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Malpractice law and health care reform: optimal liability policy in an era of managed care

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Abstract

Because fee-for-service health insurance insulates providers from the costs of treatment decisions, it may lead to ''defensive medicine'' — precautionary treatment with minimal expected medical benefit administered out of fear of legal liability. By giving providers higher-powered incentives, managed care may affect optimal liability policy. Among elderly Medicare beneficiaries with heart disease in 1984–1994, we find that liability-reducing ''tort reforms'' reduce defensive practices in areas with high and low managed care enrollment, but that managed care and liability reform are substitutes. We consider some implications of these results for the current debate over the appropriateness of extending malpractice liability to managed care organizations.

Keywords: Managed care; Liability law; Defensive medicine

JEL classification: I11; I18

1. Introduction

Because doctors and hospitals may not act as perfect agents for their patients, all countries have systems intended to penalize health care providers who fail to provide care with appropriate quality and effort. In theory, these systems seek to create incentives that lead providers to take the socially optimal amount of care

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against accidental medical injury. In the United States, for example, tort law imposes the costs of negligently-caused injuries on providers, who balance the costs of injuries against the costs of precautionary medical treatment, and undertake those tests and procedures that are worthwhile from the perspective of social welfare.

Moral hazard from health insurance, however, means that physicians and hospitals may bear only a small fraction of the true costs of precautionary care. For this reason, if conventional tort law imposes penalties of the same order of magnitude as the costs of injuries, then it would be expected to encourage defensive medicine — precautionary medical treatments that have minimal expected medical benefit administered out of fear of legal liability. Put another way, the liability system that induces optimal precaution — care with costs equal to benefits — is in general an empirical question, and is a function of the health insurance environment.

The rise of managed care in the US has changed this environment, leading to higher-powered payment incentives and regulation of medical practices that have increased the costs to providers of incremental care decisions. In other countries, increased efforts at cost containment have had similar consequences (Donelan et al., 1996). This international increased cost consciousness by providers has ambiguous implications for optimal liability policy. Reductions in liability that reduce defensive medicine in a conventional tort and insurance environment may be either more or less beneficial than they would be in a more cost-conscious environment, or may even be socially harmful. Thus, optimal liability policy in an era of managed care is an important international health policy issue.

Despite an extensive literature in the fields of law and policy emphasizing this theoretical ambiguity (e.g. Bearden and Maedgen, 1995; Daly, 1994; Frankel, 1994; O'Connell and Neale, 1998; Pedroza, 1996; Sage, 1997), no previous work has assessed empirically the relationships between liability pressure, managed care, medical treatment intensity, health care costs, and patient health outcomes. In this paper, we analyze populations of elderly US Medicare beneficiaries hospitalized for treatment of a new heart attack (acute myocardial infarction, or AMI) or of new ischemic heart disease (IHD) from 1984 to 1994, matched with information on tort laws and managed care enrollment rates from the state in which the patient was treated. We study the direct effects of liability-reducing ''tort reforms'' and managed care, and the interaction between reforms and managed care, on intensity of treatment and on patient health outcomes. We use patient hospital expenditures in the year after AMI or IHD to measure intensity of treatment, and we estimate the effect of reforms and managed care on a serious adverse outcome that is common in our study population: mortality within one year of occurrence of the cardiac illness. We also estimate the effect of reforms and managed care on two other common adverse outcomes related to a patient's quality of life: whether the patient experienced a subsequent AMI or heart failure requiring hospitalization in the year following the initial illness. With this

empirical evidence, we assess how the welfare consequences of liability policy are affected by the rise of managed care.

We proceed in four sections. Section 2 discusses the theoretical ambiguity of the interactions between liability reform and managed care. It offers a framework for analyzing these interaction effects, and illustrates that, in the presence of managed care, liability reform may be irrelevant, constructive, or harmful from the perspective of social welfare. Section 3 describes our empirical model and data sources. Section 4 presents our empirical results. Section 5 concludes the paper with an outline of the potential implications of our results for policy, and some of the limitations of our analysis.

2. Managed care and the optimal liability system

From a theoretical standpoint, optimal liability policy depends on the objectives and incentives of health care providers — in particular the incentives created by the health insurance environment in which the providers practice — and the extent to which the liability system identifies negligent behavior and imposes penalties accurately. If providers always act as perfect agents for patients, then malpractice pressure would be unnecessary to create incentives for due care in treatment decisions. In this case, the usual moral hazard inherent in all health insurance — arising out of the fact that neither patients nor physicians generally bear the full cost of their treatment decisions at the time the decisions are made — would lead to socially excessive levels of care.

But providers are not perfect agents for patients. Physicians may seek to maximize a weighted sum of their utility and patient health, and physician effort in taking care to avoid negligent medical injury may not be fully compensated. Nonetheless, because conventional health insurance shields physicians and hospitals from the true cost of precautionary medical treatment, a liability system that imposes penalties on providers of the same order of magnitude as the costs of injuries is likely to lead to wasteful precautionary care.

As managed care and other cost containment policies remove this financial shield, they have the potential to alter optimal liability policy. If more parsimonious practices resulting from managed care incentives reduce physicians' provision of additional defensive treatments, then managed care and liability reforms would reduce wasteful treatment decisions on the same margins. Reductions in liability will have more modest effects on treatment intensity as the incentives provided by health insurance become higher-powered. For example, both managed care and malpractice reforms may discourage physicians from ordering additional diagnostic procedures with high costs relative to their expected benefits.

Alternatively, managed care and liability reforms might have independent effects, to the extent they reduce socially-inefficient practices in different ways. For example, liability reform might discourage unnecessary diagnostic procedures

that are likely to be the subject of litigation if a patient has an adverse outcome, while managed care might discourage therapeutic procedures that are not often the subject of litigation but have low expected value. It is also possible that malpractice reform and managed care are complements, reinforcing each others' effects. In addition to affecting utilization, managed care may improve coordination and integration of care across providers. In this context, as we discuss below, managed care might also make it easier for multiple potential defendants in a case (e.g. an internist, a specialist, and a hospital) to intensify their defensive practices in response to liability pressure.

Finally, managed care and liability reform may have socially harmful interaction effects. Managed care may reduce low-valued care in a conventional liability environment; but, in the absence of sufficient malpractice-based incentives for physicians and hospitals, it may also reduce the provision of worthwhile treatments. Liability reform may reduce low-valued care in a conventional insurance environment, but may lead to insufficient precaution against medical injuries in the presence of higher-powered incentives.

Empirical evidence from the United States largely predating the rise of managed care suggests that reductions in liability from a conventional tort-law base improve health care productivity: liability reforms reduce medical expenditures without affecting health outcomes. In our previous work focusing on data from the 1980s (Kessler and McClellan, 1996), we showed that elderly patients with cardiac illness from states adopting tort reforms that reduced liability (such as caps on malpractice awards) experience lower growth in medical expenditures and intensity of treatment, but do not experience significantly worse health outcomes. Other investigators report similar evidence of defensive practices in obstetrics (Dubay et al., 1999). The cost effects of malpractice liability have become increasingly important in other countries as well. In Italy, for example, increases in the frequency and severity of civil and penal actions have been widely cited by doctors as a justification for additional diagnostic tests and therapeutic interventions (see, e.g. research cited in Atella et al., 2000). Israel has also experienced increased litigation and medical liability insurance rates (e.g. Kark et al., 2000).

In the same vein, empirical evidence suggests that increasing penetration of managed care in the 1990s has reduced the use of some treatments that are likely to have little medical benefit (e.g. Baker, 1999; Cutler and Sheiner, 1998; Kessler and McClellan, 2000). However, no previous work has assessed empirically the extent to which the rise of managed care has affected the prevalence of defensive medicine.

This is a somewhat surprising gap, since proposals to reform the US liability system in the wake of managed care growth have garnered considerable policy attention as a means for reducing perceived abuses of managed care. For example, current federal U.S. law — the Employee Retirement Income Security Act (ERISA) — preempts certain malpractice liability claims against managed care organizations (MCOs). Should ERISA preemption be repealed or modified? In

addition, several US states (California, Georgia, Missouri, and Texas) have passed recent legislation that seeks to expand liability for MCOs within the constraints of ERISA. Are these state-law expansions of liability socially beneficial? Our estimates cannot answer these questions definitively, because the specific policies involved have been implemented only recently if at all. Still, our experiences with existing liability reforms can provide some guidance for evaluating the likely consequences of these largely untested reforms, and more generally are relevant for determining optimal liability policy in a globally cost-conscious environment.

To address the gap in empirical evidence on the likely effects of malpractice reforms in an era of managed care, we study how changes in the legal environment of states interact with changes in state-level managed care enrollment rates to affect medical expenditures and health outcomes. By measuring the social costs and benefits of treatment undertaken as a joint result of liability pressure and the medical practice environment, we provide direct evidence on the efficiency of different types of liability regimes in different types of health care markets.

3. Models and data

3.1. Models

Our modeling strategy and data are consistent with those used in Kessler and McClellan (1996). Our statistical methods seek to measure the effects of changes in identifiable sources of influences on medical decision making — state-level liability-reducing tort reforms and average managed care enrollment rates — that are not related to unobserved heterogeneity across patients and providers. We model the effects of law changes as differences in time trends across states during the eleven-year period 1984–1994 (four years longer than in our previous analysis) in inpatient hospital expenditures, and in outcome measures including all-cause mortality as well as the occurrence of cardiac complications directly related to quality of life. We model the spillover or market-wide effects of managed care, by measuring the effect of area-average enrollment rates on Medicare beneficiaries not enrolled in a managed care plan[1]. We allow the effect of law changes to vary in states with low versus high rates of managed care enrollment. We specify expenditures and outcomes as essentially nonparametric functions of patient demographic characteristics; state-level legal, political, and health-care market characteristics; and state- and time-fixed-effects. As in our previous work, we test

[1]Throughout the period of our analysis and even today, the vast majority of Medicare beneficiaries remain in the ''traditional'' fee-for-service Medicare program. For example, in 1994, less than 10% of beneficiaries were enrolled in managed care plans (HCFA, 1999). Thus, our estimated spillover effects are approximately equal to market-level effects.

for the existence and magnitude of defensive medicine based on how law reforms affect medical expenditures and health outcomes.

While this strategy fundamentally involves differences-in-differences between reforming and nonreforming states to identify effects, we modify conventional differences-in-differences estimation strategies in several ways. First, as noted above, our models include few restrictive parametric or distributional assumptions about functional forms for expenditures or health outcomes. Second, we allow managed care and law reforms to have dynamic effects on treatment decisions, health care costs, and health outcomes. By using a panel dataset including the most recent available information, our modeling framework permits a more robust analysis of the effects of liability reform and managed care.

We use a panel-data framework with observations on successive cohorts of heart disease patients. In state $s = 1...S$ during year $t = 1...T$, our observational units consist of individuals $I = 1...N_{st}$ who are hospitalized with new occurrences of a heart attack or ischemic heart disease. Each patient has observable characteristics X_{ist}, which we describe as a fully-interacted set of binary variables, as well as many unobservable characteristics that also influence both treatment decisions and outcomes. The individual receives treatment of aggregate intensity R_{ist}, where R denotes total hospital expenditures in the year after the health event. The patient has a health outcome O_{ist}, possibly affected by the intensity of treatment received, where a higher value denotes a more adverse outcome (O is binary in our models).

We define state laws and market conditions in effect at the time of each individual's health event with five categorical variables. Table 1 summaries the eight types of state medical malpractice liability law reforms that we analyze: caps on damage awards, abolition of punitive damages, no mandatory prejudgment interest, collateral-source rule reform, caps on contingency fees, mandatory periodic payments, joint-and-several liability reform, and the existence of a patient compensation fund. Consistent with our other research and with previous research on the impact of liability reform (see Kessler and McClellan, 1996; Kessler and McClellan, 1997; Kessler and McClellan, 1999; for discussion), we group these reforms into two categories: direct and indirect reforms. Direct reforms include changes in laws which specify statutory limits or reductions in malpractice awards: caps on total or noneconomic damages, collateral source rule reforms (which require damages to be reduced by all or part of the dollar value of collateral source payments to the plaintiff), abolition of punitive damages, and abolition of mandatory prejudgment interest. Indirect reforms include changes that affect awards only indirectly, such as reforms imposing mandatory periodic payments (which require damages in certain cases to be disbursed in the form of an annuity that pays out over time), caps on attorneys' contingency fees, and abolition of joint-and-several liability for total or noneconomic damages, either for all claims or for claims in which defendants did not act in concert.

To distinguish long-term from short-term effects of law reforms, we estimate dynamic models that separate the effect of reforms soon after and long after their

Table 1
Legal reforms used in analysis

Reform	Description of reform	Potential Impact on Liability
Caps on damage awards	Either noneconomic (pain and suffering) or total damages payable are capped at a statutorily-specified dollar amount	Direct
Abolition of punitive damages	Medical malpractice defendants are not liable for punitive damages under any circumstances	Direct
No mandatory prejudgment interest	Interest on either noneconomic or total damages accruing from either the date of the injury or the date of filing of the lawsuit is not mandatory	Direct
Collateral-source rule reform	Total damages payable in a malpractice tort are statutorily reduced by all or part of the dollar value of collateral source payments to the plaintiff	Direct
Caps on contingency fees	The proportion of an award that a plaintiff can contractually agree to pay a contingency-fee attorney is capped at a statutorily-specified level	Indirect
Mandatory periodic payments	Part or all of damages must be disbursed in the form of an annuity that pays out over time	Indirect
Joint-and-several liability reform	Joint and several liability is abolished for noneconomic or total damages, either for all claims or for claims in which defendants did not act in concert	Indirect
Patient compensation fund	Doctors receive government-administered excess malpractice liability insurance, generally financed through a tax on malpractice insurance premiums	Indirect

Source: Kessler and McClellan (1996, 1997, 1999).

adoption. We denote the existence of reforms adopted during our study period using four binary variables L_{dst}:$L_{1st} = 1$ if state s adopted a direct reform between year $t-2$ and year t (no more than two years before the patient's year t health event), $L_{2st} = 1$ if state s adopted a direct reform in year $t-3$ or before (three or more years before the patient's health event), $L_{3st} = 1$ if state s adopted an indirect reform between year $t-2$ and year t, and $L_{4st} = 1$ if state s adopted an indirect reform in year $t-3$ or before. $L_{st} = [L_{1st}\ L_{2st}\ L_{3st}\ L_{4st}]$ is thus a four-dimensional binary vector describing the existence of malpractice reforms. We characterize the extent of the influence of managed care in state health care markets using a binary variable M_{st}, $M_{st} = 1$ if state s had above-median managed care enrollment at time t.

We first estimate linear models of average effects of reforms and area managed care coverage on log(expenditures) and health outcomes:

$$\ln(R_{ist}) = \theta_t + \alpha_s + X_{ist}\beta + W_{st}\gamma + L_{st}\phi + M_{st}\delta + \upsilon_{ist} \quad (1)$$

where θ_t is a time fixed-effect, α_s is a state fixed-effect, W_{st} is a vector of variables described in Kessler and McClellan (1996) which summarize the legal-political environment of the state over time[2], β and γ are vectors of the corresponding average-effect estimates for the demographic controls and additional state-time controls, ϕ is the average effect in the short and long run of direct and indirect malpractice reforms, δ is the effect of above-median (versus below-median) managed care enrollment, and υ_{ist} is a mean-zero independently-distributed error term with $E(\upsilon_{ist}|X_{ist}, L_{st,}\ W_{st}, M_{st}) = 0$. We focus on average effects, although it is possible that managed care and liability limits achieve their average effects on medical expenditures in different ways. For example, managed care may lead to more standardized care, increasing the average while reducing the tails of the distribution of costs, whereas liability limits may reduce the average primarily by reducing costs at the higher end of the distribution. For health outcomes, all of our dependent variables are binary; in effect, outcomes for more or less severely ill patients are all weighted equally in our analysis. We explore the possibility of differential incidence of the effects among patients with different illness severities in some alternative specifications of (1).

Because legal reforms may affect both the level and the growth rate of expenditures, we estimate different baseline time trends θ_t for states adopting direct and indirect reforms before 1985 (which generally adopted before 1980) and nonadopting states. Our dataset includes essentially all elderly patients hospitalized with the heart diseases of interest for the years of our study, so that our results describe the actual average differences in trends in the U.S. elderly population. We report standard errors for inferences about average differences that might arise in

[2]W includes all the variables discussed in Kessler and McClellan (1996) except lawyers per capita, because that information was not available for the 1990s.

potential populations (e.g. elderly patients with these health problems in other years). Our model assumes that patients grouped at the state/year level have similar distributions of unobservable characteristics that influence medical treatments and health outcomes after controlling for state and time fixed effects.

Simple average effect estimates of the impact of managed care and liability reform may neglect important interactions between these determinants of medical treatment decisions; liability reforms may be either complements to or substitutes for the market effects of managed care. The effects of managed care may also vary over our sample period (e.g. Kessler and McClellan, 2000). For this reason, we estimate unconstrained models that allow the effect of managed care to vary year-by-year, and allow the effect of direct and indirect reforms to vary in different managed care market environments:

$$\ln(R_{ist}) = \theta_t^A + \theta_t^B * M_{st} + \alpha_s + X_{ist}\beta + W_{st}\gamma + L_{st}\phi + (L_{st} * M_{st})\rho + \upsilon_{ist} \quad (2)$$

where ρ is the interaction effect between liability reform and managed care.

3.2. Data

The data used in our study come from three principal sources. First, we use comprehensive longitudinal Medicare claims data for the vast majority of elderly beneficiaries who were admitted to a hospital with a new primary diagnosis of AMI or IHD in every year 1984–1994. We exclude patients in Medicare HMOs (reliable individual-level treatment information on such individuals was not available until recently)[3]. Data on patient demographic characteristics were obtained from the Health Care Financing Administration's HISKEW enrollment files. Patients with admissions for the same illness in the prior year were excluded to insure that we examine only new cases of serious cardiac illness. Measures of hospital expenditures, which comprise the bulk of expenditures for patients with serious heart disease, were obtained by adding up all acute plus nonacute inpatient hospital reimbursements (including copayments and deductibles not paid by Medicare) from insurance claims for all treatments in the year following each patient's initial admission for AMI. These expenditures reflect variation in actual resource use even under the DRG-based Medicare Prospective Payment System, since the provision of intensive treatments, very costly stays, transfers, and readmissions for acute care and nonacute care (''rehabilitation'') all lead to higher hospital expenditures.

[3]As noted above, enrollment rates in Medicare HMOs over our sample period were relatively low. Further, to the extent that Medicare beneficiaries in HMOs are healthier than those enrolled in FFS Medicare (and Medicare HMO enrollment is positively correlated with non-Medicare HMO enrollment), this omission modestly biases our results toward finding that area HMO enrollment leads to higher Medicare costs and worse health outcomes.

We examine three measures of health outcomes. Measures of mortality within one year of the index AMI admission are based on death reports validated by the Social Security Administration. Measures of the occurrence of cardiac complications were obtained by abstracting data on the principal diagnosis for all subsequent admissions in the year following the patient's initial admission (transfers and readmissions within 30 days of the index admission are not counted, because they likely represent continuing treatment for the initial event). Cardiac complications included rehospitalizations within one year of the initial event with a primary diagnosis (principal cause of hospitalization) of either subsequent AMI or heart failure. Treatment of AMI patients is intended to prevent subsequent AMIs if possible, and the occurrence of heart failure requiring hospitalization is evidence that the damage to the patient's heart from ischemic disease has serious functional consequences. Recurrent AMIs, like initial AMIs, will always be treated on an inpatient basis.

Table 2 describes the elderly populations with AMI and IHD from selected

Table 2
Average expenditures, outcomes, and demographic characteristics for AMI and IHD populations used in analysis, selected years, 1984–1994

	1984	1987	1990	1994
AMI Population				
1-year total hospital expenditures	$12,076	$13,945	$15,216	$18,079
1-year mortality	40.2	40.2	36.5	32.8
1-year AMI readmit	6.2	5.6	5.3	5.3
1-year CHF readmit	7.8	8.1	8.5	8.4
Mean age	75.5	76.0	76.3	76.4
(Standard deviation)	(7.1)	(7.3)	(7.3)	(7.4)
Female	48.2	49.8	49.9	48.7
Black	5.2	5.4	5.5	5.8
Rural	28.7	30.0	29.8	30.8
Sample size	245,378	219,855	209,957	230,613
IHD Population				
1-year total hospital expenditures	$11,682	$12,775	$14,302	$16,921
1-year mortality	13.5	11.6	10.2	9.5
1-year AMI readmit	3.7	3.0	2.7	2.6
1-year CHF readmit	6.2	5.4	5.5	5.6
Mean age	74.5	74.3	74.4	74.5
(Standard deviation)	(6.9)	(6.8)	(6.8)	(6.7)
Female	55.5	54.1	51.9	49.1
Black	5.9	5.7	5.8	6.0
Rural	30.2	30.4	29.6	30.1
Sample size	359,166	345,755	355,118	355,063

Note: Hospital expenditures in 1993 dollars. Outcome measures and demographic characteristics except age in percentage points. Readmission rates based on 30-day exclusion rule (see text).

years of our study. For all the years of our study pooled together, the sample of heart attack patients includes 2,466,801 individuals; the sample of IHD patients includes 3,823,990 individuals. Table 2 demonstrates some of the well-known trends in the treatment, expenditures, and outcomes of elderly heart disease patients. The first row of the Table shows how dramatically real Medicare inpatient expenditures have grown over the 1984–1994 period. Because reimbursement given treatment choice for Medicare patients did not increase over this period (McClellan, 1997), these expenditure trends are attributable to increases in intensity of treatment. The more rapid growth since 1990 was largely attributable to increasing use of nonacute inpatient services, reflecting general trends in Medicare expenditures. Concomitant with the increase in average intensity throughout our study period, average one-year mortality for AMI has declined by 7.4 percentage points. However, trends in cardiac complications have been mixed: AMI and IHD survivors have a slightly higher risk of subsequent heart failure (CHF), but have lower rates of subsequent AMI.

Second, we match patient data with information on state liability reforms from our previous research (Kessler and McClellan, 1997), updated to include adoption and repeal of reforms through 1994. Table 3 presents the chronology of legal reforms through 1994 that we analyze for each of the 50 states. The table shows that a number of states have implemented legal reforms at different times. For example, 23 states adopted direct reforms over our 1984–1994 study period; 24 states adopted indirect reforms. Furthermore, a substantial number of states do not overlap in their adoption of policies; although 33 states adopted either direct or indirect reforms, only 14 adopted both.

Third, we match patient data with information on annual managed care enrollment rates by state from InterStudy Publications, a division of Decision Resources, Inc.[4] Managed care enrollment excludes patients enrolled in preferred provider organizations (which are effectively a form of discounted FFS insurance); point-of-service plans that are not subject to state HMO regulation; and plans that are self-insured by employers, even if they are administered by a MCO. Enrollment rates were calculated by dividing the number of enrollees (exclusive of Medicare supplementary enrollees) by the population. In order to investigate the extent to which the rate of managed care enrollment in an area interacts with liability reform, we separate states into two groups based on whether their HMO enrollment was above or below the 1984–94 overall median rate of 7.1% for each year of our analysis. Table 4, which shows the classification of states for selected years, demonstrates the growth in states with above-median managed-care penetration over the study period.

[4]During the period of our analysis, reliable measures of managed-care enrollment are available at the state level only. Although previous studies have imputed measures of managed-care performance for smaller geographic areas within states (e.g. Baker, 1999), the imputations are generally based on apportioning enrollment based on population shares. For our study, which relies primarily on state-level variations in laws, this would not generate any new variation or differences in results.

Table 3
Chronology of legal reforms through 1994[a]

Year effective			Year effective		
State	Direct reform	Indirect reform	State	Direct reform	Indirect reform
Alabama	1987	1987	Montana	1987	
Alaska	1976, 1986	1989	Nebraska	1960, 1976	1976
Arizona		1988	Nevada		
Arkansas			New Hampshire	1986	
California	1975	1975, 1986	New Jersey	1987	1972, 1976
Colorado	1986	1986, 1988	New Mexico	1976	1976, 1987
Connecticut	1985	1986	New York	1967, 1984	1970, 1985
Delaware		1976	North Carolina		
Florida	1976, 1986	1980, 1985, 1986	North Dakota		1987
Georgia			Ohio	1975	1988[e]
Hawaii	1986		Oklahoma		1953, 1978
Idaho	1987, 1990	1987	Oregon	1975, 1987	1975[c], 1987
Illinois	1976, 1985	1985	Pennsylvania		1975
Indiana	1975	1975, 1985	Rhode Island	1976	
Iowa	1975		South Carolina		1976
Kansas	1986, 1988	1974, 1976	South Dakota	1976	1988
Kentucky			Tennessee	1975	1975
Louisiana	1975[b]	1975, 1984	Texas	1977, 1992	
Maine	1989	1985	Utah	1985, 1986	1985, 1986
Maryland	1986		Vermont		1970
Massachusetts	1986[b]	1986	Virginia	1974	
Michigan	1986	1981	Washington	[b]	1986
Minnesota	1986		West Virginia	1986	
Mississippi			Wisconsin	1986[d]	1975, 1986
Missouri	1986	1986	Wyoming		1986, 1987

Source: Kessler and McClellan, (1997), updated through 1994.

Notes: [a] Except prejudgment interest. Montana imposed prejudgment interest in 1985. No other states repealed or imposed prejudgment interest 1985–1993. The following states imposed mandatory prejudgement interest effective before 1984: AK, CO, IA, LA, ME, MA, NH, NJ, NC, OK, RI, UT, WV.

[b] Common law effective before 1984 prohibits punitive damages.

[c] Repealed 1987.

[d] Held unconstitutional or expired, 1991.

[e] Held unconstitutional, 1993.

4. Empirical results

Table 5 presents estimates of the effect of liability reforms and state managed care enrollment rates on treatment intensity and health outcomes for our populations of AMI and IHD patients. In this and subsequent models, we include fully-interacted demographic effects — for patient age (65–69, 70–74, 75–79, 80–89, 90–99), gender, black or nonblack race, and urban or rural residence — state fixed-effects; time fixed-effects that vary depending on the states' preexisting

Table 4
States with managed care enrollment above and below eleven-year pooled median (1984–1994), selected years

	1984	1987	1990	1994
Above median enrollment	AZ, CA, CO, HI, MA, MN, OR, WA, WI	AZ, CA, CO, CT, DE, FL, HI, IA, IL, IN, KS, MA, MD, MI, MN, MO, NC, ND, NH, NJ, NM, NV, NY, OH, OR, PA, RI, UT, WA, WI	AZ, CA, CO, CT, DE, FL, HI, IA, IL, KS, MA, MD, MI, MN, MO, NH, NJ, NM, NV, NY, OH, OR, PA, RI, UT, WA, WI	AZ, CA, CO, CT, DE, FL, HI, IL, IN, KY, MA, MD, MI, MN, MO, NE, NH, NJ, NM, NV, NY, OH, OR, PA, RI, TN, TX, UT, VT, WA, WI
Below median enrollment	AK, AL, AR, CT, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, UT, VA, VT, WV, WY	AK, AL, AR, GA, ID, KY, LA, ME, MS, MT, NE, OK, SC, SD, TN, TX, VA, VT, WV, WY	AK, AL, AR, GA, ID, IN, KY, LA, ME, MS, MT, NC, ND, NE, OK, SC, SD, TN, TX, VA, VT, WV, WY	AK, AL, AR, GA, IA, ID, KS, LA, ME, MS, MT, NC, ND, OK, SC, SD, VA, WV, WY

Note: Median enrollment rate for 11-year period is 7.13%.

Table 5
Effect of state tort reforms and managed care enrollment rates on on expenditures and health outcomes for elderly heart attack and ischemic heart disease patients, 1984–94

Variable	Heart attack ($N=2,466,801$)				IHD ($N=3,823,990$)			
	ln(total hospital expenditures)	1-Year mortality	1-Year AMI readmit	1-Year HF readmit	ln(total hospital expenditures)	1-Year mortality	1-Year AMI readmit	1-Year HF readmit
Difference-in-difference effects of reforms								
Direct reform,	−0.16	0.34	−0.12	0.04	0.41	0.02	−0.04	−0.03
soon after adoption	(0.26)	(0.16)	(0.08)	(0.10)	(0.27)	(0.09)	(0.05)	(0.07)
Direct reform,	−4.20	0.18	−0.11	0.13	−4.42	−0.10	−0.06	−0.08
long after adoption	(0.27)	(0.17)	(0.08)	(0.10)	(0.27)	(0.09)	(0.05)	(0.07)
Indirect reform,	−3.63	0.17	−0.10	−0.15	−1.85	0.23	−0.01	0.17
soon after adoption	(0.27)	(0.18)	(0.08)	(0.10)	(0.27)	(0.09)	(0.05)	(0.07)
Indirect reform,	0.20	0.18	−0.04	−0.34	1.07	−0.01	−0.03	0.05
long after adoption	(0.28)	(0.18)	(0.09)	(0.10)	(0.29)	(0.09)	(0.05)	(0.07)
Effect of managed care enrollment (omitted category = less-than-median enrollment/population)								
High managed care	−2.99	0.12	0.03	0.05	−4.40	−0.02	−0.13	0.06
enrollment	(0.21)	(0.13)	(0.06)	(0.08)	(0.21)	(0.07)	(0.04)	(0.05)

Notes: standard errors in parentheses. Hospital Expenditures in 1993 dollars. Coefficients from expenditures models *100 from regressions in logarithms; Coefficients from outcome models in percentage points.

liability environment; and time-varying controls for states' political and regulatory environment. As described in Section 3, all of our specifications are linear, the dependent variable in the expenditure models is logged, and all coefficient estimates are multiplied by 100 and so can be interpreted as average effects in percent (for expenditure models) or percentage points (for outcomes models). The precision of the estimates is much greater than in our previous work, reflecting the fact that the current research analyzes the consequences of all elderly beneficiaries with cardiac illness for all of the years 1984–1994.

The first rows of Table 5 confirm and update the findings from Kessler and McClellan (1996): even controlling for managed care enrollment rates, there is still evidence that doctors practice defensive medicine. In the long run (three or more years after the adoption of reforms), patients from states adopting direct reforms have significantly lower growth in medical expenditures for both AMI and IHD, but do not have significantly greater increases in the rate of adverse outcomes for their illness. Especially for IHD patients, the estimates of expenditure effects in Table 5 are smaller in magnitude than the corresponding estimates reported in Table 6 of Kessler and McClellan (1996). We describe the reasons for the differences below. Table 5 reports that direct reforms decreased long-run hospital expenditures on AMI patients by approximately 4.2 percent (compared to an estimated effect of 5.8 percent from Kessler and McClellan, 1996); similarly, direct reforms decreased long-run hospital expenditures on IHD patients by approximately 4.4 percent (compared to an estimated effect of 8.9 percent from Kessler and McClellan, 1996). Although indirect reforms are associated with a reduction in expenditures in the year after adoption, this reduction in expenditures dissipates by several years after adoption. Indeed, indirect reforms are associated with a small long-term increase (about one percent) in total expenditures for IHD patients.

The last row of the table shows that the spillover effects of managed care, as measured by enrollment per capita, have a significant negative impact on treatment intensity, but no substantial or significant positive impact on adverse health outcomes. Among IHD patients, high levels of managed care enrollment not only lead to larger reductions in expenditures but also to significantly lower rates of cardiac complications (although the magnitude of the reduction, 0.13 percentage points for recurrence of AMI, is small). These findings are consistent with previous research on the effects of managed care on expenditures, such as Baker (1999) and Kessler and McClellan (2000)[5].

We estimated some analogues to Eq. (1) to explore in more detail how managed care and liability reform achieve their effects. First, we estimated Eq. (1) including M_{st} and the log of the managed care enrollment rate in state s at time t, and allowing the effects of M_{st} and the log of the managed care enrollment rate to vary

[5]Aside from Kessler and McClellan (2000), however, little previous work has jointly examined managed care and other economic and regulatory factors that may influence its effect, as we do here.

Table 6
Effect of state tort reforms and managed care enrollment rates on on expenditures and health outcomes for elderly heart attack and ischemic heart disease patients, 1984–94 allowing for interactions between reforms and managed care, and the effect of managed care to vary over the study period

Variable	Heart attack ($N=2,466,801$)				IHD ($N=3,823,990$)			
	ln(total hospital expenditures)	1-Year mortality	1-Year AMI readmit	1-Year HF readmit	ln(total hospital expenditures)	1-Year Mortality	1-Year AMI Readmit	1-Year HF Readmit
Difference-in-difference effects of reforms								
Direct reform,	−1.72	0.17	−0.14	0.07	−1.59	0.31	0.00	−0.02
soon after adoption	(0.55)	(0.34)	(0.17)	(0.20)	(0.56)	(0.19)	(0.10)	(0.14)
Direct reform,	−3.81	0.37	0.51	0.37	−7.07	−0.10	0.02	−0.21
long after adoption	(0.61)	(0.38)	(0.19)	(0.22)	(0.61)	(0.20)	(0.11)	(0.15)
Indirect reform,	0.52	0.47	0.01	−0.40	2.37	0.19	0.06	0.18
soon after adoption	(0.55)	(0.34)	(0.17)	(0.20)	(0.56)	(0.18)	(0.10)	(0.14)
Indirect reform,	−2.25	0.32	−0.31	−0.33	1.64	0.10	−0.04	0.15
long after adoption	(0.58)	(0.36)	(0.18)	(0.21)	(0.59)	(0.19)	(0.11)	(0.14)
Reform*managed care enrollment interactions								
High man care*direct	1.01	0.32	0.03	−0.05	1.34	−0.39	−0.04	−0.03
soon after adoption	(0.62)	(0.38)	(0.19)	(0.22)	(0.63)	(0.21)	(0.11)	(0.15)
High man care*direct	0.67	0.02	−0.70	−0.27	4.14	−0.03	−0.10	0.17
long after adoption	(0.65)	(0.41)	(0.20)	(0.24)	(0.65)	(0.21)	(0.12)	(0.16)
High man care*indirect	−8.21	−0.56	−0.10	0.33	−9.01	0.14	−0.02	−0.04
soon after adoption	(0.59)	(0.36)	(0.18)	(0.21)	(0.60)	(0.20)	(0.11)	(0.15)
High man care*indirect	−0.61	−0.33	0.37	−0.05	−4.75	−0.02	0.08	−0.11
long after adoption	(0.61)	(0.38)	(0.18)	(0.22)	(0.61)	(0.20)	(0.11)	(0.15)

Notes: standard errors in parentheses. Hospital Expenditures in 1993 dollars. Coefficients from expenditures models *100 from regressions in logarithms; Coefficients from outcome models in percentage points. Models allow time fixed effects to vary in areas with high versus low managed care enrollment rates.

before versus after 1990 (consistent with the findings of Kessler and McClellan, 2000). Results not published in Table 5 show that managed care had similar expenditure effects pre- and post-1990: a negative coefficient on M_{st} of approximately 3 to 4 percent, with a positive coefficient on the log of the enrollment rate (very small and insignificant for IHD), suggesting that expenditure-reducing effects of managed care fall away beyond a threshold effect for AMI patients. The post-1990 outcome consequences of managed care in this specification are statistically insignificant for AMI. But for IHD, the coefficients from two of the three outcome models on the log of the post-1990 enrollment rate are negative and statistically significant (although small in magnitude)[6]. That is, high levels of managed care have no overall outcome consequences for AMI patients and are associated with slightly improved outcomes for IHD patients, who generally have a relatively less severe form of cardiac illness.

Second, we created for each AMI and IHD patient an indicator variable, PRIOR_ADM_{ist}, that identified the approximately 30 percent of patients who had an inpatient hospital admission in the year prior to the adverse cardiac event under analysis. By estimating Eq. (1) with additional controls for PRIOR_ADM_{ist}, $\text{PRIOR\_ADM}_{ist}^{*}\theta_t$, $\text{PRIOR\_ADM}_{ist}^{*}\text{L}_{st}$, and $\text{PRIOR\_ADM}_{ist}^{*}\text{M}_{st}$, we examined the extent to which managed care and liability reform have different effects on more versus less severely ill patients. Results not reported in Table 5 show that direct reforms lead to greater expenditure reductions among more severely ill AMI and IHD patients[7]. In contrast, high managed care enrollment leads to smaller expenditure reductions among more severely ill AMI and IHD patients[8]. In spite of this, liability reforms do not have significant differential outcome effects on more versus less severely ill patients. However, high managed care enrollment does lead to statistically significantly higher rates of cardiac complications (both AMI and IHD samples) and mortality (IHD sample only) on more versus less

[6]For example, a 10 percent increase in managed care enrollment in a state with above-median enrollment leads to 0.034 percentage points lower mortality and to 0.014 percentage points lower readmissions for AMI.

[7]For AMI patients, approximately 3.5 percent lower expenditures long after adoption for patients without a prior year admission, compared to approximately 5.1 percent lower expenditures long after adoption for patients with a prior year hospital admission; for IHD patients, approximately 4.0 percent lower expenditures long after adoption for patients without a prior year admission, compared to approximately 5.1 percent lower expenditures long after adoption for patients with a prior year hospital admission.

[8]For AMI patients, approximately 4.6 percent lower expenditures in high-enrollment states for patients without a prior year admission, compared to approximately 2.6 percent lower expenditures in high-enrollment states for patients with a prior year hospital admission; for IHD patients, approximately 5.2 percent lower expenditures in high-enrollment states for patients without a prior year admission, compared to approximately 2.5 percent lower expenditures long after adoption for patients with a prior year hospital admission.

severely ill patients[9], although this result would have limited policy relevance if the differential effects of managed care on outcomes by illness severity follow the same trend through the 1980s and 1990s as do the average effects of managed care outlined above.

Table 6 presents estimates of Eq. (2), allowing the effect of malpractice reforms to vary in high- and low-managed-care market environments. In all market environments, for both AMI and IHD patients, direct reforms lead to long-run reductions in medical expenditures without substantial consequences for patient health outcomes. Among AMI patients, direct reforms in environments with low managed-care penetration lead to significant long-run increases in AMI readmission rates, and indirect reforms lead to significant decreases in AMI readmission rates. However, both of these effects are very small in magnitude (i.e. upper bound of the 95% confidence interval less than a one percentage-point effect), and the adverse effects of direct reforms on patient health are not present in areas with high managed care enrollment. Coupled with the estimated expenditure effect, the point estimate for the long-run expenditure/benefit ratio for a higher-pressure liability regime in a low-managed-care environment is well over $130,000 per year of better cardiac health (e.g. without readmission for a recurrent AMI)[10]. Among IHD patients, the the estimated effects on outcomes are all insignificant and generally smaller in magnitude.

In high managed-care environments, the long-run effect of reforms on expenditures for AMI are smaller in magnitude than but not statistically different from the effect in low-managed-care environments. These results imply that malpractice reforms and managed care do not have large substitutable or complementary effects on overall resource use for AMI patients; most of the long-run independent expenditure-reducing effects of managed care spillovers and direct reforms can jointly be achieved. In other words, they appear to achieve their effects by influencing different kinds of treatment decisions. Among IHD patients, however, managed care and direct reforms are substitutes. Significantly less additional cost savings among IHD patients are achieved by managed care once direct reforms are

[9]For AMI patients, 0.19 percentage points higher readmissions for AMI in high-enrollment states for patients with a prior year hospital admission versus patients without, and 0.63 percentage points higher readmissions for CHF; for IHD patients, approximately 0.46 percentage points higher mortality in high-enrollment states for patients with a prior year hospital admission versus patients without, 0.12 percentage points higher readmissions for AMI, and 0.72 percentage points higher readmissions for CHF.

[10]That is, if we directly apply the estimates from Table 6 to form a cost-effectiveness ratio based on the average expenditure per AMI patient in 1994, we have (0.038*$18,079)/0.0051=$134,706. Note that this is likely an underestimate of the cost-effectiveness ratio of reform-induced treatment in low managed care areas, since our conversion from the percentage effect of malpractice reform in the log model to the average effect in levels potentially understates effects for high-cost cases on the average in levels (see, e.g. Manning et al., 1987). This cost-effectiveness ratio is high compared to that for other cardiac treatments and other forms of medical care reported in the literature; see Garber (2000) and Gold et al. (1996), respectively.

in place. The magnitude of this interaction between managed care and reform is approximately equal to the average effect of managed care enrollment from Table 5. In low-managed-care environments, the estimated independent effect of direct reforms on IHD expenditures is approximately 7.1 percent; in high managed care environments, the estimated independent effect is approximately 2.9 percent. Not surprisingly, for both AMI and IHD patients, the estimated effects of direct reforms in low managed-care areas more closely resemble those reported in Kessler and McClellan (1996), which were obtained on an earlier sample in which managed care was less prevalent and influential.

The estimates in Table 6 suggest that managed care and indirect reforms have complementary effects on medical treatment intensity, at least for patients with IHD. However, the estimated effects of managed care and indirect reforms masks substantial heterogeneity in the interaction effects for particular types of indirect reforms. Estimates from supplementary IHD models (not presented in Table 6) that disaggregate indirect reforms into two groups, joint and several liability reforms and all other indirect reforms, show that managed care and joint and several liability reforms are complements, whereas managed care and all other indirect reforms are substitutes. This effect is consistent with distinctive features of joint and several reforms, which may have a particularly large effect on liability-induced treatment behavior in environments with greater coordination and integration of care[11].

The lower level of disease severity generally found among IHD relative to AMI patients is consistent with the differences in our estimates for the two populations. In IHD relative to AMI patients, both direct reform and managed care have greater independent effects on treatment intensity, but not a substantially greater joint effect. Because a larger share of IHD patients are likely to have less severe illness and thus more ''marginal'' indications for many intensive treatment, the scope for defensive practices is likely to be greater, leading to larger average effects of managed care and direct reforms, at least in low-managed-care environments. However, the more parsimonious practices associated with managed care are also

[11]In particular, joint and several liability may have distinctive interactions with characteristics of the health care market environment. Joint-and-several liability means that a malpractice plaintiff can sue any physician or hospital who played a role in causing his medical injury and recover the full extent of his damages from each, regardless of the extent of the individual defendant's fault. If managed care supports better coordination and integration of care among providers, it may lead to more use of defensive practices by multiple doctors and hospitals to reduce the costs of joint-and-several liability that they bear individually. In fee-for-service markets with less coordination of care, doctors and hospitals may have more difficulty in undertaking joint defensive practices that reduce their collective liability. In addition, in unintegrated markets, much of the savings in joint and several liability costs from an individual provider's defensive practices accrue to other providers. Integration of markets through managed care could help solve the ''collective action problem'' that prevents an individual doctor or hospital from capturing the full savings in joint and several liability costs that defensive practices can provide.

more likely to reduce physicians' incentives and ability to provide intensive treatments for ''marginal'' IHD cases, and therefore to reduce the magnitude of the effects of liability reform.

5. Conclusion

What is the appropriate medical liability policy in an era of managed care? Previous research based principally on data from the 1980s has shown that reforms limiting medical malpractice liability lead to statistically and economically significant reductions in medical treatment intensity, but not to significant increases in rates of adverse health outcomes. These results imply that doctors practice defensive medicine, and that marginal reductions in liability from a conventional level improve productivity in health care. Since the 1980s, however, the rise of managed care in the US and increased efforts at cost-containment in other countries may have reduced the utilization of marginally-valuable treatments. In this new health insurance environment, the results from early studies assessing the social implications of medical liability reform may no longer be valid. Because the magnitude and even the direction of the interaction effects between managed care and liability pressure are theoretically indeterminate, the social implications of liability reform in the present and the future — in which managed care or its analogues will play an important role in shaping markets for health care for all individuals, whether or not they are enrolled in a managed care plan — is an important empirical question. However, no previous work has investigated this issue.

In this paper, we analyze updated populations of elderly Medicare beneficiaries from 1984 to 1994, matched with information on tort laws and managed care enrollment rates from the state in which the patient was treated, to study how managed care and liability reform interact to affect medical treatment decisions, health care costs, and health outcomes — and ultimately social welfare. We present two main findings. First, although reforms that directly reduce liability pressure (such as caps on damages) reduce defensive practices in areas with low and high levels of managed care enrollment, managed care and direct reforms are substitutes, so the reduction in defensive practices that can be achieved with direct reforms is smaller in areas with high managed care enrollment. Especially for patients with IHD, the magnitudes of the estimated effects of direct liability reforms are smaller than in previous work based on earlier time periods, when managed care was less prevalent and influential. This is likely due to the fact that patients with IHD are more likely to have marginal indications for intensive treatment; the more parsimonious practices associated with managed care are more likely to reduce physicians' incentives and ability to engage in defensive treatments for IHD, and therefore to reduce the magnitude of the effects of liability

reform. Second, managed care and direct reforms do not have long-run interaction effects that are harmful to average patient health.

Our results also have implications for the current debate over the appropriateness of extending malpractice liability to MCOs. Currently, the federal U.S. Employee Retirement Income Security Act (ERISA) preempts certain state law malpractice claims against MCOs that administer plans that pay directly out of employers' assets, on the grounds that the MCOs are acting as ''administrators of an employee benefit plan'' (see Frankel, 1994 and Bearden and Maedgen, 1995 for an extensive legal analysis of the ERISA preemption question). Some observers have suggested that ERISA preemption should be repealed, thereby holding MCOs liable for coverage decisions in particular cases, because of concerns that managed care is more likely to result in inadequate precautionary care decisions. Along these lines, several states have passed recent legislation that seeks to expand liability for MCOs within the constraints of ERISA.

Since there is no evidence that the level of liability in states both with reforms and with substantial influence of managed care (as measured by enrollment rates) is too low, our results provide little evidence to support the repeal of ERISA preemption, on the grounds that the *overall* level of liability on doctors and MCOs together is insufficient. For example, one possible way to repeal ERISA preemption would be to allow malpractice plantiffs two separate legal causes of action, one against their physician, and one against their MCO. To the extent that any determination of liability at trial involves a stochastic component, this mechanism could increase the overall level of liability by giving plaintiffs the option of taking ''two bites at the apple.'' The expected value of a stochastic tort claim rises with the number of draws allowed to the claimholder, because the value of the claim can only be positive. Our results suggest that such reforms would not improve welfare.

However, whether the extension of liability to MCOs would improve welfare *if the overall level of liability and thus malpractice pressure were held constant* remains an open question. To the extent that MCOs have medical decision-making authority in practice, it may be efficiency-enhancing to reallocate tort liability from physicians to MCOs, if this cannot be accomplished through contracts between physicians and MCOs. This potentially could be accomplished by the mechanism set out in detail in Frankel (1994): a bifurcated malpractice trial that first evaluated whether *some* party had behaved negligently and caused injury, and second apportioned responsibility between physicians and MCOs.

Continuing changes in health care delivery and financing arrangements may reduce the salience of the issue of ERISA preemption in the future. For example, capitated contracts for managing all patient care, in which multispecialty physician practices bear the risk for health care expenses of covered patients, have become common between physician groups and health plans in many markets. These contracts presumably reflect the preeminence of the treating physicians in making ultimate patient care decisions, and have occurred despite the fact that physician

groups historically have not borne insurance risks. Some large employers such as those in the Buyers' Health Care Action Group (BHCAG) in Minneapolis are taking the logical next step of direct contracting with provider groups; MCOs are increasingly providing plan administration services to physician groups. Since the treating physicians would more clearly have ultimate responsibility for care decisions in these cases, it is difficult to see how an MCO could be held legally responsible for medical management advice even in the absence of ERISA.

Although we reach some important conclusions about the role of malpractice liability in an era of managed care, substantial work remains to be done. We examine only the spillover effects of managed care. While it is possible that the effects of liability laws may be greater for patients who are enrolled in managed care plans, it seems unlikely that physician practices could diverge too much between MCO and non-MCO patients (e.g. Cutler et al., 2000). It is also possible that effects might be different for other patient groups, e.g., Medicaid and uninsured individuals, who might be subject to additional ''spillover'' reductions in treatment intensity from the emergence of managed care. Effects might also be different for other health problems, e.g., managed-care plans may have stronger incentives to reduce intensity of treatment for chronic conditions like cancer. Further studies of additional patient populations and health problems using the methods we have applied here could address these questions. Finally, we do not identify here the mechanisms through which the changes in liability pressure and managed care penetration achieve their effects on area practice patterns. Such research on the particular types of treatments and patients affected could validate the findings in this paper, as well as provide an empirical foundation for predicting how managed care, liability reform, and other untried approaches to improving productivity in health care might interact.

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