous, we perform subgroup analyses by profit status, chain membership, and market competition. For-profit facilities may be more likely

to sell or close facilities if they experience increased litigation or worsening malpractice environment, as not-for-profit facilities may include quantity or quality of services in their objective functions and thus may have a higher tipping point for exit. Similarly, facilities that are part of a chain may be more likely to be targets of litigation because they have more financial wealth. To protect themselves, facilities that are part of a chain may be likely to sell or close facilities if the malpractice environment worsens. Finally, a decision to sell or close a facility may also depend on the level of competition in the market. Facilities that are located in less competitive areas may continue to operate despite increased litigation or worsening malpractice environment because they can still make profits through higher margins or higher occupancy percentages. In more competitive areas, facilities might find it difficult to survive if they face litigation or a worsening malpractice environment. The level of competitiveness depends on the value of the HHI. The Federal Trade Commission defines markets with HHI < 0.15 to be unconcentrated, HHI between 0.15 to 0.25 to be moderately concentrated, and HHI > 0.25 to be highly concentrated.[35] Thus, we perform subgroup analyses by competition level with facilities that are located in a county with HHI > 0.15 grouped in a less competitive market, and those in a county with HHI < 0.15 considered to be located in a more competitive market. As sensitivity analyses, we estimated our main models using HHI as a continuous measure as well as using a different cutoff point at HHI < 0.25 to define a competitive market.

Ideally, we want to model the change in ownership and closure as competing risks using a multinomial logit or probit regression.[29,30] However, the means of the dependent variables in our regressions are small enough to preclude convergence when multinomial models are used. As a sensitivity analysis, our alternative approach to accounting for such competing risks is to model a joint outcome, defined as a single variable representing either a change in ownership or a closure.

In addition, it is possible that minimum staffing requirements and Medicaid reimbursement rates also affect ownership or closure. However, we are unable to adjust for minimum staffing requirements and Medicaid reimbursement rates in all of our models for different reasons. Because we have a limited number of states, our models do not converge when controlling for minimum staffing requirements in the subgroup analyses. Furthermore, we do not have readily available Medicaid reimbursement rates prior to 2000. For a robustness check to see whether inclusion of this variable matters, we control for Medicaid rates assuming that the rates for years 1997-1999 are the same as those in 2000.

Finally, because our probit models are estimated using state and year fixed effects but not facility fixed effects, we might worry that there are other important facility-level characteristics omitted from the model. An alternative would be to use facility fixed effects, but probit models are known to suffer from the incidental parameters problem when estimated using fixed effects.[36,37] We can estimate ordinary least squares linear probability models (OLS-LPM) with facility fixed effects, but OLS-LPM models are known to suffer from bias and consistency issues.[38] Thus, to check whether the omission of facility fixed effects might bias our coefficients, we estimate a facility fixed effects logit model as a robustness check. We present coefficients from this model rather than marginal effects because we cannot estimate marginal effects without making assumptions about fixed effects. Standard errors for the logit coefficients are obtained using 100 bootstraps. Fixed effects logit models have smaller samples and the results are presented in Appendix A.

Results

The characteristics of nursing homes included in the study are summarized in Table 1. We have a total of 2246 facilities and 15 914 facility-year observations. Approximately 7% of the facility-year observations involved a change in ownership in the market in the 2 years following the reference year, while 2% involved closure. Direct litigation occurred for 13% of the observations. Malpractice environment (market litigation threat) was 1.8 claims per 1000 beds.

Our main regressions reveal that it is the malpractice environment, not direct litigation, that is more strongly associated with subsequent change of ownership, but that neither has a significant effect on closure. The association between litigation, malpractice environment, and other observable nursing home characteristics and the change in ownership or closure are presented in terms of average marginal effects in Table 2. Direct litigation has a nonsignificant effect on change in ownership or closure with or without malpractice environment in the regression, although the magnitude may be meaningful (0.65 percentage-point increase in the probability of change of ownership)—a magnitude that may be absorbing the effects of the malpractice environment as well as the effects of being sued. In the model with malpractice environment, facilities that are sued are 0.4 percentage points more likely to change ownership, but the effect is not statistically significant at standard levels. In the same model, an additional lawsuit per 1000 beds in the state (malpractice environment) significantly increases the probability of a change in ownership by 0.3 percentage points ($P < .05$). In addition, malpractice environment is significantly associated with a change in ownership of similar magnitude even among the nursing homes that never experienced a lawsuit during the study period. None of the models show any statistically significant effect of litigation or malpractice environment on the closure of facilities.

The average marginal effects of litigation and malpractice environment from the probit regressions across different subgroups are presented in Table 3. Because we did not find any significant impact of litigation or malpractice environment on nursing home closure in our base models, we focus

Table 1. Summary Statistics for the Sample of Nursing Homes, 1997-2005.

	Mean (SD)
Dependent variables	
Change of ownership in next 2 years	0.07 (0.25)
Closure in next 2 years	0.02 (0.13)
Independent variables	
Litigation	0.13 (0.33)
Malpractice environment[a]	1.81 (2.07)
Control variables	
Less competitive market (HHI > 0.15)	0.24 (0.43)
For-profit	0.71 (0.46)
Not-for-profit	0.25 (0.43)
Government-owned	0.04 (0.20)
Multifacility organization	0.51 (0.50)
Urban	0.84 (0.37)
Average damage amount[a]	1.12 (6.17)
ADL index	9.80 (1.45)
Special care index	0.17 (0.17)
% Medicaid	60.99 (23.20)
% Medicare	11.64 (13.05)
Facility total beds (in 100s)	1.33 (0.69)
Total RN hours per resident-day	0.41 (0.38)
Total LPN hours per resident-day	0.64 (0.40)
Total nurse aides hours per resident-day	2.05 (0.82)
Nursing home beds in county (in 1000s)	6.11 (10.11)
Number of observations	15 914
Number of facilities	2246

Note. HHI = Herfindahl-Hirschman Index; ADL = activities of daily living; RN = registered nurse; LPN = licensed practical nurse.
[a]Malpractice environment is defined as the number of litigation claims in the state minus facility per 1000 beds. Average damage amount is defined per claim in the county (in $10 000).

these subanalyses only on change in ownership. Across all subgroups, direct litigation has no significant impact on change in ownership. Malpractice environment has no significant association with change in ownership among facilities that are not-for-profit, independently owned, and located in less competitive markets. However, the malpractice environment has a statistically significant impact on change in ownership among facilities that are for-profit, part of a multifacility organization (chain), and located in competitive markets.

Finally, the coefficients on litigation and malpractice environment from facility fixed effects logit models are presented in Appendix A. The results in terms of direction and significance are largely consistent with our findings from probit regression models, indicating that our primary specification was not substantially biased by the omission of facility-level fixed effects.

The results from several sensitivity analyses presented in Appendix B confirm our findings. First, when we adjusted for both minimum staffing and Medicaid reimbursements, our results are essentially the same. Second, adjustment for a continuous version of HHI instead of a binary version also has no impact on the main findings. The effect of litigation or malpractice environment on change of ownership or closure is similar whether we use HHI < 0.15 or HHI < 0.25 to define a competitive market. Finally, the findings are similar when we model a joint outcome of either a change in ownership or closure.

Discussion

We found that directly experiencing a lawsuit has no statistically significant impact on a nursing home's decision to exit a market, whether through sale or closure of the facility, and this finding was consistent across different specifications and subgroups. However, an increase in market litigation threat, as a proxy for the malpractice environment, was significantly associated with an increased probability of change in ownership. This was true when considering all nursing homes in our sample and even among the nursing homes that never experienced a lawsuit during the study period. The association between the malpractice climate and change in ownership is not uniform. Specifically, it appears to be driven by for-profit facilities, facilities that are a part of a multifacility (chain) organization, and facilities located in competitive markets. Little effect was observed among not-for-profit facilities, facilities that were independently owned, and facilities located in less competitive markets.

Our findings are largely consistent with Brickley and colleagues, who find that a high-risk state litigation climate leads large chains to sell their facilities to smaller owners.[20] However, the effect of state litigation risk they found could simply have been a proxy for the effects of direct litigation. In our study, by using data on lawsuits at the individual nursing home level, we are able to differentiate whether being sued makes a difference in exit behavior beyond that predicted by the malpractice environment, a key issue in that actual lawsuits directly affect the finances, reputation, and staff morale of a nursing home. Our findings indicate that their lack of nursing-home-level litigation data is unlikely to have caused bias in their results.

Our findings should be viewed in light of several key limitations. First, our data allow us to identify whether a nursing home is part of a chain but not which chain, so we are unable to account for chain-wide effects. However, unlike most other studies, we have data on individual lawsuits and not just the litigation climate, so our focus is more on the response at the individual nursing home level. Second, our findings may be limited in generalizability in that they are based on a purposeful sample of 6 states and are driven mainly by variation in Florida relative to the other 5. Third, we use data from 1997-2005, which may be considered dated in typical biomedical research but reflects a time period of substantial change in nursing home litigation rates. This is also the time period used by other ongoing studies of nursing home litigation.[20] As litigation rates have not been as volatile since then, collecting

Table 2. Effect of Litigation or Malpractice Environment on Exit Average Marginal Effects From Probit Models.

	All nursing homes				Nursing homes with no litigation during the study period	
	Without malpractice environment		With malpractice environment		Only malpractice environment	
	Change of ownership[a]	Closure[a]	Change of ownership[a]	Closure[a]	Change of ownership[a]	Closure[a]
Dependent variable (mean)	0.0663	0.0178	0.0663	0.0178	0.0520	0.0183
Independent variables						
Litigation	0.0065 (0.0064)	−0.0027 (0.0033)	0.0037 (0.0064)	−0.0034 (0.0033)	—	—
Malpractice environment	—	—	0.0032** (0.0014)	0.0008 (0.0008)	0.0038* (0.0019)	0.0001 (0.0014)
Less competitive market (HHI>0.15)	0.0163** (0.0077)	−0.0071* (0.0037)	0.0160** (0.0077)	−0.0071* (0.0036)	0.0245*** (0.0080)	−0.0106** (0.0044)
Average damage amount	0.0002 (0.0003)	0.0000 (0.0001)	0.0002 (0.0003)	−0.0000 (0.0001)	0.0007 (0.0006)	0.0003 (0.0003)
ADL index	0.0065*** (0.0022)	−0.0012 (0.0012)	0.0065*** (0.0022)	−0.0012 (0.0012)	0.0072*** (0.0025)	0.0015 (0.0016)
Special care index	−0.0176 (0.0168)	0.0033 (0.0053)	−0.0173 (0.0167)	0.0035 (0.0053)	−0.0238 (0.0196)	0.0004 (0.0057)
Total RN hours per resident-day	−0.0004 (0.0072)	0.0030 (0.0034)	−0.0008 (0.0072)	0.0029 (0.0034)	−0.0125 (0.0105)	−0.0074 (0.0063)
Total LPN hours per resident-day	−0.0047 (0.0066)	0.0093*** (0.0023)	−0.0046 (0.0065)	0.0093*** (0.0023)	−0.0155* (0.0094)	0.0154*** (0.0037)
Total nurse aides hours per resident-day	−0.0069* (0.0041)	−0.0011 (0.0017)	−0.0060 (0.0041)	−0.0009 (0.0017)	0.0004 (0.0050)	−0.0004 (0.0020)
% Medicaid	0.0004*** (0.0002)	0.0005*** (0.0001)	0.0004*** (0.0002)	0.0005*** (0.0001)	0.0006*** (0.0002)	0.0005*** (0.0001)
% Medicare	0.0001 (0.0003)	0.0001 (0.0002)	0.0002 (0.0003)	0.0001 (0.0002)	0.0003 (0.0003)	−0.0003 (0.0003)
Facility total beds (in 100s)	−0.0018 (0.0048)	−0.0083*** (0.0033)	−0.0017 (0.0048)	−0.0082*** (0.0033)	0.0085 (0.0058)	−0.0152*** (0.0054)
NH beds in county (in 1000s)	−0.0006 (0.0004)	−0.0001 (0.0002)	−0.0006 (0.0004)	−0.0001 (0.0002)	0.0003 (0.0006)	0.0002 (0.0003)
Not-for-profit	−0.0385*** (0.0084)	0.0063* (0.0035)	−0.0387*** (0.0084)	0.0062* (0.0035)	−0.0235*** (0.0092)	0.0058 (0.0045)
Government-owned	−0.1004*** (0.0322)	−0.0025 (0.0087)	−0.1005*** (0.0324)	−0.0026 (0.0087)	−0.0776*** (0.0288)	−0.0011 (0.0100)
Multifacility organization	0.0379*** (0.0060)	0.0026 (0.0029)	0.0381*** (0.0060)	0.0026 (0.0029)	0.0380*** (0.0073)	0.0039 (0.0038)
Urban	0.0203* (0.0110)	−0.0058 (0.0043)	0.0201* (0.0109)	−0.0058 (0.0043)	0.0188* (0.0101)	−0.0056 (0.0049)

Note. Malpractice environment is defined as the number of litigation claims in state minus facility per 1000 beds. Average damage amount is defined per claim in the county (in $10 000). HHI = Herfindahl-Hirschman Index; ADL = activities of daily living; RN = registered nurse; LPN = licensed practical nurse.
[a]Average marginal effects from probit models controlling for "Medicare bite" variables along with state and year fixed effects are provided. Standard errors provided in parentheses are clustered at the facility level.
*P < .10. **P < .05. ***P < .01.

Table 3. Effect of Litigation or Malpractice Environment on Change of Ownership—Subgroup Analyses.

Subgroups	Change in ownership (mean)	Average marginal effect[a]
Profit status		
For-profit	0.0829	
Litigation		0.0022 (0.0083)
Malpractice Environment		0.0035* (0.0018)
Not-for-profit	0.0294	
Litigation		0.0004 (0.0109)
Malpractice Environment		0.0012 (0.0022)
Chain membership		
Multifacility organization	0.0961	
Litigation		0.0050 (0.0102)
Malpractice environment		0.0046** (0.0023)
Independent ownership	0.03439	
Litigation		−0.0006 (0.0077)
Malpractice environment		0.0007 (0.0016)
Market competition		
Competitive market (HHI ≤ 0.15)	0.0687	
Litigation		0.0032 (0.0069)
Malpractice environment		0.0032** (0.0016)
Less competitive market (HHI > 0.15)	0.0590	
Litigation		0.0016 (0.0197)
Malpractice environment		0.0051 (0.0036)

Note. Malpractice environment is defined as the number of litigation claims in state minus facility per 1000 beds. An insufficient number of government-owned facilities precludes stratification for this group. HHI = Herfindahl-Hirschman Index.
[a]Average marginal effects from probit models are provided after adjusting for facility case-mix and state and year fixed effects. Standard errors provided in parentheses are clustered at the facility level.
*$P < .10$. **$P < .05$. ***$P < .01$.

more recent data (an arduous manual process) would be unlikely to result in substantially different conclusions. Fourth, we can only identify lawsuits that are publicly reported and we do not have information on whether lawsuits are required to be filed under seal in some states. We believe these results still have important implications for future malpractice "crises" in the nursing home sector. Finally, as closure is relatively rare, our study may be limited in its power to detect the effects of malpractice litigation and climate on closure.

These findings have implications for practice and policy. Discussions of the welfare effects of market exit in health care often center on the consequences for quality and for resident access to care. Evidence from prior studies on the impact of changes in the ownership structure of nursing homes (not necessarily related to litigation) on quality of care is mixed, with most studies finding no effect or inconsistent effects on quality.[39-42] Overall, our finding that neither direct litigation nor the malpractice environment has significant impact on closure implies that market supply may change little as a result of litigation, and these prior studies indicate little change in quality as a result of change in ownership. However, a change in ownership may still lead to market friction and emotional stress for nursing home staff and residents (and their families) who must adjust to new management, effects that may not be well captured in existing studies. Our findings indicate that nursing home residents in

states with high malpractice rates may be subject to these stresses through change of ownership even if the facilities they reside in are not sued.

Our findings suggest that high levels of malpractice threat are not particularly effective in "weeding out bad apples" and may have adverse consequences for nursing homes that are not sued. A high-risk malpractice climate appears to affect all nursing homes in the market in terms of the probability of sale regardless of whether those facilities were the target of lawsuits. For-profit and chain facilities, which are often thought to provide lower quality of care,[43,44] are particularly affected by the malpractice environment, but there is no compelling evidence in the literature that a change in ownership would improve that quality. Viewed in conjunction with prior evidence that the relationship between poor quality and litigation is not strong, this implies that state-level measures to reduce litigation, such as tort reform, may be welfare-improving. If costs associated with litigation could be redirected toward more specific quality improvements and toward compensation of victims of poor care, perhaps as a condition of tort reform, efficiency gains may be possible. On the positive side, our findings imply that litigation does not lead to widespread disruption in resident access to care through facility closure. Viewing our results in light of previous studies finding the correlation between nursing home quality and the probability of a lawsuit to be low[16] and

the deterrence effect to be negligible,[17,18] this analysis adds to the lack of evidence that a high-risk malpractice environment contributes positively to the nursing home sector. Tort reform and alternatives to tort reform that focus on more efficient ways of getting compensation to victims of poor quality of care may be promising avenues to pursue.

Appendix A

Effect of Litigation or Malpractice Environment on Change of Ownership—Facility Fixed Effects Logit Models.

	All nursing homes		Nursing homes with no litigation during the study period
	Without malpractice environment[a]	With malpractice environment[a,b]	Only malpractice environment[a,b]
Dependent variable (mean)	0.2905	0.2905	0.2931
Independent variables			
Litigation	0.0582 (0.1385)	−0.0060 (0.1398)	—
Malpractice environment	—	0.0601 (0.0287)**	0.0737 (0.0548)
Less competitive market (HHI > 0.15)	0.1292 (0.2534)	0.1293 (0.2532)	0.4639 (0.3848)
Average damage amount	0.0063 (0.0081)	0.0055 (0.0083)	0.0758 (0.0430)*
ADL index	−0.0486 (0.0717)	−0.0489 (0.0713)	−0.0670 (0.1007)
Special care index	−1.0463 (0.6128)*	−1.1310 (0.6213)*	−0.0800 (1.0038)
Total RN hours per resident-day	0.2134 (0.2321)	0.2101 (0.2341)	−0.1448 (0.3408)
Total LPN hours per resident-day	−0.1684 (0.1744)	−0.1605 (0.1672)	−0.4564 (0.2891)
Total nurse aides hours per resident-day	−0.1389 (0.1084)	−0.1095 (0.1079)	0.0458 (0.1468)
% Medicaid	0.0033 (0.0052)	0.0032 (0.0052)	−0.0008 (0.0086)
% Medicare	0.0017 (0.0108)	0.0023 (0.0108)	−0.0153 (0.0197)
Facility total beds (in 100s)	−0.0649 (0.8193)	−0.0468 (0.8118)	0.1750 (1.7320)
NH beds in county (in 1000s)	−0.0798 (0.0735)	−0.0809 (0.0779)	0.0696 (0.1733)
Not-for-profit	−0.4186 (0.3173)	−0.4128 (0.3190)	0.1188 (0.6145)
Government-owned	0.4117 (7.3116)	0.4533 (7.0490)	0.5307 (6.6060)
Multifacility organization	0.5408 (0.1778)***	0.5577 (0.1803)***	0.3260 (0.3199)

Note. HHI = Herfindahl-Hirschman Index; ADL = activities of daily living; RN = registered nurse; LPN = licensed practical nurse; NH=Nursing Home.
[a]Coefficients from facility and year fixed effects logit models controlling for Medicare bite variables are provided. Standard errors provided in parentheses are obtained using 100 bootstraps.
[b]Malpractice environment is defined as the number of litigation claims in state minus facility per 1000 beds. Average damage amount is defined per claim in the county (in $10 000).
*$P < .10$. **$P < .05$. ***$P < .01$.

Appendix B

Effect of Litigation or Malpractice Environment on Change of Ownership or Closure—Sensitivity Analyses.

Sensitivity	Change in ownership	Closure
Adjustment for minimum staffing and Medicaid reimbursement		
Litigation	0.0030 (0.0065)	−0.0035 (0.0034)
Malpractice environment	0.0047*** (0.0017)	0.0003 (0.0009)
Adjustment for continuous HHI		
Litigation	0.0035 (0.0065)	−0.0034 (0.0034)
Malpractice environment	0.0032** (0.0014)	0.0007 (0.0008)
Competitive market (HHI ≤ 0.25)		
Litigation	0.0028 (0.0066)	−0.0042 (0.0033)
Malpractice environment	0.0031** (0.0015)	0.0010 (0.0008)
Joint outcome (change in ownership or closure)		
Litigation	0.0010 (0.0065)	—
Malpractice environment	0.0035*** (0.0014)	—

Note. Average marginal effects from probit models are provided after adjusting for facility case-mix and state and year fixed effects. Standard errors provided in parentheses are clustered at the facility level. Malpractice environment is defined as the number of litigation claims in state minus facility per 1000 beds. An insufficient number of facilities with HHI > 0.25 precludes stratification for this group. HHI = Herfindahl-Hirschman Index.
*$P < .10$. **$P < .05$. ***$P < .01$.

Declaration of Conflicting Interests

Funding

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