10-1-2013

Economic Analysis of Medical Malpractice Liability and its Reform

Jennifer Arlen
NYU School of Law, Jennifer.Arlen@nyu.edu

Recommended Citation

Arlen, Jennifer, "Economic Analysis of Medical Malpractice Liability and its Reform" (2013). *New York University Public Law and Legal Theory Working Papers.* Paper 398.
http://lsr.nellco.org/nyu_plltwp/398

Research Handbook on the Economics of Torts

Edited by

Jennifer Arlen

New York University School of Law, USA

Edward Elgar

Cheltenham, UK • Northampton, MA, USA

2. Economic analysis of medical malpractice liability and its reform
Jennifer Arlen*

1. INTRODUCTION

Patients seeking medical treatment face a serious risk that they will be severely injured or killed by the treatment they receive. Studies suggest that 4 to 18 percent of patients seeking care in hospitals are the victims of preventable medical error,[1] with many suffering serious injury.[2] About 1 percent of hospital patients suffer errors that constitute medical negligence (Brennan et al. 1991). Moreover, medical error reaches beyond hospital walls. Many patients seeking care from their regular physicians routinely receive less than medically recommended care.[3] These medical errors cause enormous human suffering. They also are costly. Medical error increases average hospital costs by $1,246 per patient admission, and increases average costs in the riskiest hospitals by $4,769 per patient admission (Mello et al. 2007, 847). Overall, medical error costs about $17–29 billion per year (Institute of Medicine 2000).

Many medical errors are properly characterized as medical negligence, in that the patient did not receive treatment consistent with appropriate medical practice (see Weiler et al. 1993; Mello & Studdert 2008; see Andrews 2005). States thus could substantially reduce the total cost of medical care, and increase social welfare, by adopting optimal malpractice liability rules that induce physicians, hospitals, and other medical providers to invest optimally in patient safety.[4] This presents two related questions: how can medical

---

[1] Throughout this chapter, the term "medical error" refers to both errors of commission and omission—such as when a physician fails to provide medically appropriate treatment to patients with chronic conditions, *see infra* notes 19–21 (discussing evidence).

[2] Weiler et al. (1993, reviewing written hospital records and finding that 3.7 percent of the patients were victims of an error that caused significant harm); Andrews (2005), conducting an on-site observation of hospital error (going beyond errors noted in written records) and finding that 17.7 percent of patients were the victim of at least one error that extended their hospital stay).

[3] McGlynn et al. (2003, 2641, finding that patients on average receive only about 55 percent of recommended care); Schuster et al. (1998, 521, finding that, for chronic conditions, only 60 percent of patients received recommended care and 20 percent received contraindicated care).

[4] Malpractice liability is a vital supplement to regulation for the reasons discussed in Arlen & MacLeod (2003); see also Shavell (2012, discussing why negligence liability is superior to regulation).

providers optimally protect patients, and what liability rules are needed to induce them to do so.

To answer these questions, economic analysis of malpractice liability traditionally has relied on the classic model of accidents (Brown 1973; Shavell 1980). This model examines the role of liability when social welfare depends on the amount that each informed physician invests in treating (i.e., taking care towards) a specific patient. This framework implies that malpractice liability enhances social welfare when physicians would otherwise under-invest in treatment, as they will when they bear the cost of treatment and patients cannot reliably oversee treatment choice. This analysis implies that mandatory malpractice liability may not be needed to increase treatment expenditures, even when patients cannot observe physician quality, if insurers bear all treatment costs (*infra* section 2.B) or patients can contract over liability and know the expected benefit to them of doing so (*infra* section 4).[5] Moreover, in this framework, institutional liability generally is not necessary because individuals make all care decisions and physicians are rarely insolvent (see generally Kornhauser 1982; Sykes 1984; and see Polinsky & Shavell 1993).

Although the traditional analysis provides many useful insights, we cannot rely on it when formulating medical malpractice liability reform because it does not fully capture the causes of medical negligence, and thus omits important goals and effects of tort liability. The traditional model assumes that negligence results when an individual injurer knowingly decides to select suboptimal care (Shavell 1980). As applied to medicine, this model treats medical negligence as a knowing decision by a physician to provide suboptimal treatment. Yet empirical analysis suggests that many, if not most, medical errors occur accidentally when physicians unknowingly misdiagnose a patient, select the wrong treatment, or err in providing the treatment selected.[6] These accidental errors constitute negligence if a physician of ordinary prudence and expertise would not have made such an error.

The possibility of accidental error is important because physicians can reduce the risk of these accidental errors by investing in the expertise, health care technology, staffing, and systems that assist in correctly diagnosing, properly selecting and providing treatment to all their patients. These investments, which we refer to as "patient safety investments," share a common feature: they increase the probability that a physician will have the *information* needed (before or during treatment) to select and ultimately provide the medically appropriate treatment to all of his patients. These investments materially differ from the patient-specific treatment decisions examined by the traditional model in two ways. First, patient safety investments, such as a physician's efforts to acquire expertise over his years of practice, tend to fall outside the factors courts consider in determining whether the

---

[5]   This discussion focuses on the simplest form of the traditional model.

[6]   Studies of medical error in hospitals suggest that physicians often err because they did not have sufficient knowledge to correctly diagnose the patient and/or select the right treatment, or were improperly supervised. See, e.g., Weiler et al. (1993, 42–44, 137–39); Mello & Studdert (2008, 605); Andrews (2005, 362–63). A study of diagnostic errors in the outpatient setting found that 59 percent involved diagnostic errors that resulted in death or serious permanent injury and that most of these resulted from failures in judgment (79 percent), knowledge (48 percent), or vigilance or memory (59 percent) (Gandhi et al., 2006).

physician was negligent. Courts instead tend to focus on patient-specific treatment decisions and actions in determining whether a physician was negligent. Thus, a physician can invest optimally in patient safety and nevertheless be found liable if he accidentally (and unknowingly) provides negligent treatment. Second, unlike treatment choice, patient safety investments are not patient-specific. Instead, these investments impact all of a physician's patients by affecting his ability to properly diagnose, select and provide treatment (Arlen & MacLeod 2003; 2005a). Accordingly, to fully analyze medical malpractice liability, we need to determine the optimal role of tort liability in regulating physicians' investments in patient safety.

In addition, to fully analyze medical care, we need to move beyond the traditional model's focus on individual injurers. We must take into account the fact that medical institutions, such as hospitals and Managed Care Organizations (MCOs), not only impact patients' welfare indirectly through incentives provided to physicians (as in the traditional model), but also directly affect the risk of medical error by investing in health care technology and systems (Weiler et al. 1993; Abraham & Weiler 1994; Andrews 2005; Arlen & MacLeod 2003; Mello & Studdert 2008, 605).

This chapter examines the optimal malpractice liability, employing a model of medical error in which patient welfare depends on physicians' willingness to invest optimally in both (1) patient-specific treatment choice and (2) patient safety (which affects the probability that the physician is sufficiently informed to select and deliver medically appropriate treatments) (Arlen & MacLeod 2003, 2005a).[7] The present analysis also takes into account the role of health insurance and medical institutions. It identifies and examines the optimal structure of malpractice liability and considers several leading reform proposals, including contract-based liability and medical-entity liability.

This chapter demonstrates that attending to the sources of medical error and the role of medical institutions alters the conclusions regarding the optimal structure of malpractice liability and the validity of the leading reform proposals. Optimal negligence liability can be welfare enhancing even when the negligence determination is based entirely on the physician's treatment choice and informed physicians always provide optimal treatment. This is because, absent liability, physicians underinvest in patient safety, even when they always select optimal treatment when informed. Malpractice liability increases physicians' investments in patient safety, by threatening liability for accidental medical negligence (unknowing medical errors) (Arlen & MacLeod 2003; 2005a).[8] To induce optimal patient safety, expected damages for accidental negligence must be less than the *ex post* harm to the patient of medical error, however (Arlen & MacLeod 2005a).[9]

This chapter also shows that patients cannot be relied on to contract optimally over malpractice liability, even when they are fully informed about the costs and benefits

---

[7]   "Patient safety investments" are synonymous with the "expertise" investments considered in Arlen & MacLeod (2003; 2005a).

[8]   This analysis also shows why malpractice liability is needed even when patients are insured and doctors do not bear any of the cost of providing high quality treatment.

[9]   Moreover, whereas, in the traditional model, care is insensitive to damages if due care is set optimally (Cooter 1984), here we find that excessive damages induces excessive investments in *ex ante* care designed to reduce the probability of accidental error (Arlen & MacLeod 2003; 2005a).

of such liability.[10] Informed patients, who benefit from malpractice liability, could be harmed by the ability to contract over liability because these contracts, like many medical care contracts, are plagued by inefficiencies. First, patient safety investments—and thus malpractice liability—are a collective good that is not optimally regulated by individual contracting (Arlen 2010; see Arlen & MacLeod 2003). Individual contracting also is inefficient when patients can negotiate over liability with providers. While contracting through health insurers would remedy some inefficiencies, it would introduce another: adverse selection (Arlen 2010). In addition, liability with national standards potentially provides superior networking externalities to firm-specific contracting over liability with independent standards. Accordingly, contracting would be inefficient because contractual liability provides lower deterrence benefits at a higher price than mandatory malpractice liability. Thus, some informed patients who benefit from mandatory liability would rationally waive the right to impose liability—to their detriment (Arlen 2010; see Arlen & MacLeod 2003).

Finally, this chapter expands the model to account for the direct effect of medical institutions on expected patient outcomes. It shows why malpractice liability must be imposed on the medical institutions, such as hospitals, which directly and indirectly affect both treatment choice and the probability of medical error (Abraham & Weiler 1994; Mello & Brennan 2002; see Sage 1997; Havighurst 1986).[11]

This chapter is organized as follows: Section 2 presents the traditional economic analysis of accidents (e.g., Brown 1973; Shavell 1980) as applied to medical malpractice and describes the results that follow from this analysis. Section 3 analyzes optimal malpractice liability when patients' welfare depends on both treatment choice and physicians' investment in patient safety. Section 4 examines the claim that states could enhance social welfare by allowing patients to contract over liability with their physicians or health insurers and shows why contracting over liability would be inefficient, even if patients know the expected costs and benefits of imposing liability. Section 5 presents the economic argument favoring imposing liability on medical institutions, such as hospitals.[12]

2.   TRADITIONAL ECONOMIC MODEL OF ACCIDENTS

This section examines the traditional model of accidents as applied to market relationships, such as medical malpractice, where consumers cannot determine the quality of the good or service at the time of purchase (Spence 1977; see Brown 1973; Shavell 1980).[13]

---

[10]   For a discussion of information problems with contractual malpractice liability see, e.g., Arrow (1963) and Arlen (2010).

[11]   This chapter does not discuss MCO liability which is discussed at length in Arlen & MacLeod (2003; 2005a).

[12]   The chapter does not address damage caps which are considered in Chapters 18–21 in this volume.

[13]   We discuss the original traditional model as a starting point for our analysis because it is still employed, implicitly or explicitly, by many scholars. This chapter does not incorporate the numerous extensions that have been made to this model, in order to focus on the particular extension discussed in Section 3 *infra*.

The traditional analysis finds that tort liability is needed to induce optimal care when, as is likely, patients cannot determine their physician's expected patient outcomes (Arrow 1963). In this context, absent liability physicians will under-treat if they bear treatment costs. Negligence liability is needed to induce optimal treatment. Indeed, optimal negligence liability eliminates suboptimal care (see Shavell 1980). Malpractice liability may not be needed to deter under-investment in treatment when physicians do not bear treatment costs, however. Finally, the traditional analysis finds that malpractice liability need not be mandatory if patients are informed about the costs and benefits of liability, and thus can rationally contract over it (Epstein 1976; 2005; Havighurst 1984; Robinson 1986; see Thaler & Sunstein 2008), as is explained in section 4 *infra*.

A.   The Classic Economic Analysis of Accidents

As applied to medical malpractice, the classic model of accidents examines the decision by an individual physician to invest in care (treatment intensity) and its effect on the expected welfare of a particular patient (see generally Brown 1973; Spence 1977; Shavell 1980). In this model, the physician bears treatment costs and knows the optimal treatment, whereas the patient does not. Social welfare is maximized when the physician selects the level of treatment that has the highest net expected benefit (which is given by expected treatment outcomes minus treatment costs). Absent liability, however, physicians will under-treat when they bear the full cost of treatment, but do not capture the full benefit of improved patient outcomes (see generally Arrow 1963; Spence 1977; Brown 1973; Shavell 1980) (discussing accidents generally).[14]

Absent liability, physicians do not obtain the full benefit of selecting optimal treatment, even though patients are their customers, because market forces do not ensure that physicians' internalize the expected cost of their decisions. Physicians' expected revenues per patient do not reflect actual treatment decisions for many reasons. First, medical care is a credence good, the quality of which is determined by non-contractible investments made post-contract (Arlen & MacLeod 2003, 1962–66; see Korobkin 1999). In addition, patients do not have sufficient expertise to know when a physician has delivered medically appropriate care. Reputation does not adequately discipline providers because patients are not fully informed about their providers' past patient outcomes (see generally Arlen & MacLeod 2003; Glied 2000). Finally, medical prices are determined through negotiations with health insurers and hospitals, neither of which bears the full cost of patients' injuries (see Mello et al. 2007). Accordingly, absent liability, physicians who bear treatment costs will provide suboptimal treatment because they bear the cost of care but do not obtain the full benefit of investing in optimal care.

Optimal negligence liability can enhance social welfare because physicians will provide optimal treatment if they are liable for harms to patients whenever they fail to select the

---

[14]   We can represent this formally by assuming that patients seeking treatment face a probability of suffering a harm of H as a result of their treatment. The probability of the harm, $p(t)$, depends on the level of care t (which we can think of as the level of treatment), which the doctor provides at a cost to himself of $c(t)$. In this model, social welfare is maximized when the doctor invests in the level of care that minimizes $c(t) + p(t)H$ (Shavell 1980). This implies that it is optimal for injurers to increase care up to the point where $c'(t) = -p'(t)H$ (see generally Brown 1973; Shavell 1980).

optimal treatment (i.e., the treatment that minimizes the cost of treatment plus expected accident costs). Indeed, under the assumptions of this simple model, malpractice liability *eliminates* medical negligence because fully informed physicians always comply with the legal standard, assuming that the legal standard and damages are set optimally and litigation costs are negligible (Shavell 1980). Moreover, in the simple traditional model, negligence liability does not impose any litigation costs on society because patients will never need to sue if physicians always take care (see generally Shavell 1980). There also is no reason to worry about excessive damages because physicians can avoid all risk of liability by complying with the legal standard (Shavell 1980; Cooter 1984). Finally, the only breaches that occur in this framework (on the off-equilibrium path) involve a deliberate decision to deviate from the standard of care and thus often would be appropriately eligible for punitive damages.[15]

B.   Extensions: Health Insurance and Customary Standard of Care

The traditional model also implies that malpractice liability may not be needed once we consider health insurance and the use of custom to determine the legal standard of care.

Under this model, when patients are fully insured, malpractice liability is not needed to deter under-treatment because physicians do not pay treatment costs (Danzon 1997).[16] Indeed, physicians' financial incentives may result in insured patients receiving excessively costly treatment (Danzon 1997; see Epstein & Sykes 2001; Arlen & MacLeod 2003; Korobkin 1999). This tendency towards high treatment costs may also affect non-insured patients if physicians standardize their treatment recommendations across patients and treat uninsured patients the same as insured ones. Consequently, when insurers cover treatment costs, market forces alone may deter under-treatment; however, markets alone will not prevent the provision of excessively intensive and risky treatments.

In theory, malpractice liability can deter excessively risky treatment if the standard of care is based on the optimal treatment (Arrow 1968; Arlen & MacLeod 2003; see Currie and MacLeod 2006, finding malpractice liability can deter offensive medicine). Nevertheless, malpractice liability may enhance the tendency towards excessive treatment to the extent that the due care standard is based on the customary level of care (Posner 2011, 219).[17] A due care standard based on custom will result in over-treatment when custom is based on the excessively intensive care provided to insured patients (see Danzon 1977; cf. Kessler & McClellan 1996, discussing defensive medicine; Currie and

---

[15]   Doctors may be found negligent even when they provided due care when courts err in setting due care (Calfee & Craswell 1986). In this case, excessive damages *may* induce treatment that is more intensive than is optimal (see Calfee & Craswell 1986; but cf. Kahan 1989). Yet this does explain evidence that physicians regularly *are* negligent, in fact providing suboptimal care. This chapter focuses on the causes of actual physician negligence and their implications for malpractice liability.

[16]   Physicians also will not knowingly under-treat patients who bear the full cost of services rendered. By contrast, physicians who have capitation arrangements with insurers have incentives to under-treat because they bear many treatment costs. See Zeiler (2003, showing that rules requiring disclosure of compensation arrangements between medical providers and MCOs can increase social welfare).

[17]   See Frakes (2013, discussing customary standards and providing evidence that changes in

MacLeod 2006, same; Frakes 2012). This problem does not arise if physicians are not liable if the care they provide was medically appropriate care as determined by scientific evidence, even when the treatment selected was not the customary treatment (see Peters 2002, 913–21, finding that some states employ a reasonable physician standard, not a customary standard).

3. ECONOMIC MODEL OF DELIBERATE AND ACCIDENTAL MALPRACTICE

Although the simple traditional economic model of accidents provides useful insights, we cannot rely on it to formulate legal policy governing medical malpractice because it fails to capture the leading cause of medical error. The traditional analysis only examines deliberate deviations from the standard of care. Yet patient injuries due to medical negligence generally involve accidental medical negligence resulting from inadvertent misdiagnosis, errors in treatment selection, or non-deliberate errors in treatment provision.

The distinction between deliberate and accident error is important because they have two different causes. Physicians who deliberately provide suboptimal treatment generally do so to reduce patient-specific treatment costs. By contrast, physicians deliver medically inappropriate care accidentally because they did not have sufficient information to correctly diagnose the patient, select the right treatment, or provide treatment and respond to problems appropriately. Physicians thus can reduce the risk of accidental negligence through *ex ante* investments in "patient safety"—in expertise, health care technology, and systems designed to provide physicians with the information they need to properly diagnose the patient, select the medically appropriate treatment, and provide it correctly. These investments differ from the patient-specific treatment choice decisions examined by the traditional model. First, they are not patient specific, but instead reduce the risk of harm to each of a physician's patients. Second, they only reduce, but do not eliminate, the risk of negligence liability because court determinations of negligence generally are based on patient-specific decisions, such as treatment choice, and not on *ex ante* investments that are not patient-specific (Arlen & MacLeod 2003; 2005a; Arlen 2010). Accordingly, patient safety investments warrant separate consideration in an economic model of malpractice.

This section analyzes optimal medical malpractice liability employing a model in which (i) patient outcomes depend on both *ex ante* investments in patient safety (which affect all patients) and patient-specific treatment choice and (ii) courts generally predicate the negligence determination only on patient-specific treatment choice. We show that malpractice liability enhances social welfare even when it would not be needed under the traditional framework. Specifically, malpractice liability is needed, even when physicians always want to select the right treatment, in order to deter physicians from under-investing in patient safety (specifically, information). We show that negligence liability can induce physicians to make optimal investments in information, as well as to select the optimal treatment, even when courts base negligence only on the treatment choice. We also find that in the

---

customary standards affects physician behavior); Stein (2012, 1206–7, discussing why courts base the standard of care on certain types of custom but not others).

optimal equilibrium, doctors err accidentally and supra-optimal damages can induce doctors to overinvest in patient safety (Arlen & MacLeod 2003; 2005a).[18]

A.   Causes of Medical Error

Although the traditional model assumes that medical negligence is deliberate, empirical studies of medical error do not support this view; nor do they find that medical negligence is attributable to "bad apple" physicians who are too incompetent to provide medically appropriate care (see Rolph et al. 2007). Instead, evidence suggests that many, if not most, medical errors are committed by physicians who are sufficiently competent to practice, but who nevertheless err accidentally (when a reasonable physician would not have). Physicians often err accidentally because they did not have the expertise needed to properly diagnose the patient[19] or select and provide the medically appropriate treatment. Younger physicians also err as a result of inadequate supervision.[20] In addition, medical error is often attributable to deficiencies in health care technology and systems that provide medical caregivers with the information they need both to select and provide the right treatment and to detect and redress adverse events. These systems affect both the probability that errors occur and the time required to detect and correct errors that do occur (Weiler et al. 1993, 42–4, 137–9; Mello & Studdert 2008; see Gandhi et al. 2006; see also Andrews et al. 1997; Andrews 2005). Physicians who provide negligent care because of errors in judgment or insufficient knowledge often do not know that they are providing less than medically appropriate care.

Physicians can reduce the risk of such accidental error by investing in the expertise needed to properly diagnose patients and select treatments, as well as in systems, staffing and health care technology[21] needed to treat patients without excessive risk of preventable error (Mello and Studdert 2008; Palmieri et al. 2008; see generally Arlen & MacLeod 2003; 2005a). Medical institutions, like hospitals and MCOs, also can reduce the risk of accidental medical negligence through investment in superior systems, supervision,

---

[18]   Section 4 *infra* shows that this empirically grounded model undermines the economic justification for contractual malpractice liability (Arlen & MacLeod 2003; Arlen 2010).

[19]   A recent study of 350,706 paid malpractice claims finds that diagnostic errors are the leading cause of error (28.6 percent) and resulted in death more often than other errors (Tehrani et al. 2013). Another study estimates that 40,000–80,000 Americans die each year as a result of incorrect diagnosis (Leape 2002).

[20]   This conclusion is consistent with evidence that medical errors often result from insufficient knowledge, judgment, or supervision. E.g., Mello & Studdert (2008, 606, tbl.1: finding that 48 percent of medical errors that produced a claim were attributable, at least in part, to the physician's lack of technical competence or knowledge and 57 percent were attributable to a failure of vigilance or memory); see Gawande (2003, 197–8, studies of hospital patient autopsies reveal that 40 percent were misdiagnosed; one-third of these patients would have been expected to live if properly diagnosed and treated); Gandhi et al. (2006, 79 percent of malpractice claims arising from diagnostic error in the outpatient setting result from failure in judgment; 48 percent result from insufficient knowledge; 59 percent from insufficient vigilance or memory). See *supra* note 3 (discussing evidence on error by physicians).

[21]   Medication errors are among the most common, harming an estimated 1.5 million people per year. (Institute of Medicine 2007). Many of these could be prevented through the use of health care technology.

and health care technology (Abraham & Weiler 1994; Mello & Brennan 2002; Arlen & MacLeod 2003). We refer to these investments as "patient safety investments." Patient safety investments differ from treatment choice because they benefit many patients by increasing the probability that the physician will correctly diagnose, select and provide medically appropriate treatment to each of his patients. These investments, thus, are a form of "collective care."

Accordingly, medical markets are optimal only if physicians and other medical providers have optimal incentives both to make optimal treatment decisions (when informed) and to invest optimally in patient safety—specifically in obtaining the information needed to properly diagnose the patient, select treatment and provide treatment. Accordingly, to analyze optimal malpractice liability, economic analysis must separately incorporate these two different forms of care because they interact differently with patient outcomes and with negligence liability (Arlen & MacLeod 2003; 2005a; Arlen 2010).[22]

B.   An Economic Model of Accidental and Deliberate Physician Malpractice

This part presents an economic model of deliberate and accidental malpractice liability based on Arlen & MacLeod (2003; 2005a). It provides an informal analysis. The formal discussion of the model is in the appendix to this chapter.

1.   The economic framework

Each patient seeks treatment from a physician who he must rely on to select the medically appropriate treatment. Each patient is insured and pays premiums equal to the expected cost of his medical treatment. Thus, *ex ante*, patients want physicians to select the treatment that maximizes the expected benefit of treatment minus expected costs, which also is the socially optimal treatment.[23] We denote the optimal treatment as the treatment t^*.

Patients cannot ensure that the physician selects the optimal treatment for two reasons. First, the physician may not be sufficiently informed to identify the optimal treatment. A physician can only provide optimal care if he is sufficiently informed to correctly diagnose the patient, select the correct treatment, and provide that treatment without unnecessary error. The probability that a physician is sufficiently well informed depends, in turn, on his investment in "patient safety" measures which increases the probability that the physician will know, and be able to select, the optimal treatment, t^*. For simplicity, we assume that "uninformed" physicians always select "erroneous treatment," t^0, accidentally. Suboptimal or erroneous treatment costs less, but increases the risk of harm to the patient.

Second, the physician, even when informed, may nevertheless decide not to select the optimal treatment. An informed physician *can* provide optimal treatment but he *will* do so only if it maximizes his welfare. In order to focus on patient safety investment, here we assume that physicians care about their patients—internalizing a portion of the net

---

[22]   Although courts generally do not predicate negligence liability on an individual physician's investment in patient safety, individual physician expertise may be relevant to whether hospitals are held liable for negligent credentialing. These claims do not reach the majority of cases where expertise and other collective investments were relevant, however.

[23]   Once ill, however, fully-insured patients want the treatment that maximizes their welfare without regard for treatment costs (Arlen & MacLeod 2003).

benefit of treatment to patients—and that insurers bear some of the costs of treatment (and in some cases all treatment costs). Accordingly, some physicians (those who obtain a greater portion of the treatment benefits than costs) select the optimal treatment when informed, even without liability.

Observe that even when physicians want to select optimal treatment, they may fail to do so because they are uninformed. The physician's investment in patient safety determines the probability that physicians provide suboptimal (negligent) instead of optimal treatment accidentally.

Patients cannot prevent either deliberate or accidental negligence through contract because physicians select treatment after contracting with patients and both patient safety and treatment choice is non-contractable.[24] Nor can patients verify *ex post* whether the physician provided the optimal treatment, at least not without filing a claim and obtaining discovery. Thus, patients will receive optimal medical care only if physicians have incentives both to invest optimally in the information needed to select optimal treatment (hereinafter patient safety) and to provide optimal treatment when informed.

2. Socially optimal care

Physicians maximize social welfare when they select optimal treatment and invest optimally in patient safety. As previously explained, the optimal treatment is the one that maximizes the social net benefit of treatment, and is given by t^*. Patient safety investments are optimal when each physician invests up to the point where the marginal cost of these investments (to the physician and thus society) equals the marginal benefit of patient safety to society. The social marginal benefit of an investment in patient safety is the resulting increase in the probability that a physician is informed and has the capacity to select the optimal treatment multiplied by the expected net benefit of the physician's patients receiving optimal care instead of suboptimal care when they receive treatment.[25]

3. No liability equilibrium

To determine the no-liability equilibrium, we first consider the treatment choice of doctors who are informed about both the patient's condition and the costs and benefits of treatment. We then consider physicians' incentives to invest in patient safety.

Informed physicians select the treatment that maximizes the benefit they receive from treatment minus the costs they bear. Accordingly, even without liability, informed compassionate physicians will select optimal treatment if health insurers (or patients) either cover all treatment costs or cover sufficient costs that the benefit to physicians of superior patient outcomes exceeds the additional cost to them of providing optimal treatment. If neither of these conditions are met, then a physician will knowingly select suboptimal treatment, even when he cares about his patients (Arlen & MacLeod 2005a, 5101; see Zeiler 2003).

---

[24]   See Arlen & MacLeod (2003). The conclusion that treatment choice is generally non-contractable is reinforced by an examination of MCO contracts with patients and providers. These contracts generally do not specify treatment for most conditions, but instead allow insurers to deny coverage for treatments that are not "medically necessary and appropriate."

[25]   This assumes that an informed physician selects optimal treatment (which he would in the optimal equilibrium).

Although informed physicians may select optimal treatment absent liability, they do not invest optimally in patient safety absent liability. Absent liability, physicians do not invest optimally in obtaining the information needed to provide optimal care because they bear the full cost of this investment—which is not reimbursed by either insurers or patients—but do not obtain the full social benefit of the superior expected patient outcomes that result from these investments. Physicians do not obtain the full social benefit of patient safety investments, even when compassionate, because the benefit to a compassionate physician of providing optimal treatment instead of negligent treatment will always be less than the benefit to the patient of receiving higher quality care (see Arlen & MacLeod 2003; 2005a).[26] Thus, while liability is only sometimes required to induce optimal treatment choice, it is always needed to induce optimal investment in patient safety in this model.

4.   Optimal negligence liability

We now consider whether negligence liability can induce optimal investment in patient safety, as well as optimal treatment choice, assuming that the negligence determination is predicated entirely on treatment choice. Here we assume that physicians bear all treatment costs and thus informed physicians select suboptimal treatment absent liability (Arlen & MacLeod 2003; 2005a). Consistent with current law, we assume that negligence liability imposes liability for a patient's injuries on physicians who provide suboptimal treatment, t^0, that injures a patient, even if the error was accidental. Thus, this section shows that negligence liability can induce both optimal treatment choice by informed physicians and optimal investments in patient safety, even though only the former serves as the basis for the due care determination.

Negligence liability ensures that *informed* physicians always provide optimal treatment so long as due care is set equal to the optimal treatment. Negligence liability induces optimal treatment because physicians held liable for patient injuries if they select suboptimal treatment face lower expected costs when they provide optimal treatment than when they under-treat. The definition of optimal treatment implies that the additional cost of providing optimal treatment instead of suboptimal treatment is less than the resulting increase in the expected benefit (and decrease in the expected risk) of treatment to the patient. Accordingly, physicians required to pay expected damages equal to the expected harm patients suffer when provided with suboptimal care are always better off providing optimal treatment, even when the physician bears treatment costs (Arlen & MacLeod 2005a; see Shavell 1980).

Physicians subject to negligence liability also will invest optimally in "patient safety"—in the information needed to provide optimal care—when due care is based on optimal treatment and damages are set optimally. Negligence liability can provide physicians with optimal incentives to invest in patient safety even though the standard of care is based entirely on treatment choice, because it forces physicians to bear the costs of their accidental errors. This threat of liability for accidental negligence forces physicians to

---

[26]   There are situations where the nature of the available treatments is such that physician compassion is sufficient to induce optimal treatment choice—as when there is only one plausible choice, the cost of which does not exceed the benefit of treatment to the physician.

bear their patients' accident costs. This provides physicians with an incentive to make optimal investments in patient safety designed to reduce the risk of accidental error. Negligence liability will induce physicians to make optimal investment in patient safety as long as each physician's *expected* liability for injuries resulting from accidental negligence equals (but does not exceed) the full expected cost to the patient of being given erroneous treatment instead of the optimal treatment (Arlen & MacLeod 2003; 2005a).[27]

5.   Discussion

This analysis thus shows that malpractice liability is needed to render medical care markets efficient, even when informed physicians can be relied on to provide optimal treatment, because liability is needed to induce physicians to invest optimally in patient safety (Arlen & MacLeod 2003; 2005a). Negligence liability is able to regulate patient safety investments, even when these investments are unobservable, through the threat of liability for accidental medical negligence. The threat of liability for accidental negligence induces optimal investment in patient safety so long as expected damages for accidental negligence equal the expected benefit to patients of informed instead of uninformed physician decision-making (Arlen & MacLeod 2003; 2005a).[28]

Although negligence liability can regulate both treatment choice and accidental negligence, it does impose social costs once litigation costs are taken into account. The traditional model finds that negligence does not impose any litigation costs so long as expected liability is sufficiently high to deter all negligence, thus eliminating the need for lawsuits. By contrast, in this framework, optimal negligence liability results in an equilibrium in which the parties do bear litigation costs because physicians face liability for accidental negligence even when they invest optimally in patient safety and select optimal treatment when informed.[29] These litigation costs must be considered a social cost of negligence liability, unlike under the simple traditional model of accidents.

Liability for knowing negligence will induce optimal treatment choice when damages equal the *ex post* harm the victim suffered as a result of receiving suboptimal treatment, H. By contrast, in order to induce optimal investment in patient safety, expected damages for accidental error generally must be less than the *ex post* harm to the victim of the injury produced by the physician's negligence. Instead, expected damages must equal the expected *ex ante* benefit to the patient of receiving optimal treatment instead of negligent treatment—which often is given by the reduction in the risk of injury associated with optimal instead of erroneous treatment. This is less than the patient's *ex post* injury if, as is often the case, the patient risks injury from both the optimal and suboptimal treatment.[30]

---

[27]   Arlen & MacLeod (2003; 2005a) discuss the situation where optimal and erroneous treatments may differ both in terms of the probability harm and the expected benefits associated with a good outcome. In this case, optimal damages should be based on the expected net benefit of receiving optimal treatment instead of erroneous treatment multiplied by the reciprocal of the probability that injury results and a suit is brought.

[28]   This liability for accidental error does not regulate treatment choice since, by definition, *un*informed physicians cannot avoid liability by selecting optimal treatment (since they are uninformed).

[29]   These suits against physicians who err accidentally are not inefficient, but instead are essential to the optimal functioning of the tort system.

[30]   See *infra* equation 2A.9 in the Appendix. The reason that optimal damages are less than

If courts set damages too high, doctors will over-invest in patient safety because they will have excessive incentives to avoid the risk of accidental error (Arlen & MacLeod 2003; 2005a).[31] This provides a reason why damages for accidental error should be less than those for deliberate breach.

C.   Problems Plaguing the Current Tort System

Although an optimal negligence regime can enhance social welfare by inducing both optimal treatment choices by informed physicians and optimal investment in patient safety, at present malpractice liability is not optimally deterring medical error (Arlen 2010; Mello & Brennan 2002; Epstein 2005). Section 5, *infra*, explores the most pressing problem facing malpractice liability: that it does not ensure that medical institutions, such as hospitals, bear the full cost of decisions they make that increase patients' risk of receiving inappropriate medical care (Abraham & Weiler 1994; Sage 1997; Mello & Brennan 2002; Arlen & MacLeod 2003; see Mello & Studdert 2008; Arlen 2010). Here we explore reasons why individual liability does not provide optimal incentives to individual physicians.

Malpractice liability does not optimally deter medical error because, under existing law and institutions, physicians who provide negligent treatment can do so without bearing the full cost of their patients' injuries. Physicians do not fully internalize the cost of the harms they impose because most patients with valid claims do not sue, even when seriously injured or killed by medical error.[32] Moreover, many patients with valid claims do not recover (Studdert et al. 2006, 2028; see also Cranberg et al. 2007, 161). In addition, existing rules governing damages for death and serious permanent injury produce awards that are generally less than optimal damages for these injuries (Arlen 1985; 2000). Finally, negligent physicians often do not bear liability even when a patient does recover because malpractice liability insurers, not physicians, generally bear out-of-pocket costs (Zeiler et al. 2007), and individual physician liability insurance is not experience-rated

---

ex post harm differs from the argument provided by Kaplow (1994). Here damages must be less than the *ex post* harm whenever, as is often the case, the physician's negligence increased, but did not create, the risk to the patient of the injury he suffered (e.g., death), because the patient could have suffered the same *ex post* harm if given the optimal treatment. In this situation, the *ex post* harm is not the proper measure of the harm associated with accidental error.

[31]   Thus, negligence liability operates as a "sanction" as applied to knowing decisions to select suboptimal treatment choice, but operates as a "price" (Cooter 1984) when regulating expertise (Arlen & MacLeod 2003; 2005a).

[32]   Weiler et al. (1993); Localio et al. (1991, less than 2 percent of hospital patients who suffered adverse events due to medical negligence filed a claim); Studdert et al. (2000, only 3 percent of patients who suffered negligent injury brought a claim); see Danzon (1985); Andrews (2005, 370, finding that only 13 of the 185 who suffered some injury due to medical error filed a claim); Sloan et al. (1995). Patients with valid claims do not file suits for a variety of reasons, including that they do not know that the doctor erred, they need further care from the same provider, they are too ill to effectively pursue a claim, or their expected damages are less than the $250,000–$500,000 threshold most lawyers require to take a case (see Shepard 2012, discussing the damages issue). This latter problem is enhanced by collateral source rule reform, joint and several liability reform, and damage caps (see generally Holtz-Eakin 2004; Avraham 2007; Avraham et al. 2013).

(e.g., Danzon 2000, 1360–1; Mello & Brennan 2002, 1616; Sage 2005, 473; Zeiler et al. 2007).

Malpractice liability also does not optimally deter medical malpractice because injured patients rarely have sufficient information *ex ante* to determine whether they received negligent care; thus they often sue both negligent and non-negligent physicians. While the vast majority of claims (73 percent) are eventually resolved correctly (Studdert et al. 2006),[33] the claims filed against non-negligent physicians (as well as any erroneous settlements)[34] impose costs on them which are not optimal. Physicians who invest optimally in patient safety also pay higher than optimal malpractice liability insurance premiums as a result of the negligence of other physicians because premiums are not experience-rated.

Accordingly, to achieve its promise, malpractice liability needs to be reformed. The question is how best to do this? The next two sections address this issue.

4.   CONTRACTUAL LIABILITY

Leading scholars operating within the traditional economic model of accidents argue that states can best reform malpractice liability by allowing patients to contract over (and potentially out of) liability with their providers or health insurers (Thaler & Sunstein 2008, Ch 14; Epstein 1976, 2005; Danzon 1997, 493–4; Robinson 1986, 198; Epstein & Sykes 2001, 644–8; Havighurst 1986, 161–2; Havighurst 1995, 265–302; see also Hylton 2000; Rubin 1993, 75–7). Proponents of contractual liability contend that contracting over liability is efficient as long as patients know the costs and benefits of imposing liability and have sufficient capacity to contract in their own best interests.

The traditional economic argument favoring contractual liability rests on the premise that patients would obtain the same benefit from malpractice liability imposed by contract as they would from equivalent liability imposed by the state. Given this premise, proponents argue that informed rational patients can only benefit from the right to contract over liability. Proponents claim that informed rational patients[35] who would benefit from state-imposed malpractice liability would not be harmed by the ability to contract over

---

[33]   This conclusion that tort resolutions tend to be accurate runs contrary to a finding of the Harvard Medical Practice Study (HMPS). The HMPS was designed to study medical error, however, and not claims resolution accuracy, and did not have a sufficient number of filed claims or sufficiently in-depth evidence on the claim quality to do so (see Danzon 1998, 626; Baker 2005b; Studdert et al. 2006; Arlen & MacLeod 2003, 1940, n 36; Mello & Zeiler 2008 682–4; Andrews 2005, noting reliance by HMPS on written hospital records which do not record most medical errors; Encinosa & Hellinger 2008, noting that existence of error can remain hidden for years).

[34]   Claims resolution errors are more likely to favor physicians than patients. A recent examination of closed claims that were erroneously resolved found that 62 percent (236/381) of the erroneous resolutions denied recovery to a patient with a valid claim whereas only 38 percent imposed liability on a physician who probably did not err (Studdert et al. 2006, 2028, fig 1; see also Peters 2007b, discussing evidence juries are more likely to rule against plaintiffs with valid claims than to rule in favor of patients who should lose).

[35]   Patients can be sufficiently informed to contract over liability, even when they cannot observe individual provider quality, as long as patients can assess the effect of liability on expected treatment quality and costs. They do not need to know the actual quality of individual physicians.

liability because they can, and will, obtain the same benefit by contracting into liability. By contrast, patients who do not benefit from traditional malpractice liability would benefit from using the right to contract for liability terms that they prefer, including full waiver of the right to impose liability (see Epstein 1976; Robinson 1986; Danzon 1997; see Thaler & Sunstein 2008, Ch 14; Epstein & Sykes 2001; Havighurst 1986; see also Hylton 2000).[36] Beyond this, some suggest that contracting over liability is the best way to reform malpractice liability because patients and providers are better informed about the costs and benefits of different liability provisions (Epstein 2005).

This section shows that, contrary to proponents' assertions, patients do not have efficient incentives to contract over liability with individual providers. First, patients do not have sufficient information, and often will not have sufficient capacity, to contract in their own best interests with their individual providers (Arlen 2006; Arlen 2010; Baker & Lytton 2010; see Arrow 1963; Arlen & MacLeod 2003). Second, contracting over liability is inefficient, even when patients can determine the expected costs and benefits of liability, because health care contracts in general, and malpractice liability contracts in particular, are plagued with a host of inefficiencies which would cause many patients to be worse off under contractual liability than under optimal malpractice liability imposed by the state.

A.   Information Problems

Patients do not have sufficient information, and often will not have sufficient capacity, to contract in their own best interests. In order to evaluate a liability contract, patients must (i) know the benefits and costs of imposing liability by contract, (ii) know the nature of liability clauses contained in their providers' contracts, and (iii) have the physical capacity to evaluate these clauses and the ability to reject providers with suboptimal clauses in favor of those with optimal liability clauses (Arlen 2010, 1006–7, n. 123). These conditions are unlikely to be met, especially in the case of contracting with physicians at the point of service. First, patients tend to underestimate both their risk of becoming seriously ill and the risk of medical error, and thus often underestimate the potential benefit of optimal liability. Second, very ill patients may not have the capacity to contract on their own behalf. Third, medical providers can profitably include liability waivers in their contracts, even if they know most patients do not want them, when patients cannot obtain adequate information about the liability clauses before seeking medical care and/or do not have a genuine choice of provider because they need emergency care or are restricted by their health plan (Arlen 2010, 1006–7 and n. 123; see Arlen 2006, 253–4, 263–4; see Baker & Lytton 2010, providing an additional behavioral critique of contractual liability; cf. Geistfeld 1995 critiquing contractual products liability).

---

[36]   This section examines whether contractual liability can replicate the potential deterrence benefits of malpractice liability. By contrast, Thaler & Sunstein (2008, Chapter 14) focus on the compensatory role of liability, largely ignoring deterrence concerns. We do not consider their claims because the justification for malpractice liability rests on deterrence, not compensation, as discussed in Arlen (2010, 977–8, n. 54).

B.   Inefficiency of Informed Individual Contracting over Liability

Moreover, even if patients were informed, rational, and capable of contracting in their own best interests, individual negotiable contracting between patients and their medical providers would be inefficient. The traditional view that informed and rational patients cannot be hurt by a move to contractual liability rests on the assumption that state-provided malpractice liability and contractual liability are the same—providing patients with the same deterrence benefits at the same price. This is not correct.

Adoption of contractual liability would not expand the choices available to patients. Instead, it would alter the scope of the liability that patients can impose—leaving them with liability that covers fewer medical providers and patients, for a more limited duration, and only upon request. As a result, contractual liability provides lower deterrence benefits at a higher cost, as shown below. Because patients get less benefit from contractual liability at a higher price, a shift to contracting over liability could result in all patients waiving liability even when every single patient would have benefited from malpractice liability imposed by the state. Thus, contracting over liability can reduce social welfare even when patients are rational and informed (Arlen 2010; Arlen & MacLeod 2003; cf. Baker & Lytton 2010, providing additional critiques).

To demonstrate this, we begin by analyzing the form of contracting that offers patients the greatest individual choice: individual negotiated contracting between patients and individual medical providers. We then show that patients offered the right to contract into liability with an individual provider would receive less benefit from imposing liability than they would were the state to adopt an optimal malpractice liability rule.[37] As a result, patients who would have benefited from state-imposed liability may waive the right to impose liability by contract, leaving them worse off than when liability is mandatory. This form of contractual liability thus is inefficient.

In order to evaluate contractual liability in the most favorable light, we assume that (i) contracting is costless, (ii) patients know the contractual liability terms in each potential provider's contracts, (iii) patients accurately estimate the deterrence benefits of contracting over liability, and that (iv) patients contracting directly with physicians actively negotiate for the terms that maximize their welfare. We consider collective contracting through health insurers in the next part.

1.   Collective goods problem
Contractual liability proponents claim that patients would derive the same net benefit—in the form of increased investments in care—from the decision to impose liability by contract as they would from optimal malpractice liability. This claim is correct when (but only when) patient welfare depends *entirely* on patient-specific investments in care (here treatment) made entirely *ex post*, after liability terms are established. In this context, physician-

---

[37]   In addition, patients also would have to pay more to impose liability by contract than is optimal as a result of adverse selection. In the next part we show that adverse selection would plague contracting through health insurers, but it also would afflict contracting through individual health care providers (Arlen 2010, 1000–3). Moreover, Arlen (2010) also shows that contracting over liability may not enable patients and providers to benefit from the network externalities associated with optimal malpractice liability.

specific liability imposed by contract provides the same incentives to select treatment as state-imposed malpractice liability (see Hylton 2000, formal model; see Epstein 1976; Robinson 1986; Danzon 1997). Yet this conclusion is not correct when malpractice liability is needed to induce physicians to invest optimally in obtaining the information needed to diagnose patients, select treatment, and provide treatment without excessive risk of iatrogenic injury (i.e., to make patient safety investments).[38]

Unlike treatment decisions, which are patient-specific, patient safety investments increase the expected benefit to all of a provider's patients of receiving treatment from that provider.[39] Thus, investments in patient safety are a collective good because, once the physician has invested in patient safety, all of his patients benefit (Arlen & MacLeod 2003; Arlen 2010).

The fact that patient safety investments are a collective good implies that malpractice liability for accidental negligence also is a collective good. Malpractice liability for accidental negligence provides physicians incentives to invest in patient safety for the benefit of all of their patients. Accordingly, the expected welfare of each patient treated by a physician depends only in part on the physician's expected liability to that particular patient. It also depends on the physician's expected liability to all of his patients, as this determines the extent of his investment in patient safety.

Accordingly, patients who benefit from state-imposed liability are worse off under contractual liability because the deterrence benefit of imposing liability by contract is much lower than the deterrence benefit associated with liability imposed by the state. Malpractice liability provides greater deterrence benefits because the physician risks liability should he injure any of this patients. This will induce investments in patient safety to the benefit of all patients. By contrast, a patient imposing liability by contract only imposes liability for injuries to himself. He cannot also impose, and obtain the benefit of, liability for other patients. As a result, the increase in a patient's expected health outcomes resulting from a decision to impose liability individually by contract will almost always be less than the increase resulting from the imposition of optimal malpractice liability (holding constant the liability decisions of the other patients).[40]

Indeed, under some circumstances, such as when a physician has many patients and

---

[38]   It also is not correct when patients and providers can negotiate over liability after physicians have invested in care, as is the case when malpractice is needed to induce patient-specific investments in care pre-contract. See *infra* Section 4.B.2.

[39]   These investments benefit all of a provider's patients because providers usually use their expertise, improved administrative systems, and health information technology when treating all of their patients, not just a select few. For example, once a physician develops expertise in a particular illness or treatment choice, he uses this expertise to benefit all affected patients. He will not knowingly deny some patients the right to that expertise because they have not paid for premium care. Similarly, physicians who develop administrative systems or surgical procedures to reduce error generally apply them to all relevant patients, and do not limit them to a select few (see Frank & Zeckhauser 2007, 1102, finding that physicians tend to follow norms rather than customizing care for individual patients).

[40]   Beyond this, patients do not even have optimal incentives to impose liability for their own injuries because each patient deciding whether to impose liability only considers the direct effect on him of liability and does not consider the benefits to other patients of his decision to impose liability. This is inefficient (Arlen 2010).

liability is needed to induce substantial, discrete investments in patient safety (such as expensive health care technology or systems reforms), a patient may obtain little marginal benefit from imposing liability by contract even when his welfare is substantially enhanced by state-imposed malpractice liability. For example, a patient will get no deterrence benefit from imposing liability by contract if the needed patient safety investment is sufficiently expensive that it is only cost-effective if the medical provider faces potential malpractice liability for most of his patients. In this situation, each individual patient, in the course of deciding whether to impose liability, could rationally conclude that his individual decision to impose liability will not materially reduce his risk of accidental error because it will not provide sufficient incentives to induce the needed large discrete investments. This conclusion holds even if each patient thinks that most other patients will impose liability. In this case, each patient would have an incentive to free ride, assuming that he could obtain the benefit of the safety investments induced by the threat of liability to other patients without paying the additional price to impose liability himself.[41]

Thus, contractual liability is inefficient because it substitutes a less valuable form of liability—liability imposed individually—for a form of liability—collectively-imposed malpractice liability—that is more valuable to patients because medical safety investments are collective goods. Accordingly, instead of leading to optimal liability rules, individual contracting over liability could produce an equilibrium in which each informed, rational patient waives the right to impose liability by contract, even when every patient would have benefited from mandatory malpractice liability (Arlen 2010, 992–7; Arlen & MacLeod 2003, 2003–4).[42]

2.   Pre-contractual care: malpractice insurance and negotiation

Individual contracting over liability also is inefficient when patient outcomes depend on pre-contractual investments in care (whether patient-specific or otherwise) and liability contracts are negotiable.

In order to induce optimal medical quality, malpractice liability must induce investments in care that predate the contract, such as expertise, health care technology, systems, and staffing. State-imposed malpractice liability provides physicians with an incentive to make pre-contractual investments in patient safety which reduce their risk of accidental medical error. By contrast, a patient cannot use the decision to contract into liability to *induce* similar investment in pre-contractual care because contractual liability is not imposed until after pre-contractual care is determined.

Nevertheless, in some circumstances patients can use the decision to impose liability

---

[41]   Even risk-averse patients would not impose liability in this situation because the expected gain to a patient of the compensation provided by liability far exceeds the expected cost, which would include the defendant's expected litigation fees (as reflected in the price) and the patient's expected litigation fees (Arlen 2010, 977 n. 54, 991 n. 90, n. 91).

[42]   This problem could be addressed by the use of contracting with commitment, as when patients are presented with take-it-or-leave-it standard form contracts under which all patients contracting with the provider are required to make the same choice regarding liability. While this would reduce the collective good problem it would introduce other problems, as discussed in Arlen (2010) and below.

by contract to ensure that they obtain treatment from a physician who invested more in pre-contractual care. This is the case if physicians can use the offer to bear liability to signal that they invested optimally in patient safety pre-contract. High quality physicians can use liability to signal quality if (but only if) low quality physicians cannot profitably offer to bear liability for the same price because their resulting liability costs would exceed the increased price they get for bearing liability. Should this be the case, then contractual liability would provide physicians with an incentive to invest in pre-contractual care, as then they could attract patients by using the offer to bear liability to signal their high quality (see Spence 1977, 569–70; Grossman 1981, 474–7; see generally Arlen 2010, summarizing the traditional signaling analysis as applied to malpractice liability).

Yet patients engaged in negotiable contracting over liability cannot use liability contracts to identify physicians who invested optimally in pre-contractual care because physicians cannot use negotiable contractual liability to signal higher quality.[43] To be precise, negotiable contracting over liability cannot produce a Perfect Bayesian Separating Equilibrium (PBSE)[44] in which physicians can use contractual liability clauses to signal their superior investments in pre-contractual care if, as is usually the case, patients benefit from liability only for its effect on patient safety and not for the potential compensation it provides.[45] To see this, consider a patient who believes that only high quality providers offer to bear liability (as is required were a PBSE to exist). Assume the patient seeks care from a physician who offers to bear liability but who charges a higher price to reflect both the cost of patient safety investments and the expected cost of liability. A rational patient who believes he is contracting with a high quality physician should seek the services of the physician but negotiate for mutually beneficial change in the contract. The patient should waive his right to impose liability because a patient who believes that the *offer* to bear liability signals quality has gained all the information he needs from the offer itself. He has no reason to actually impose liability since the signal is complete once the offer is made. Thus, the patient is better off waiving liability in exchange for a price reduction equal to the cost to the physician of bearing liability since the expected price reduction will exceed the net benefit to the patient of the expected right to compensation because the provider must charge a price for liability that includes

---

[43] Physicians also cannot use liability to signal their superior quality if physicians are insulated from their expected liability costs by non-experience-rated malpractice liability insurance. In this situation, liability clauses will not signal quality because low-quality providers can mimic the liability offers of high-quality providers without directly bearing higher expected liability costs (Arlen 2006; 2010, 997–1000). Of course, malpractice liability insurance undermines both contractual liability and malpractice liability imposed on individual providers. This is one reason many medical malpractice scholars favor imposing liability on medical entities—which can then regulate physicians—as these entities either self-insure or have experience-rated insurance (e.g., Abraham & Weiler 1994; Mello & Brennan 2002; Arlen & MacLeod 2003; see Sage 1997).

[44] Specifically, negotiable contracting over liability does not produce a separating equilibrium in which patients rationally and accurately believe that only high-quality providers agree to bear liability.

[45] Patients do not benefit from the right to compensation because physicians who bear liability will increase their prices by more than the net benefit to patients of liability because physicians' prices will include both defense and plantiff-side litigation costs (Arlen 2010).

litigation costs. The waiver cannot affect the provider's pre-contractual investments in care, but will reduce total costs for the particular patient (producing a saving he can use to purchase first-party insurance). Although *ex post* each patient is better off offering to waive liability, *ex ante* each patient is hurt by the ability to waive liability because low-quality providers—anticipating in-office waivers—can freely mimic high quality ones since they know that most patients will waive. Thus, patients' incentive to waive liability undermines the signaling value of contractual liability. Accordingly, whereas malpractice liability does benefit patients by inducing precontractual investments in care, negotiable contractual liability does not. Thus, patients who would have benefited from the effect of malpractice liability on precontractual care may be worse off under contractual liability (Arlen 2010).[46]

C.   Contracting Through Health Insurers' Standard Form Contracts

Many contractual liability proponents favor an alternative form of contracting over liability: contracting through clauses in health insurance plans that stipulate the extent to which the subscriber would be entitled to sue medical providers for medical negligence (Danzon 1997; Epstein & Sykes 2001; see Havighurst 1986; 1995; 2000).

Contracting through mandatory clauses in health insurance contracts has several advantages over individual contracting over liability. First, it enables people to contract before they need medical care, when they have time to deliberate and can consult others (Danzon 1997; Epstein & Sykes 2001).[47] Second, collective contracting over liability through standard form contracts also avoids the collective goods and renegotiation problems discussed above, as long as health insurers present subscribers with health insurance plans that require all patients and physicians under the plan to accept the same liability terms (Arlen 2010, 1003–6).

Yet collective contracting through insurers undermines a core asserted justification for contracting over liability: the ability to tailor liability to patients' individual needs. Standard form contracting through MCOs reduces patients' ability to tailor malpractice liability to their individual willingness to pay for patient safety which is a central argument favoring contractual liability. The absence of choice is particularly striking for the many employees whose employers only offer one health plan.

Moreover, standard form contracting through health insurers would be inefficient. Economic analysis provides many reasons to doubt the optimality of standard form

---

[46]   For a discussion of how renegotiation can also undermine physicians' ability to use contractual liability to regulate post-contractual care (moral hazard) see Arlen & MacLeod (2003, 2002–3; see also Wickelgren, (2006, providing a formal proof in the products liability context).

[47]   Epstein and Sykes (2001) also claim that MCO contractual liability can address information problems because liability clauses will be selected for employees by employers who are informed about the costs and benefits of liability. Yet employers contracting for employee benefits will not make optimal choices for employees, even when employers are fully informed, if employees underestimate the deterrence benefits of liability. Employers will try to provide the benefits that employees value most (in their ignorance) and not the ones that are best for them. Thus, employees' lack of information will be reflected in the choices made for them by their informed employers (Arlen 2010, 1006–7, n. 123).

contracts[48]—particularly those procured by employers on behalf of employees who are imperfectly informed (Arlen 2010). Moreover, these particular contracts would be plagued by an additional source of inefficiency—adverse selection—which would distort both the availability of, and price charged for, liability clauses.[49] We now consider this latter concern.

The claim that contractual liability is efficient rests on the premise that contracting into liability provides patients with the same deterrence benefits at the same price (Arlen 2010). This implies that the additional cost to patients of imposing liability should equal, but not exceed, the expected cost to caregivers of bearing liability, holding all else constant. Accordingly, patients who impose liability should pay an additional premium equal to the cost to providers of their increased investment in care plus their expected liability costs. If health insurers charge more than this, then patients have suboptimal incentives to impose liability.

Health insurers incorporating liability clauses into health plans will charge a premium for these plans that is higher than the cost of the higher quality care (and expected liability) resulting from physicians' decision to bear liability. Health insurers cannot simply charge a premium for such plans that reflects the expected costs associated with providing higher quality care to—and incurring negligence liability for—the average patient because, in addition to increasing physician care, an optimal liability clause affects subscribers' expected demand for health services. These clauses attract patients who need more health care because patients derive a greater benefit from—and have a greater willingness to pay for—measures that increase expected outcomes to the extent that they expect to need serious medical treatment. Thus, the patients willing to pay a premium in order to impose liability have higher than average expected health care costs. Given this, insurers would rationally charge more for plans with liability to reflect the fact that the patients seeking these clauses are more likely to be ill and have high health care expenses. Average patients seeking liability could not get it without paying an additional premium that exceeds what they would pay were liability imposed by fiat.

Indeed, under contractual liability, health insurers generally will not include liability clauses in plans aimed at relatively healthy patients even if most patients would prefer liability clauses. Health insurers want to charge unhealthy patients more than relatively healthy ones, but are not allowed to do so directly because they must charge each patient in a given plan the same price. Accordingly, health insurers seek to price discriminate indirectly by structuring their health plans to appeal to different types of patients: offering high-quality/high-cost plans designed to appeal to less healthy patients and low-cost/lower-quality plans aimed at average patients. This effort to segment the market works when the lower cost plan aimed at average patients does not include coverage and quality that unhealthy patients need. This pushes unhealthy patients to the higher cost and higher quality plans, which impose liability on providers. Yet, because the patients in this plan

---

[48]   Standard form contracts enhance the risk that patients may waive liability unknowingly because patients often, rationally (Katz 1998), do not read standard form contracts (Bakos et al. 2009).

[49]   Adverse selection problems also can be expected to plague contracting over liability through individual providers, but the problem is likely to be worse when contracting occurs through health insurers who bear subscribers' health care costs.

are less healthy than average, the resulting premium will exceed the willingness to pay of average patients, who do not anticipate needing the same level of services (Arlen 2010, 1013–7).[50]

While this effort to separate the market often works, it is inefficient because insurers can be expected to depress the quality of the lower-cost plan below the quality that healthy people would prefer—and be willing to pay for—in order to ensure that the quality of the lower cost plan is sufficiently low that less healthy people will not select this plan even though it costs less. Thus, even when all patients would have been better off under state-imposed liability, contracting through health insurers is likely to produce an equilibrium in which average patients select plans that do not give them the right to impose liability, and provide them with lower expected quality than is optimal for them. Healthier patients, who might have been willing to pay the fair cost to receive higher quality care, nevertheless often will select the lower quality plan because they cannot afford, or do not wish to pay, the inflated premium associated with the higher quality one (Arlen 2010, 1013–7; see generally Newhouse 2008).

Accordingly, contracting over liability through health insurers would not result in the optimal imposition of liability because it provides health insurers with yet another instrument for discriminating between healthy and less healthy patients. It therefore would result in an equilibrium in which liability clauses are only included in expensive policies structured to appeal to high cost patients, even when all patients would prefer to impose malpractice liability. This could leave both healthy and unhealthy patients worse off than they would be were liability imposed by fiat, especially over the long run[51] (Arlen 2010, 1013–17).

D.   Summary

The preceding analysis thus reveals that patients will not contract optimally over liability, even when patients have the information needed to contract in their own best interests. This conclusion should not be surprising. Contracts are reliably welfare enhancing only when they are not plagued by inefficiencies, such as collective goods and commitment problems, adverse selection, and externalities. Yet the voluminous literature on the economics of health care markets shows that contracting in health care markets suffers from all of these problems. These problems would also undermine the efficiency of malpractice liability contracts and would produce an excessive use of liability waivers. This suggests that states would harm many, if not most, of their citizens by adopting a contractual liability regime. They should instead reform malpractice liability to enhance its effectiveness.

---

[50]   In extreme situations, contractual liability could lead to a "premium death spiral" under which all health insurers offer only lower-quality no liability plans even when most patients would be better off were liability imposed by the state (Arlen 2010, 1013–17).

[51]   Healthy patients do not benefit from efforts to segment the market to the extent that the expected benefit to younger healthier patients of the ability to obtain medical care at the lower pooled price should (when) they become ill in the future is greater than the cost of the higher premiums paid when young (Arlen 2010).

5.   MALPRACTICE LIABILITY REFORM THROUGH HOSPITAL LIABILITY

The conclusion that we cannot rely on contracting over liability to produce efficient malpractice liability rules implies that states must address the issue of malpractice liability reform directly. Reforms should be directed at addressing the central problems that undermine the use of liability to induce optimal investment in patient safety, as well as optimal treatment decisions. These problems include: (i) patients' inability to get full, timely information about the causes of injuries suffered during medical care, (ii) non-experience rating of individual physician malpractice liability insurance, (iii) inefficient and unpredictable damage awards, and (iv) insufficient medical entity responsibility for medical error.

Unfortunately, none of the most politically popular reform proposals—such as damage caps, collateral source rule reform, joint and several liability reform, and contingency fee reform—reduce the core problems plaguing the tort system. Indeed, these reforms can harm patients with legitimate claims.[52] True reform requires (i) granting patients both increased information *ex ante* about expected patient outcomes (by physician and hospital) adjusted to reflect patient characteristics and timely complete information *ex post* about the causes of any injuries they suffer, (ii) rationalizing damage awards by adopting a damage schedule, and (iii) expanding the scope of liability for the medical entities (hospitals and MCOs) whose actions directly and indirectly affect patient outcomes (see generally Abraham & Weiler 1994, hospital liability; Arlen 2000, damage schedule; Arlen 2010, 985–8; Arlen & MacLeod 2003; 2005a, MCO liability; Baker 2005a; Danzon 1997, MCO liability; Mello & Brennan 2002, hospital liability and damage rules; Studdert et al. 2006, increased disclosure to injured patients; Williams 2012, disclosure of adverse events). This section focuses on the importance of expanding hospital liability.

Evidence suggests that most medical errors involving hospital patients are attributable, at least in part, to systems decisions in the control of hospital administrators,[53] including (i) supervision of medical personnel,[54] (ii) procedures for transferring responsibility for patients, (iii) staffing, (iv) sanitation procedures, (v) health care technology, and (vi) rules governing the providers' hours[55] (Mello & Studdert 2008, 605). Yet notwithstanding their direct and indirect ability to affect patients' welfare, hospitals are not liable for most of their patients' iatrogenic injuries, even when the physician was negligent, because physicians practicing within hospitals generally are independent contractors. This is inefficient

---

[52]   For an assessment of these tort reforms see Chapters 20 and 21 in this volume.

[53]   We can gain some insight about the potential benefit to patients of improving systems at the worst hospitals from evidence that the expected error cost per patient admission ranges from $42 per patient admission in some hospitals to a high of $4769 per patient admission in others (Mello et al. 2007).

[54]   Mello & Studdert (2008, 606, tbl.1, finding that inadequate supervision was a contributing cause of 20 percent of the medical errors that resulted in claims).

[55]   Physician exhaustion produced by long hospital shifts is a known cause of medical error (Dawson & Reid 1997, finding that people kept awake for 24 hours suffered a deficit in cognitive psychomotor performance "equivalent to the performance deficit observed at a blood alcohol concentration of roughly 0.10 percent"; Landrigan et al. 2004 interns on the traditional extended schedule made 35.9 percent more "serious medical errors" than did interns on a lighter schedule).

(Abraham & Weiler 1994; Sage 1997; Mello & Brennan 2002; Arlen & MacLeod 2003; see Mello et al. 2007).[56]

This section examines the economic argument for imposing liability on hospitals.[57] It first summarizes the traditional analysis of vicarious liability which finds that entity-level liability is not necessary if employees are able to bear optimal damages. It then shows that we cannot rely on the conclusions of the traditional model to determine the optimal scope of hospital liability because the traditional framework rests on assumptions that do not hold in this context. The traditional analysis assumes that individuals are strictly liable. Accordingly, individuals pay for all the harms they cause and firms internalize those costs through wages. By contrast, medical malpractice imposes negligence liability; under a regime of pure individual negligence liability, liability is predicated on an individual act of negligence. As a result, under pure individual liability no one is liable for the many iatrogenic injuries that result from systems deficiencies that are not also the product of individual physician error (Mello & Studdert 2008).[58] Beyond this, individual malpractice liability is inefficient even when physicians are negligent because physicians do not bear, and thus do not charge hospitals for, their actual expected liability costs. Optimal deterrence requires that hospitals be liable for iatrogenic injuries to their patients.

A.   The Traditional Analysis of Vicarious Liability

The traditional economic analysis of entity liability finds that, as long as individual employees bear expected liability equal to the harms they cause, there is no reason to also impose liability directly on the entity that employs them (Kornhauser 1982; Sykes 1984).[59] The traditional analysis, which examines entity liability when individuals are strictly liable for harms caused, finds that individual liability provides indirect incentives for firms to encourage employees to take optimal care because firms internalize victims' expected accident costs. Firms must pay wages equal to their employees' expected liability costs (assuming they take optimal care). Accordingly, individual liability should be sufficient to induce firms to intervene to minimize total expected accidents costs (including care

---

[56]   Some courts have expanded hospitals' liability through doctrines such as ostensible agency. Yet hospitals still can avoid liability for much of the iatrogenic injuries occurring within them (see Mello et al. 2007, providing evidence).

[57]   Hospitals are not the only important medical entity. MCOs directly affect patients' outcomes through their utilization of review decisions, and indirectly affect them through the hospitals and physicians included on their plans and the financial incentives they provide physicians. Health care decisions will not be optimal unless MCOs are liable for their decisions to deny coverage on the grounds that a treatment was not "medically necessary and appropriate" or is experimental. MCOs also should be liable for physician negligence, especially when a hospital is not also liable or is insulated from full liability by asset insufficiency or charitable organization damage caps (Arlen & MacLeod 2003; 2005a; see also Danzon 1997, contractual liability for MCOs; Epstein & Sykes 2001, same; Havighurst 1986, same).

[58]   For a discussion of the ways in which systems can cause preventable error without any one individual provider being clearly to blame, (see Gawande 2003).

[59]   This section only summarizes the traditional analysis of vicarious liability. Corporate liability is discussed in more detailed in Chapter 9 in this volume; see also Arlen (2012, sec. 3.3, 5.1).

costs), as long as employees have sufficient assets to pay optimal damages (Kornhauser 1982; Sykes 1984).

This analysis might seem to suggest that entity liability generally is not needed for medical malpractice since physicians should be able to pay the expected optimal damages caused by their negligence (Epstein & Sykes 2001, noting that the risk of physician asset insufficiency is low). Nevertheless, this conclusion is not correct. The conclusions of the traditional model do not apply to medical malpractice liability because the structure of malpractice liability and the relationship between medical entities and patient safety is inconsistent with core assumptions of the traditional model.

B. Entity-Level Liability for Harms Caused by Physicians

The traditional analysis finds that entity-level liability is not needed to induce entities to invest optimally in precautions designed to induce their employees to take optimal care when the following conditions are met: (1) employees bear the expected cost of all harms they cause directly; (2) employers bear employees' expected liability costs indirectly through *ex ante* wages; and (3) employee liability provides employers with incentives to invest in precautions to reduce expected accidents because precautions are observable to employees and thus reduce employees' expectations concerning future liability payments (Kornhauser 1982; Sykes 1984). None of these assumptions hold in the medical malpractice context.

First, physicians who are negligent do not bear their own expected liability costs for many reasons, as discussed in Section 3.C, including that they are protected by non-experience rated malpractice liability insurance. Thus, medical entities also do not bear the expected cost of their providers' negligence when only individual providers are liable because employees will not demand higher wages for injury costs they do not bear. By contrast, under medical entity liability, entities would bear expected accident costs even when insurance is available because they either self-insure or purchase experience-rated insurance. Moreover, entities can and would shift costs to negligent physicians in ways that are not covered by physician malpractice liability insurance, thereby inducing increased investment in patient safety (e.g., Abraham & Weiler 1994; Arlen & MacLeod 2003).

Second, individual negligence liability would not provide hospitals with optimal incentives even if physicians did bear their own expected liability costs. Optimal deterrence requires that liability induce both physicians and hospitals to invest in patient safety. Indeed, many patient injuries are attributable, at least in part, to decisions by institutions—for example, administrative systems, staffing, training, and health care technology—that affect the probability that physicians provide medically appropriate care.[60] The traditional analysis assumes that pure individual liability would take the form of strict liability. In this case, employees will exercise due care (Kornhauser 1982; Sykes 1984). Moreover, they would have strong incentives to ensure that hospitals invest optimally in patient safety, and can provide this incentive by requiring the hospital to bear liability costs whenever a hospital fails to do so. Yet in fact malpractice liability is governed by a negligence liability

---

[60] Similarly, MCOs take actions, such as utilization review, that directly affect expected patient outcomes (Arlen & MacLeod 2003; 2005a).

rule. Individual negligence liability does not provide hospitals with optimal incentives to invest in patient safety for two reasons. First, courts applying negligence generally require proof of an individual act of negligence, such as an incorrect treatment decision by a physician (e.g., Mello & Brennan 2002). Second, physicians are only deemed negligent if they fail to conform to the behavior of a reasonable physician *under the circumstances*. Thus, a physician who delivers erroneous care in an emergency situation will not be held liable if a reasonable doctor would have made the same decision under the circumstances, even though the circumstances causing the error may have resulted from deficiencies in the hospital's systems.[61] Since physicians can escape liability for errors that were not their fault under the circumstances, they do not have optimal incentives to ensure that hospitals make optimal investments to reduce the probability that such circumstances arise.

Accordingly, when only physicians are held liable for patients' injuries, no one will be forced to shoulder liability in many cases where patients suffer iatrogenic harm.[62] Given this, hospitals have insufficient incentives to invest in patient safety systems because they can invest suboptimally in patient safety without being held liable for the resulting patient injuries for which they are largely responsible (see Weiler, 1993; Mello & Studdert 2008; Andrews 2005, all discussing evidence on the role of institutions; see Mello & Brennan 2002).

Finally, sole reliance on individual liability is inefficient when individuals do not have sufficient assets to pay optimal damages (Kornhauser 1982; Sykes 1984).

Accordingly, optimal deterrence of medical error cannot be achieved by relying entirely on individual physician liability for medical negligence. In order to ensure that hospitals have optimal incentives to invest in patient safety, we must hold hospitals liable for iatrogenic injuries to patients who received treatment within the hospital, even when the injury cannot be attributed to the negligence of any individual provider (Abraham & Weiler 1994; Mello & Brennan 2002; see Sloan & Chepke 2008, 324–5).[63] This liability should be predicated on iatrogenic injury, as opposed to negligence, if, as is likely, courts cannot establish clear "due care" standards to govern hospitals (Abraham & Weiler 1994). Moreover, in order to provide hospitals with optimal incentives to invest in patient safety, hospitals should be jointly liable with physicians in those cases where patients can attribute

---

[61]   In extreme cases, hospitals may be liable for bad systems, but more often than not they are not.

[62]   The present analysis focuses on a regime of pure individual liability in order to facilitate comparison with the traditional analysis of vicarious liability. The actual liability regime is closer to one of pure individual liability than is optimal. While it is true that hospitals face liability for a glaring act of negligence in systems, health care technology, supervision, or staffing, hospitals nevertheless often escape liability for decisions they make that harm patients because courts cannot easily assess the optimality of many, if not most, hospital decisions concerning systems, health care technology and staffing, especially when there is no established custom to guide courts.

[63]   Entity-level liability for iatrogenic injuries is superior to negligence liability that is predicated on whether a hospital had optimal systems, supervision, health care technology, and staffing for the same reason that strict corporate liability is superior to duty-based liability as a mechanism for inducing optimal corporate investment in measures to prevent corporate crime (Arlen 2012). Courts are not well equipped to determine optimal investments in systems because it involves examining costs and benefits of actions that affect all of a hospital's patients across multiple periods of time. Generally, it is better to have the hospital bear the costs so that it will use its superior information to make the right decision.

their injuries to negligence by an individual provider because channeling liability through medical entities would increase its effectiveness[64] (e.g., Abraham & Weiler 1994; see also Sage 1997; Havighurst 1984; cf. Arlen & MacLeod 2003; 2005a, discussing the benefits of MCO liability for physician negligence; Arlen 2010, same). This would require reform of the existing liability rule governing entity liability which generally allows hospitals to avoid vicarious liability for negligence by physicians— such as surgeons, anesthesiologists and radiologists—because they are independent contractors.[65]

C. Summary

Accordingly, in order to optimally regulate medical care, malpractice liability must ensure that medical institutions, such as hospitals, have optimal incentives to intervene both directly and indirectly to maximize social welfare. To do this, we must expand hospital liability to ensure that hospitals are liable for all injuries to hospital patients resulting from medical error, whether or not this error can be attributed to an individual act of negligence. Moreover, state courts should expand their willingness to impose liability directly on hospitals even when physicians can be, and are, held liable for their medical negligence. One effective way to achieve this goal would be to impose joint and several liability on hospitals and physicians, and allow hospitals to impose private sanctions on physicians if held liable. Malpractice liability would be more effective if liability were imposed on medical entities because much (if not most) medical error appears to result from decisions made by entities that either affect care directly or influence the quality of care that physicians can provide.

6. CONCLUSION

Medical error is one of the most important problems facing this country, killing and seriously injuring more people every year than automobile accidents (Arlen 2010). In order to optimally deter medical error we must ensure that physicians, hospitals and MCOs want to make cost-effective investments in patient safety. Physicians must be induced to invest optimally in the expertise needed to correctly diagnose patients, and select and deliver treatment. Hospitals must invest in optimal systems (including health care technology), and also optimally monitor physicians practicing within them.[66]

As this chapter has shown, careful consideration of the institutional features of medical

---

[64] An additional advantage of hospital liability is that hospital malpractice liability insurance is experience rated (Abraham & Weiler 1994; Arlen 2010).

[65] For a full discussion of the independent contractor rule see Chapter 9 in this volume; see also Arlen & MacLeod (2005b). Doctrines such as ostensible vicarious liability and non-delegable duties have been used to hold hospitals liable for independent contractors practicing within the hospital, but have not created robust hospital liability for errors by those serving patients within the hospital.

[66] In addition, MCOs need to make optimal coverage decisions, and also to intervene optimally to induce optimal care by the providers with whom they contract, especially when those providers' incentives to take care might be undermined by asset insufficiency, damage caps or malpractice liability insurance.

care markets reveals we can use optimal negligence liability to achieve these goals, if damages for accidental negligence are set correctly. Optimal deterrence requires that we must impose malpractice liability on medical providers for injuries resulting from medical error. Moreover, the cornerstone of this liability must be medical entity liability, not individual physician liability, in order to ensure that medical entities employ their enormous influence to increase social welfare. Finally, full consideration of the nature of medical care contracts reveals that liability is best imposed through the tort system, and cannot be efficiently regulated by contract.

REFERENCES

Abraham, Kenneth & Paul C. Weiler (1994), *Enterprise Medical Liability and the Evolution of the American Health Care System*, Harvard Law Review, 108, 381–436.

Andrews, Lori B. et al. (1997), *An Alternative Strategy for Studying Adverse Events in Medical Care*, Lancet, 349, 309–13.

Andrews, Lori (2005), *Studying Medical Error in Situ: Implications for Malpractice Law and Policy*, DePaul Law Review, 54, 357–92.

Arlen, Jennifer (2012), *Economic Analysis of Corporate Criminal Liability: Theory and Evidence*, *in* Keith Hylton & Alon Harel eds, Research Handbook on the Economics of Criminal Law (Northampton, Mass.: Edward Elgar Press).

Arlen, Jennifer (2010), *Contracting Over Liability: Medical Malpractice and the Cost of Choice*, University of Pennsylvania Law Review, 158, 957–1023.

Arlen, Jennifer (2006), *Private Contractual Alternatives to Malpractice Liability*, in Rogan Kersh & William M. Sage eds, Medical Malpractice and the U.S. Healthcare System: New Century, Different Issues, (New York, N.Y.: Cambridge University Press).

Arlen, Jennifer (2000), *Tort Damages*, *in* Boudewijn Bouckaert & Gerrit De Geest eds, Encyclopedia of Law & Economics (Cheltenham, UK and Northampton, Mass.: Edward Elgar Publishing).

Arlen Jennifer (1985), *An Economic Analysis of Tort Damages for Wrongful Death*, New York University Law Review, 60, 1113–36.

Arlen, Jennifer & W. Bentley MacLeod (2005a), *Torts, Expertise and Authority: Liability of Physicians and Managed Care Organizations*, Rand Journal of Economics, 36, 494–519.

Arlen, Jennifer & W. Bentley MacLeod (2005b), *Beyond Master-Servant: A Critique of Vicarious Liability*, *in* M. Stuart Madden ed., Exploring Tort Law (New York, N.Y., Cambridge University Press).

Arlen, Jennifer & W. Bentley MacLeod (2003), *Malpractice Liability for Physicians and Managed Care Organizations*, New York University Law Review, 78, 1929–2006.

Arnedt, J. Todd, Judith Owens, Megan Crouch, Jessica Stahl, & Mary A. Carskadon (2005), *Neurobehavioral Performance of Residents After Heavy Night Call vs. After Alcohol Ingestion*, Journal of the American Medical Association, 9, 1025–33.

Arrow, Kenneth J. (1963), *Uncertainty and the Welfare Economics of Medical Care*, American Economic Review, 53, 941–73.

Avraham, Ronen (2007), *An Empirical Study of the Impact of Tort Reform on Medical Malpractice Settlement Payments*, Journal of Legal Studies, 36, S183–S229.

Avraham, Ronen, Leemore S. Dafny, & Max M. Schanzenbach (2012), *The Impact of Tort Reform on Employer-Sponsored Health Insurance*, Journal of Law, Economics, and Organization, 28, 657–86.

Baba-Akbari Sari, Ali, Trevor A. Sheldon, Alison Cracknell, Alastair Turnbull, Yvonne Dobson, Celia Grant, William Gray, & Aileen Richardson (2007), *Extent, Nature and Consequences of Adverse Events: Results of a Retrospective Case Note Review in a Large NHS Hospital*, British Medical Journal, 16, 434–9.

Baker, Tom (2005a), The Medical Malpractice Myth (Chicago: Chicago University Press).

Baker, Tom (2005b), *Reconsidering the Harvard Medical Practice Study Conclusions About the Validity of Medical Malpractice Claims*, Journal of Law, Medicine & Ethics, 33, 501–14.

Baker, Tom & Timothy Lytton (2010), *Allowing Patients to Waive the Right to Sue for Medical Malpractice: A Response to Thaler and Sunstein*, Northwestern University Law Review, 104, 233–52.

Bakos, Yannis, Florencia Marotta-Wurgler, & David Trossen (2009), *Does Anyone Read the Fine Print? Testing a Law and Economics Approach to Standard Form Contracts*, New York University Law and Economics Research Paper, No. 09–40 (October 2009).

Barger, Laura, Brian E. Cade, Najib T. Ayas, John W. Cronin, Bernard Rosner, Frank E. Speizer, & Charles A. Czeisler (2005), *Extended Work Shifts and the Risk of Motor Vehicle Crashes Among Interns*, New England Journal of Medicine, 352, 125–34.

Black, Bernard, Charles Silver, David A. Hyman, & William M. Sage (2005), *Stability Not Crisis: Medical Malpractice Outcomes in Texas, 1988–2002*, Journal of Empirical Legal Studies, 2, 207–59.

Brennan, Troyen, Lucian L. Leape, Nan M. Laird, Liesi Hebert, A. Russell Localio, Ann G. Lawthers, Joseph P. Newhouse, Paul C. Weiler, & Howard H. Hiatt (1991), *Incidence of Adverse Events and Negligence in Hospitalized Patients. Results of the Harvard Medical Practice Student I.* New England Journal of Medicine, 324, 370–6.

Brook, Robert H., Morris H. Berg, & Philip a. Schechter (1973), *Effectiveness of Nonemergency Care Via an Emergency Room: A Study of 116 Patients with Gastrointestinal Symptoms*, Annals of Internal Medicine, 78, 333–9.

Brown, John Prather (1973), *Toward an Economic Theory of Liability*, Journal of Legal Studies, 2, 323–49.

Burton, Susan (Mar. 16, 2003), *The Biggest Mistake of Their Lives*, N.Y. Times, §6 (Magazine), 48.

Calfee, John & Richard Craswell (1986), *Deterrence and Uncertain Legal Standards*, Journal of Law, Economics & Organization, 2, 279–303.

Chassin, Mark R., Edward L. Hannan, & Barbara A. DeBuono (1996), *Benefits and Hazards of Reporting Medical Outcomes Publicly*, New England Journal of Medicine, 334, 394–8.

Cooter, Robert D. (1984), *Prices and Sanctions*, Columbia Law Review, 84, 1523–60.

Cranberg, Lee D., Thomas H. Glick, & Luke Sato (2007), *Do the Claims Hold Up? A Study of Medical Negligence Claims Against Neurologists*, Journal of Empirical Legal, 4, 155–62.

Currie, Janet & W. Bentley MacLeod (2006), *First Do No Harm? Tort Reform and Birth Outcomes*, Quarterly Journal of Economics, 123, 795–830.

Danzon, Patricia M. (2000), *Liability for Medical Malpractice*, in Anthony J. Culyer and Joseph P. Newhouse eds, Handbook of Health Economics, vol. 1 (Amsterdam: North Holland).

Danzon, Patricia M. (1998), *Medical Malpractice*, 624, in Peter Newman ed., The New Palgrave Dictionary of Economics and the Law, vol 2 (Hampshire: Palgrave Macmillan).

Danzon, Patricia M. (1997), *Tort Liability: A Minefield for Managed Care?*, Journal of Legal Studies, 26, 491–519.

Danzon, Patricia M. (1985), Medical Malpractice: Theory, Evidence And Public Policy (Cambridge, Mass.: Harvard University Press).

Danzon, Patricia & Lee Lillard (1983), *Settlement Out of Court: The Disposition of Medical Malpractice Claims*, Journal of Legal Studies, 12, 345–77.

Dawson, Drew & Kathryn Reid (1997), *Fatigue, Alcohol and Performance Impairment*, Nature, 388, 235–7.

Encinosa, William E. & Fred J. Hellinger (2008), *The Impact of Medical Errors on Ninety-Day Costs and Outcomes: An Examination of Surgical Patients*, Health Services Research, 43, 2067–85.

Epstein, Richard A. (2005), *Contractual Principle Versus Legislative Fixes: Coming to Closure on the Unending Travails of Medical Malpractice*, DePaul Law Review, 54, 503–26.

Epstein, Richard A. & Alan O. Sykes (2001), *The Assault on Managed Care: Vicarious Liability, ERISA Preemption, and Class Actions*, Journal of Legal Studies, 30, 625–59.

Epstein, Richard A. (1976), *Medical Malpractice: The Case for Contract*, American Bar Foundation Research Journal, 1, 87–149.

Farber, Henry S. & Michelle J. White (1994), *A Comparison of Formal and Informal Dispute Resolution in Medical Malpractice*, Journal of Legal Studies, 23, 777–806.

Farber, Henry S. & Michelle J. White (1991), *Medical Malpractice: An Empirical Examination of the Litigation Process*, Rand Journal of Economics, 22, 199–217.

Frakes, Michael (2013), *The Impact of Medical Liability Standards on Regional Variations in Physician Behavior: Evidence from the Adoption of National Standard Rules*, American Economic Review, 103, 257–76.

Frakes, Michael (2012), *Defensive Medicine and Obstetric Practices*, Journal of Empirical Legal Studies, 9, 457–81.

Frank, Richard G. & Richard Zeckhauser (2007), *Custom-Made Versus Ready-to-Wear Treatments: Behavioral Propensities in Physicians' Choices*, Journal of Health Economics, 26, 1101–27.

Fudenberg, Drew & Jean Tirole (1990), *Moral Hazard and Renegotiation in Agency Contracts*, Econometrica, 58, 1279–319.

Gandhi, Tejal K., Allen Kachalia, Eric J. Thomas, Ann Louise Puopolo, Catherine Yoon, Troyen A. Brennan, & David M. Studdert (2006), *Missed and Delayed Diagnosis in the Ambulatory Setting: A Study of Closed Malpractice Claims*, Annals of Internal Medicine, 145, 488–96.

Gawande, Atul (2003), Complications: A Surgeon's Notes on an Imperfect Science (New York: Picador).

Geistfeld, Mark (1995), *The Political Economy of Neocontractual Proposals for Products Liability Reform*, Texas Law Review, 72, 803–47.

Gibson, James (2008), *Doctrinal Feedback and (Un)Reasonable Care*, Virginia Law Review, 94, 1641–714.

Glied, Sherry (2000), *Managed Care*, 707–53, in Anthony J. Culver & Joseph P. Newhouse eds, HANDBOOK OF HEALTH ECONOMICS, vol. 1A (Amsterdam: North Holland).

Glied, Sherry & Joshua G. Zivin (2002), *How Do Doctors Behave When Some (But Not All) of Their Patients Are in Managed Care?*, JOURNAL OF HEALTH ECONOMICS, 21, 337–53.

Grossman, Sanford (1981), *The Informational Role of Warranties and Private Disclosure About Product Quality*, JOURNAL OF LAW & ECONOMICS, 24, 461–84.

Havighurst, Clark C. (1995), HEALTH CARE CHOICES (Washington, D.C.: American Enterprise Institute).

Havighurst, Clark C. (2000), *Vicarious Liability: Relocating Responsibility for the Quality of Medical Care*, AMERICAN JOURNAL OF LAW AND MEDICINE, 26, 7–29.

Havighurst, Clark C. (1986), *Private Reform of Tort-Law Dogma: Market Opportunities and Legal Obstacles*, LAW AND CONTEMPORARY PROBLEMS, 49, 143–72.

Havighurst, Clark C. (1984), *Doctors and Hospitals: An Anti-Trust Perspective on Traditional Relationships*, DUKE LAW JOURNAL, 1984, 1071–162.

Heidenreich, Paul A., Mark McClellan, Craig Frances, & Laurence C. Baker (2002), *The Relation Between Managed Care Market Share and the Treatment of Elderly Fee-for-Service Patients with Myocardial Infarction*, THE AMERICAN JOURNAL OF MEDICINE, 112, 176–82.

Holtz-Eakin, Douglas (2004), *The Effects of Tort Reform: Evidence from the States* (Washington, D.C.: Congressional Budget Office).

Hylton, Keith N. (2000), *Agreements to Waive or to Arbitrate Legal Claims: An Economic Analysis*, SUPREME COURT ECONOMIC REVIEW, 8, 209–63.

Hyman, David A., Bernard S. Black, Kathryn Zeiler, Charles Silver, & William M. Sage (2007), *Do Defendants Pay What Juries Award? Post-Verdict Haircuts in Texas Medical Malpractice Cases*, JOURNAL OF EMPIRICAL LEGAL STUDIES, 4, 3–68.

Hyman, David, Bernard Black, Charles Silver, & William M. Sage (2009), *Estimating the Effect of Damage Caps in Medical Malpractice Cases: Evidence from Texas*, JOURNAL OF LEGAL ANALYSIS, 1, 355–409.

Institute of Medicine (2007), PREVENTING MEDICATION ERRORS (Washington, D.C.: National Academies Press).

Institute of Medicine (2000), TO ERR IS HUMAN: BUILDING A SAFER HEALTH SYSTEM (Washington, D.C.: National Academies Press).

Jewett, Jacquelyn J. & Judith H. Hibbard (1996), *Comprehension of Quality Care Indicators: Differences Among Privately Insured, Publicly Insured, and Uninsured*, HEALTH CARE FINANCE REVIEW, 18, 75–94.

Kahan, Marcel (1989), *Causation an Incentives to Take Care Under the Negligence Rule*, JOURNAL OF LEGAL STUDIES, 18, 427–47.

Kaiser Family Foundation/Agency for Health Care Research and Quality (2000), National Survey on Americans as Health Care Consumers: An Update on The Role of Quality Information.

Kaplow, Lewis (1994), *The Value of Accuracy in Adjudication*, JOURNAL OF LEGAL STUDIES, 23, 307–401.

Katz, Avery (1998), *Standard Form Contracts*, *in* Peter Newman, ed, THE NEW PALGRAVE DICTIONARY OF LAW AND ECONOMICS (New York: Stockton Press).

Kessler, Daniel & Mark McClellan (1996), *Do Doctors Practice Defensive Medicine*, QUARTERLY JOURNAL OF ECONOMICS, 111, 353–90.

Korobkin, Russell (1999), *The Efficiency of Managed Care "Patient Protection" Laws: Incomplete Contracts, Bounded Rationality, and Market Failure*, Cornell Law Review, 85, 1–88.

Kornhauser, Lewis A. (1982), *An Economic Analysis of the Choice Between Enterprise and Personal Liability for Accidents*, CALIFORNIA LAW REVIEW, 70, 1345–92.

Krizek, Thomas J. (2000), *Surgical Error: Ethical Issues of Adverse Events*, ARCHIVES OF SURGERY, 135, 1359–66.

Landrigan, Christopher P., Jeffrey M. Rothschild, John W. Cronin, Rainu Kaushal, Elisabeth Burdick, Joel T. Katz, Craig M. Lilly, Peter H. Stone, Steven W. Lockley, David W. Bates, & Charles A. Czeisler (2004), *Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units*, NEW ENGLAND JOURNAL OF MEDICINE, 351, 1838–48.

Leape, Lucian L. (2002), *Counting Deaths Due to Medical Errors*, JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 288, 2404–5.

Localio, A. Russell, Ann G. Lawthers, Troyen A. Brennan, Nan M. Laird, Liesi E. Herbert, Lynn M. Peterson, Joseph P. Newhouse, Paul C. Weiler, & Howard H. Hiatt (1991), *Relation between Malpractice Claims and Adverse Events Due to Negligence—Results of Harvard Medical Practice Study III*, NEW ENGLAND JOURNAL OF MEDICINE, 325, 245–51.

McGlynn, Elizabeth A., Steven M. Asch, John Adams, Joan Keesey, Jennifer Hicks, Alison DeCristofaro, & Eve A. Kerr (2003), *The Quality of Health Care Delivered to Adults in the United States*, NEW ENGLAND JOURNAL OF MEDICINE, 348, 2635–45.

Mello, Michelle M. & David M. Studdert (2008), *Deconstructing Negligence: The Role of Individual and System Factors in Causing Medical Injuries*, GEORGETOWN LAW JOURNAL, 96, 599–623.

Mello, Michelle M., David M. Studdert, & Eric J. Thomas (2007), *Who Pays for Medical Errors: An Analysis of*

Adverse Event Costs, the Medical Liability System, and Incentives for Patient Safety Improvement, JOURNAL OF EMPIRICAL LEGAL STUDIES, 4, 835–60.

Mello, Michelle M. & Troyan A. Brennan (2002), *Deterrence of Medical Errors: Theory and Evidence for Malpractice Reform*, TEXAS LAW REVIEW, 80, 1595–637.

Mello, Michelle M. & Kathryn Zeiler (2008), *Empirical Health Law Scholarship: The State of the Field*, GEORGETOWN LAW JOURNAL, 96, 649–702.

Millenson, Michael L. (2001), *Moral Hazard vs. Real Hazard: Quality of Care Post-Arrow*, JOURNAL OF HEALTH POLITICS, POLICY & LAW, 26, 1069–80.

Newhouse, Joseph P. (2008), *The Economics of Health Insurance*, in Steven N. Durlauf & Lawrence E. Blume eds. THE NEW PALGRAVE DICTIONARY OF ECONOMICS, vol. 3, 872–5 (New York: Palgrave Macmillan 2nd ed.).

Ostrov, Barbara F. & Julie S. Lyons (Apr. 30, 2002), *Surgical Errors Alleged at Stanford Hospital*, SAN JOSE MERCURY NEWS, at 1B.

Paik, Myungho, Bernard Black, & David Hyman (2012), *Will Tort Reform Bend the Cost Curve? Evidence from Texas*, JOURNAL OF EMPIRICAL LEGAL STUDIES, 9, 173–216.

Palmieri, Patrick A., Patricia R. DeLucia, Lori T. Peterson, Tammy E. Ott, & Alexia Green (2008), *The Anatomy and Physiology of Error in Adverse Health Events*, ADVANCES IN HEALTH CARE MANAGEMENT, 7, 33–68.

Peters, Philip G., Jr. (2002), *The Role of the Jury in Modern Malpractice Law*, IOWA LAW REVIEW, 87, 909–69.

Peters, Philip G., Jr. (2007a), *What We Know About Malpractice Settlements*, IOWA LAW REVIEW, 92, 1783–833.

Peters, Philip G., Jr. (2007b), *Doctors and Juries*, MICHIGAN LAW REVIEW, 105, 1453–95.

Polinsky, A. Mitchell & Steven M. Shavell (1993), *Should Employees be Subject to Fines and Imprisonment Given Existence of Corporate Liability?*, INTERNATIONAL REVIEW OF LAW AND ECONOMICS, 13, 239–57.

Posner, Richard (2011), ECONOMIC ANALYSIS OF LAW (8th ed.) (New York: Wolters Kluwer Law & Business).

Public Citizen (2001), *Ranking of Serious Doctor Disciplinary Actions By State Medical Licensing Boards— 2001*, HRG PUBLICATION #1616, available at http://www.citizen.org/documents/1616table1.pdf.

Ramseyer, Mark J. (1996), *Products Liability Through Private Ordering: Notes on a Japanese Experience*, UNIVERSITY OF PENNSYLVANIA LAW REVIEW, 144, 1823–40.

Robinson, Glen O. (1986), *Rethinking the Allocation of Medical Malpractice Risks Between Patients and Providers*, LAW AND CONTEMPORARY PROBLEMS, 49, 173–99.

Rolph, John E., John L. Adams, & Kimberly McGuigan (2007), *Identifying Malpractice-Prone Physicians*, JOURNAL OF EMPIRICAL LEGAL STUDIES, 4, 125–53.

Rubin, Paul H. (1993), TORT REFORM BY CONTRACT (Washington D.C.: American Enterprise Institute).

Sage, William (2005), *Malpractice Insurance and the Emperor's Clothes*, DEPAUL LAW REVIEW, 54, 463–84.

Sage, William (1999), *Regulating Through Information: Disclosure Laws and American Health Care*, COLUMBIA LAW REVIEW, 99, 1701–829.

Sage, William (1997), *Enterprise Liability and the Emerging Managed Health Care System*, LAW AND CONTEMPORARY PROBLEMS, 60, 159–210.

Schuster, Mark A., Elizabeth A. Mcglynn & Robert H. Brook (1998), *How Good is the Quality of Health Care in the United States*, MILLBANK QUARTERLY, 76, 517–63.

Schwartz, Alan (1988), *Proposals for Products Liability Reform: A Theoretical Synthesis*, YALE LAW JOURNAL, 97: 353–419.

Schwartz, Gary (1998), *Medical Malpractice, Tort, Contract, and Managed Care*, ILLINOIS LAW REVIEW, 3, 885–907.

Sharkey, Catherine M. (2005), *Unintended Consequences of Medical Malpractice Damage Caps*, NEW YORK UNIVERSITY LAW REVIEW, 80, 391–512.

Shavell, Steven M. (1980), *Strict Liability Versus Negligence*, JOURNAL OF LEGAL STUDIES, 9, 1–25.

Shavell, Steven M. (2012), *A Fundamental Enforcement Cost Advantage of the Negligence Rule Over Regulation*, HARVARD LAW, ECONOMICS AND BUSINESS DISCUSSION PAPER NO 731.

Shepard, Joanna (2012), *Justice in Crisis: Victim Access to the American Medical Liability System*, EMORY UNIVERSITY SCHOOL OF LAW LEGAL RESEARCH PAPER SERIES, No. 12–222.

Sloan, Frank A., Kathyrn Whetten-Goldstein, Penny B. Githens, & Stephen S. Entman (1995), *Effects of the Threat of Medical Malpractice Litigations and Other Factors on Birth Outcomes*, MEDICAL CARE, 33, 700–14.

Sloan, Frank A. & Lindsey M. Chepke (2008), MEDICAL MALPRACTICE (Cambridge, MA: MIT Press).

Spence, Michael (1977), *Consumer Misperceptions, Product Failure and Producer Liability*, REVIEW OF ECONOMIC STUDIES, 44, 561–72.

Stein, Alex (2012), *Toward a Theory of Medical Negligence*, IOWA LAW REVIEW, 97, 1201–57.

Steel, Knight, Paul M. Gertman, Caroline Crenscenzi, & Jennifer Anderson (1981), *Iatrogenic Illness on a General Medical Service at a University Hospital*, NEW ENGLAND JOURNAL OF MEDICINE, 304, 638–42.

Studdert, David M., Michelle M. Mello, Atul A. Gawande, Tejal K. Gandhi, Allen Kachalia, Catherine Yoon, Ann Louise Puopolo, & Troyen A. Brennan (2006), *Claims, Errors, and Compensation Payments in Medical Malpractice Litigation*, NEW ENGLAND JOURNAL OF MEDICINE, 354, 2024–33.

Studdert, David M., Eric J. Thomas, Helen R. Burstin, Brett I. W. Zbar, E John. Orav, & Troyen A. Brennan (2000), *Negligent Care and Malpractice Claiming Behavior in Utah and Colorado*, Medical Care, 38, 250–60.

Sykes, Alan O. (1984), *The Economics of Vicarious Liability*, The Yale Law Journal, 93, 1231–80.

Tehrani, Ali S. Saber, HeeWon Lee, Simon C. Mathews, Andrew Shore, Martin A. Makary, Peter J. Pronovost, and David E. Newman-Toker (2013), *25-Year Summary of US Malpractice Claims for Diagnostic Erorrs 1986–2010: An Analysis from the National Practitioner Data Bank*, BMJ Quality and Safety in Health Care.

Thaler, Richard H. & Cass R. Sunstein (2008), Nudge: Improving Decisions About Health, Wealth, and Happiness (New York: Penguin).

Weiler, Paul C., Howard Hiatt, Joseph Newhouse, William G. Johnson, Troyen Brennan, & Lucian Leape (1993), A Measure Of Medical Malpractice: Medical Injury, Malpractice Litigation, And Patient Compensation (Cambridge, Mass.: Harvard University Press).

Weiler, Paul C. (1991), Medical Malpractice on Trial (Cambridge, Mass.: Harvard University Press).

White, Michelle J. (1994), *The Value of Liability in Medical Malpractice*, Health Affairs, 13, 75–87.

Wickelgren, Abraham (2006), *The Inefficiency of Contractually-based Liability with Rational Consumers*, Journal of Law, Economics & Organization, 22, 168–83.

Williams, Alan (2012), *The Cure for What Ails: A Realistic Remedy for the Medical Malpractice "Crisis"*, Stanford Law and Policy Review, 23, 477–521.

Zeiler, Kathryn, Bernard Black, David Hyman, Charles Silver, & William Sage (forthcoming), To Sue is Human: A Profile of Medical Malpractice Litigation (New Haven: Yale University Press).

Zeiler, Kathryn, Bernard S. Black, Charles Silver, David A. Hyman, & William M. Sage (2007), *Physicians' Insurance Limits and Malpractice Payments: Evidence from Texas Closed Claims, 1990–2003*, Journal of Legal Studies, 36, S9–S45.

Zeiler, Kathryn (2005), *Turning from Damage Caps to Information Disclosure: An Alternative Approach to Tort Reform*, Yale Journal of Health Policy, Law, and Ethics, 5, 385–400.

Zeiler, Kathryn (2003), Medical Malpractice and Contract Disclosure: A Student of the Effects of Legal Rules on Behavior in Health Care Markets (dissertation).

Zhan, Chunliu & Marlene R. Miller (2003), *Excess Length of Stay, Charges and Mortality Attributable to Medical Injuries During Hospitalization*, Journal of the American Medical Association, 290, 1868–74.

APPENDIX

Formal Analysis of Malpractice Liability for Knowing and Accidental Medical Error

An ill patient seeks treatment from a physician. The physician can provide one of two treatments: optimal treatment, t^*, or suboptimal treatment, t^0. These treatments provide the same benefit to the patient if successful, b, but differ in the probability, p, that they impose a harm of H on the patient.[67] The expected benefit of optimal treatment is given by $b - p^*H$ and the expected benefit of erroneous treatment is given by $b - p^0H$, where $b - p^*H > b - p^0H$. The optimal treatment is more costly to provide than erroneous treatment, $c^* > c^0$, but these costs are less than resulting reduction in the expected risk of treatment to the patient, $(p^0 - p^*)H$. The patient's health care costs are partially covered by a group health insurer who bears a portion of the cost of all treatment selected, given by β. The insurer does not adjust the premium to reflect a patient's actual treatment costs.[68] The patient cannot verify the quality of care selected and relies on the physician to diagnose him and select treatment. Neither the patient nor the insurer can ensure that the physician selects optimal treatment by contract.

The physician cares about patient outcomes, either as a result of compassion or reputation. Accordingly, the expected benefit to a physician of providing treatment is given by $\alpha(b - p^iH)$, where $0 < \alpha < 1$, is the measure of compassion and i is the treatment choice (optimal or suboptimal).

The physician can only select the optimal treatment if he is "informed." The probability that the physician is "informed" is given by $q(e)$,[69] where e is the physician's investment in becoming informed (i.e., expertise, systems, and health care technology)—hereinafter investment in patient safety. The cost of patient safety is given by $C(e)$.[70] We assume that the physician invests in patient safety after contracting with the patient, but the analysis applies as well to unobservable investments made pre-contract. This cost is non-verifiable and thus the physician bears this cost directly.

When informed, the physician selects the treatment that maximizes his welfare. When uninformed, the physician selects suboptimal treatment.[71] Patients cannot observe either the amount the physician invests in patient safety or the probability he selects suboptimal treatment.

---

[67]   Arlen & MacLeod (2005a) presents a model where physicians have many treatment options which differ in their expected benefits and expected harm.

[68]   Arlen & MacLeod (2005a) expands this analysis to consider the situation where the insurer attempts to control treatment costs through utilization review and capitation contracts. Zeiler (2005) also considers capitation contracts.

[69] $q'(e) > 0$, $q''(e) < 0$.

[70] $C'(e) > 0$, $C''(e) > 0$.

[71]   For example, a physician who is unable to diagnose the patient properly either will not treat the patient or will select the wrong treatment. Similarly, a physician who does not know the latest literature on treatments will select the wrong treatment—and possibly a contraindicated treatment (see McGlynn 2003)—believing that it is the correct treatment. Arlen & MacLeod (2005a) employs a more realistic assumption that uninformed physicians may accidentally provide optimal treatment (for example, when it is optimal not to treat) and also recognizes that patients are not always injured by erroneous treatments. We abstract from this additional complexity here.

A.   Optimal equilibrium

Social welfare is maximized when the provider selects the treatment and invests in the level of patient safety that maximizes the joint welfare of the patient, physician and insurer. This implies that the physician must select the treatment that maximizes the expected *net* social benefit of treatment: $(1+\alpha)(b - p^iH) - c^i$, where i is an index of treatment type.[72] For the reasons given above, this implies that the physician should select the optimal treatment, t^*, which we assume is also the treatment that maximizes the expected benefit of treatment to the patient, $b - p^iH$.

The socially optimal investment in patient safety is given by the e that maximizes the expected social benefit of treatment assuming that informed physicians select the optimal treatment:[73]

$$(1+\alpha)b - q(e)\{(1+\alpha)(p^*H) + c^*\} - (1-q(e))\{(1+\alpha)(p^0H) + c^0\} - C(e) \quad \text{(2A.1)}$$

Thus, optimal e satistfies Equation (2A.2):

$$q'(e)\{(1+\alpha)(p^0 - p^*)H - (c^* - c^0)\} = C'(e) \quad \text{(2A.2)}$$

Accordingly, a physician invests optimally in patient safety—i.e., in the information needed to correctly diagnose the patient, select treatment and provide treatment—when he invests up to the point where the marginal cost of investment in patient safety equals the net social marginal benefit of patient safety investment—where the latter is given by the net expected social marginal benefit of the patient receiving optimal instead of suboptimal treatment multiplied by the change in the probability of accidental error resulting from the investment in patient safety.

B.   No liability equilibrium

We now consider the physician's choice of treatment (when informed) and investment in patient safety when there is no tort liability and both decisions take place post-contract (and are non-contractable) (see Arlen & MacLeod 2003).

An informed physician selects the treatment that maximizes his net benefit of treatment, which is given by $\alpha(b^i - pH) - \beta c^i$. If the physician internalizes a greater portion of patient welfare than treatment costs ($\alpha > \beta$), then he will select treatment t^*, which is the optimal treatment. Accordingly, in this context, tort liability is not needed to regulate treatment choice. Otherwise, he may select suboptimal treatment. We assume here that all treatment costs are borne by the insurer and thus the physician selects the optimal treatment when informed.

We now consider the physician's investment in patient safety absent liability. Each physician undertakes the investment in patient safety that maximizes his expected welfare

---

[72]   This formulation of the social welfare function assumes that both the patient and the physician benefit when the patient is cured and are harmed when the patient is physically injured. None of the core results change if we assume that the net social benefit of treatment is given by $b - p^iH$, with the physician obtaining a portion of this benefit, as given by α.

[73]   *See supra* note 71.

assuming that he selects the optimal treatment when informed but selects erroneous treatment when uninformed:

$$\alpha[b - q(e)p^*H - (1 - q(e))p^0H] - C(e) \qquad (2A.3)$$

This implies that the physician invests in the level of patient safety, e^*, at which:

$$q'(e)(p^0 - p^*)\alpha H = C'(e) \qquad (2A.4)$$

Comparing Equation (2A.4) to Equation (2A.2) we see that, absent liability, the physician underinvests in patient safety because he does not take into account the net marginal benefit to others of the patient receiving optimal treatment instead of erroneous treatment. This equals the marginal gain to the patient of receiving optimal instead of erroneous care minus the additional cost of the superior treatment (to the insurer). The definition of optimal treatment implies that this amount is positive.[74]

Thus, we see that even when physicians are well meaning and always select optimal treatment when informed, patients face an excessive risk of medical error absent tort liability because physicians underinvest in patient safety (Arlen & MacLeod 2003; 2005a). This provides a reason to impose medical malpractice liability even on physicians who are so compassionate that they would never knowingly provide negligent medical treatment.

C.   Optimal negligence liability

Negligence liability can be used to induce both optimal treatment choice and patient safety. Moreover, negligence liability can induce optimal patient safety even when courts base the negligence determination solely on whether the physician provided the optimal treatment, and do not consider the physician's investment in patient safety, $C(e)$, as currently is generally the case (Arlen & MacLeod 2003; 2005a).[75]

Below we examine the effect of negligence liability on the physician's investment in patient safety. We do not consider the effect of negligence on treatment choice because informed physicians select the optimal treatment even absent liability because the insurer bears all treatment costs and, in this model, physicians cannot profit from providing high cost/higher risk care.[76] Thus, we focus on the effect of negligence liability on investments in patient safety, assuming that physicians select optimal treatment when informed

---

[74]   Here we assume that the benefit to the patient of optimal instead of erroneous treatment exceeds the additional cost of providing this treatment.

[75]   There is some movement in the courts towards taking expertise into account, such as when a hospital is held liable for negligently credentialing an incompetent or inadequately experienced physician. Yet these cases are relatively rare and do not encompass the substantial number of situations where expertise and other investments in patient safety affects patients' expected welfare.

[76]   Negligence liability can be needed to regulate treatment costs even when insurers bear all treatment costs if physicians can profit from providing care that is more costly than optimal and this higher-cost care also is more risky for the patient. In theory, negligence liability can be structured to deter this form of negligence.

Negligence liability also is needed when physicians bear *ex post* treatment costs. In this situation, negligence liability will induce informed physicians to select the optimal treatment as long as damages are such that physicians expected costs are higher if they select erroneous care than if they

and erroneous treatment when uninformed. We also assume that courts cannot observe patient safety investments and thus negligence liability only regulates these investments by holding physicians liable for accidental error.

Given these assumptions, each physician's expected payoff under a negligence regime is given by Equation (2A.5):

$$\alpha b - q(e)\alpha H p^* - (1 - q(e))p^0\{\alpha H + D\} - C(e) \tag{2A.5}$$

This implies that the physician selects the level of patient safety at which:

$$q'(e)\{\alpha H(p^0 - p^*) + p^0 D\} = C'(e) \tag{2A.6}$$

A comparison of Equations (2A.2) and (2A.6) reveals that negligence liability can induce optimal investment in patient safety so long as expected damages for accidental negligence equal the *expected* cost to the patient of receiving suboptimal instead of optimal treatment minus the cost to the insurer of the patient receiving optimal instead of suboptimal treatment, $(p^0 - p^*)\,H - (c^0 - c^*)$. This implies that the damage award must be such that:

$$p^0 D = (p^0 - p^*)H - (c^* - c^0) \tag{2A.7}$$

When physicians bear all treatment costs, then optimal expected damages are given by:

$$p^0 D = (p^0 - p^*)H \tag{2A.8}$$

Thus, in this case the optimal actual damage award, D^*, is given by:

$$D^* = \frac{(p^0 - p^*)H}{p^0} < H. \tag{2A.9}$$

---

select optimal care. In other words, informed physicians will not be negligent so long as damages equal or exceed the D such that:

$$\alpha(b - p^*H) - c^* = \alpha(b - p^0 H) - c^0 - p^0 D. \tag{2.A10}$$

This condition is definitely satisfied if expected damages equal the cost of providing optimal treatment instead of erroneous care. Damages equal to H will satisfy this condition, but exceed the minimum amount needed to do so. Negligence liability cannot deter excessively expensive treatment choices that do not increase the expected harm to the patient as such deviations from due care do not cause any harm to the patient.