STRICT LIABILITY FOR UNREASONABLE HARM: AN AGGREGATIVE MEDICAL MALPRACTICE REGIME

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Large medical facilities are involved in many adverse events, even when taking reasonable care. Under prevailing law, these institutions are liable only for the harm they cause by failing to take reasonable care. Thus, to reach a finding of liability, courts must review every incident to determine whether the patient received negligent care, and, if so, whether the negligent conduct was the but-for cause of the injury. However, it is often easier, and more accurate, to determine whether a medical facility negligently caused unreasonable harm to some (unknown) victims, based on outcomes, than it is to examine the facility's conduct in each incident. For example, if a court determines that it is reasonable for 100 patients to contract an infection during hospitalization, it can surmise that when 150 patients have contracted an infection, the hospital, or its employees, negligently caused harm to 50 patients. In light of this informational advantage, this article examines a liability regime that, like a strict liability regime, depends solely on outcomes. Like a negligence regime however, it requires the injurer to pay only for harm that could reasonably have been avoided. This article shows that when applied to medical facilities, the proposed regime increases the chances that negligent hospitals will compensate victims while significantly decreasing the direct and indirect costs of investigating suspected malpractice cases individually. Last, the article shows that strict liability for unreasonable harm can be applied to other tortfeasors, such as polluters and product manufacturers, and that it offers significant advantages when applied to manufacturers of smart devices and other AI products.

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1. INTRODUCTION

Negligence law holds injurers accountable only if they fail to conform to the applicable standard of care and if their victims can establish that the injurer's conduct caused the victim's harm. According to legal economists, this structure of negligence law is designed to induce injurers to make optimal investments in care since they are held liable for the expected harm caused by their actions when they fail to take reasonable care.[1]

This emphasis on the injurer conduct is due to the fact that potential injurers are rarely personally involved in accidents, even when they are negligent. For example, while reckless driving increases the risk of road accidents, most reckless drivers will arrive at their destination without incident.[2] In these paradigmatic cases, the outcome of the behavior——the occurrence of an accident——provides little information about the injurer's conduct.

Some injurers are routinely involved in many adverse events, even

[1] *See* RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW §6.1 (9th ed. 2014) (explaining that reasonable care, under negligence liability law, is defined by a marginal cost–benefit analysis, inducing injurers to optimally invest in care).

[2] According to 2020 statistics, motor vehicle accidents involving injury occur, on average, once every 1702 thousand miles driven. Car owners drive 10,900 miles on average each year, meaning that drivers are involved in an accident that causes bodily injury, on average, once every 156 years. *See* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., FATALITY ANALYSIS REPORTING SYSTEM (2020), https://www-fars.nhtsa.dot.gov/Main/index.aspx (last visited February 5, 2023)

when taking adequate care. For these injurers, the harm they cause over time offers valuable information about their conduct. This information about long-term results could prove especially valuable in cases where determining the injurer's conduct in each incident requires a costly inquiry. Consider the following example.

> Example 1. *Hospital-acquired infection*. Alex was admitted to the hospital due to a spinal injury that required simple surgery and a short hospital stay. Other than the spinal injury, Alex was generally healthy. While hospitalized, Alex developed an infection that caused permanent harm. Should Alex be compensated for the harm?[3]

The situation in Example 1 is very common and often preventable.[4] In many instances, medical staff can take simple measures, such as washing their hands before approaching a patient's bed, or removing their ties and bracelets, to reduce the risk of infection.[5]

Prevailing tort law is supposed to offer a remedy to any patient who contracts an infection because the medical staff fails to take one of these simple measures. Since the cost of these preventative measures is much lower than the risk they prevent, failing to take them is considered negligent.[6] Even so, most patients suffering from a hospital-acquired infection will not try to sue their physician or medical facility for medical malpractice, and, if they do, they will likely lose.

Consider, for example, the case of *Gahm v. Thomas Jefferson Univ. Hosp.*, on which Example 1 is based.[7] Mr. Gahm underwent back surgery. During recovery, he developed a severe infection, resulting in two months of hospitalization and long-lasting harm to his body. During the trial, Gahm presented expert reports from several physicians stating

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[3] The example is based on the case of Gahm v. Thomas Jefferson Univ. Hosp., 2000 U.S. Dist. LEXIS 2072.

[4] Patchen Dellinger et al., *Hospitals Collaborate to Decrease Surgical Site Infections*, 190 AM. J. SURGERY 9 (2005) (stating that many hospitals underutilize simple procedures that are known to reduce surgical-site infections. Hospitals participating in the study implemented several practices and reported a 27% decrease in infection rate).

[5] *See, e.g.*, John M Boyce & Didier Pittet, Guideline for Hand Hygiene in Healthcare Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/ APIC/IDSA Hand Hygiene Task Force, 30 AM. J. INFECTION CONTROL 1 (2002) (recommending that medical staff be obliged to wash their hands thoroughly before each contact with a patient); Graham Jacob, *Uniforms and Workwear: An Evidence Base for Developing Local Policy*, NHS DEPARTMENT HEALTH POLICY (2007), available at https://data.parliament.uk/DepositedPapers/Files/DEP2009-0656/DEP2009-0656.pdf (neckties and hand jewelry should not be worn in any care activity which involves patient contact, since they might harbor pathogens and increase the risk of infections).

[6] *See infra* note 34 and accompanying text.

[7] *See supra* note 3.

that since he developed a hospital-acquired infection, it stood to reason that the hospital had breached its duty to maintain safe and adequate facilities. Nonetheless, the court granted the hospital's motion to dismiss, ruling that: "There is no basis for finding that the hospital deviated from an appropriate standard of care . . . or that the hospital's services, or lack of them, increased the chances of plaintiff's infection."[8] The problems Gahm faced in proving his case are shared by most patients in a similar position.

First, claims that the staff failed to take reasonable measures to reduce the risk of infection may be difficult to prove. Infections are common whenever sick people are housed together in close proximity, regardless of efforts to prevent them.[9] Evidence regarding preventative measures in each case might be difficult to obtain. For example, hand-washing before approaching a patient may be considered standard of care, [10] but it can be challenging for a plaintiff to know if the healthcare staff washed their hands when caring for them or for other patients, or to obtain evidence of this behavior.[11] This makes it difficult to prove claims of staff failing to take reasonable measures to reduce the risk of infection.

Furthermore, even if the plaintiff can show that staff members failed to take infection-preventing measures, causation still creates a significant barrier to compensation. The plaintiff must show that the harm would have been avoided had the medical staff had taken appropriate measures. However, since the risk of contracting an infection is substantial even under optimal conditions, the plaintiff's ability to prove that the negligent conduct was the but-for cause of the harm is limited.[12]

This article proposes a new liability regime under which injurers, that

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[8] *Id.* at 8.

[9] Courts have declined shifting the burden of proof in case of a hospital-acquired infection, stating that infections ordinarily occur in the absence of negligence. *See* Bars v. Palo Verde Hosp., 2005 Cal. App. Unpub. LEXIS 9326. The statute of limitation poses an additional difficulty in cases where the harm itself does not suggest that the physician breached the standard of care. In these cases, if alleged injuries did not suggest they were the result of anything other than natural consequences of a recognized medical treatment, the statute of limitation commences only when the plaintiff has knowledge of the negligent conduct. *See, e.g.*, Moore v. Morris, 475 So. 2d 666 (Fla. 1985).

[10] Hand hygiene is one of the main strategies for reducing the incidence of healthcare-associated infections, and thus is included in national guidelines. Despite the universal acceptance of this inexpensive infection-preventative measure, hospitals consistently battle low levels of compliance among healthcare workers. *See, e.g*., L. Kingstone, et al., *Hand Hygiene-Related Clinical Trials Reported Since 2010: A Systematic Review*, 92 J. HOSPITAL INFECTIONS 309 (2016).

[11] *But see* Knight v. West Paces Ferry Hosp., Inc., 585 S.E.2d 104 (2003) (a directed verdict for the defendant was reversed on appeal, since the testimonies of the plaintiff and her husband regarding nurses' hand-washing practices were sufficient evidence for the jury to consider).

[12] *See, e.g.*, Jelinek v. Casas, 328 S.W.3d 526 (Tx. Sup. 2010) (hospital was negligent in not treating the patient with antibiotics following a surgery, but patient's family could not establish that the patient would have suffered less from the infection she contracted if antibiotics had been administered sooner).

tend to be involved in numerous accidents, such as hospitals, will be liable only for the harm they cause in excess of the harm they would have caused had they (consistently) conformed to the standard of reasonable care. This liability regime shifts the focus from the injurer's conduct in each incident to the outcome of their behavior over time. Much like a strict liability regime, a regime that assigns liability only for excessive harm does not require an inquiry into the injurer's conduct in each incident. Instead, liability will be set at a value equal to the entire harm, discounted by a fixed sum equal to the expected harm to patients given reasonable care. Under this suggested regime, the injurer is liable only for the harm that could have been reasonably prevented, as is the case under a negligence regime. We therefore call it strict liability for unreasonable harm (SLUH).

For example, assume that 150 patients contract a hospital-acquired infection in a given month. Applying SLUH, a court would have to determine if and by how much these infections exceed the number of infections that would have occurred had the hospital taken reasonable infection-preventing measures. By using data on the risk of infections from randomized-control studies and from other hospitals, the court can determine the reasonable level of harm (e.g., given the number of patients admitted to the hospital, only 100 patients should have contracted an infection assuming the hospital implemented reasonable practices).[13] Under SLUH, the court should hold the hospital liable for the harm of 50 patients, without examining the risk-reducing practices of the hospital's personnel in each incident.[14]

SLUH follows the same structure as scientific inquiry into conduct and causation. In a case of hospital-acquired infection, no scientist should be comfortable stating with any conviction that a particular patient would have fared better if he or she had received different care.[15] However, it is possible to ascertain, with some level of certainty, that more patients contracted infections than is generally the case when reasonable infection-preventing measures are taken.[16]

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[13] *See infra* text accompanying note 90.

[14] Since under SLUH there is no way to determine which patient suffered harm as a result of negligence, the hospital should pay each patient partial damages, equal to the share of excess harm relative to the entire harm. Procedurally, patients will file an aggregated action, similar to a class action. *See infra* Part 3.1.

[15] Determining causation, as a scientific endeavor, suffers from a known missing data problem—for any person examined in the study we know only the outcome that materialized for the received treatment, but we cannot know what would have been the outcome of any other (control) treatment. For that reason, science can only infer average causal effects for many individuals. *See* GUIDO W. IMBENS & DONALD B. RUBIN, CAUSAL INFERENCE FOR STATISTICS, SOCIAL, AND BIOMEDICAL SCIENCES—AN INTRODUCTION, 14 (2015) (explaining that "the problem of causal inference is. . . a missing data problem: given any treatment assigned to an individual unit, the potential outcome associated with any alternate treatment is missing").

[16] For example, if given reasonable care, patients have a 5% average risk of suffering

The use of SLUH as an alternative to the current liability regime for medical facilities solves many, if not most, of the shortcomings plaguing the current system. As hospitals' liability under SLUH is not dependent on the availability of evidence regarding conduct, hospitals and their employees will have no incentive to adopt defensive practices or hide information about errors to reduce liability risk. SLUH is also likely to save hospitals and patients money because it costs much less per incident than the current regime.

Analyzing SLUH as an alternative to current medical malpractice law is not merely a theoretical exercise. Several medical associations, such as the American Heart Association (AHA) and the American College of Surgeons (ACS), have used similar systems to detect avoidable risks and make recommendations to hospitals about managing them.[17] By collecting information from various hospitals and studies about patients' characteristics, ailments, treatments, and outcomes, these organizations can assess how many patients should be expected to suffer complications if the hospital treats all patients adequately, and by comparing the anticipated level of each complication to a hospital's outcomes, deduce which risk-reducing practices the hospital is not implementing adequately. The SLUH regime also uses similar data to assign liability.

The article continues as follows. Part 2 describes several shortcomings of current medical malpractice law. Tort liability might encourage physicians to adopt defensive practices, such as performing unnecessary tests and procedures to reduce liability risk, and might discourage hospitals from mitigating the risk of future errors following an incident. In addition, the administrative costs of the medical malpractice regime are very high relative to the damages paid out to victims. Lastly, because negligence is difficult and expensive to prove, only a tiny fraction of patients with valid claims are ever compensated, resulting in underdeterrence in the current regime.

Part 3 considers the application of SLUH to medical facilities. It shows that when a medical facility treats a sufficient number of patients, applying SLUH reduces the incentives to practice defensive medicine

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from an infection, then we can reasonably reject the hypothesis that all patients received reasonable care given a rate of patients who contract an infection exceeding 5% by a large enough margin. Patients might face an elevated risk of infection but a lower risk of other complications. These outcomes might be a result of the same decision. *See* Leslie D Hillis et al., *2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines*, 124 CIRCULATION 652, §5 (2011) (presenting the data on adverse clinical outcomes of surgery patients and risk-assessment models that estimate the rates at these various adverse events occur). For example, if the hospital decided to reduce the time between admission and treatment, it might increase the risk of some complications but reduce risks associated with delay in treatment. A comprehensive liability regime should consider all the risk associated with the treatment together. *See infra* Part 3.1.

[17] *See infra* Part 3.3.

and increases enforcement without adding administrative costs. It also shows how courts can deal with the risk of error in the assignment of liability. Lastly, it shows how current data regarding various risks of complications from medical care can be utilized for implementing SLUH.

Part 4 considers the objections and limitations of SLUH compared to other alternatives. One objection is that victims of medical malpractice are unidentified and undercompensated under SLUH. As explained in this part, while the criticism is valid, SLUH should be compared to the "law in action" and not to the ideal application of current medical malpractice law. Under the current liability regime, most victims of negligent treatment receive no compensation, and compensation is limited for the rest due to the high administrative costs of legal proceedings. Another objection to SLUH is that it encourages medical centers to adopt short-term safety practices while discouraging long-term investments. Part 4 shows that SLUH could be adjusted so as to not discourage long-term investments in care. The last objection is that other alternatives to the current medical malpractice law might be superior to SLUH. These alternatives are also considered.

Part 5 suggests other possible areas where SLUH can be used. It shows that SLUH is warranted whenever three conditions are met: (i) the total harm across cases is verifiable; (ii) it is possible to determine the reasonable harm for the injurer across time; and (iii) the injurer causes enough harm to justify a statistical inference. Typical injurers that meet these conditions include, for example, product manufacturers, car fleets, and polluters. Applied to these types of injurers, SLUH can create better incentives to take reasonable and decide on whether to participate in a risky activity than do negligence or strict liability regimes. Part 5 further shows that SLUH might be especially beneficial when applied to artificial intelligence (AI) devices and products which, despite possibly reducing accident rates, are involved in accidents that reasonable humans would avoid.

Part 6 concludes the discussion.

2. THE CHALLENGES OF A NEGLIGENCE REGIME

The example that opened this article illustrates a case of hospital-acquired infection. Unfortunately, infections in hospitals are common and very often preventable.[18] Every year, one in every twenty

[18] The Centers for Disease Control and Prevention (CDC) considers healthcare-associated infections as one of the "winnable battles," defined as a public health risk with large-scale impact on health and proven strategies that can substantially ameliorate it. *See* Centers for Disease Control and Prevention, *Healthcare-Associated Infections (HAIs)*, CDC WINNABLE BATTLES FINAL REPORT (November 2016), https://stacks.cdc.gov/view/cdc/43072 (hereinafter WINNABLE BATTLES REPORT). According to the CDC it is possible to prevent up to 70% of healthcare-associated

hospitalized patients contracts an infection, resulting in some 100,000 deaths annually.[19] Medical errors generally, including adverse drug events,[20] diagnostic errors,[21] wrong-site surgery,[22] and foreign objects left inside a patient during surgery,[23] contribute to approximately 100,000 more preventable deaths annually.

Theoretically, negligence law should encourage hospitals to reduce the risk of accidents to the optimal level, and, when they fail to do so, compensate the victim. If hospitals know, for example, that they will bear liability whenever they fail to take cost-justified precautions, they will take adequate care.[24] However, the current medical malpractice system does not promote efficiency or safety. While the United States leads in health expenditures per capita compared to other OECD countries,[25] it

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infections. For an analysis of prevention efforts in hospitals, *see* Patchen Dellinger et al., *Hospitals Collaborate to Decrease Surgical Site Infections*, 190 AM. J. SURGERY 9 (2005) (states that many hospitals underutilize simple procedures that are known to reduce surgical-site infections. Hospitals that participated in the study implemented several practices and reported 27% decrease in infection rate).

[19] *See* Sarah L. Krein et al., *Preventing Hospital-Acquired Infections: A National Survey of Practices Reported by U.S. Hospitals in 2005 and 2009*, 27 J. GENERAL INTERNAL MED. 773, 773 (2012) (citing several studies reporting that the rate of hospitals-acquired infections is 5%–10%, resulting in approximately 99,000 deaths in 2002). *See also*, WINNABLE BATTLES REPORT, *supra* note 18, at 9 (same).

[20] *See, e.g.*, Brian J. Kopp et al., *Medication Errors and Adverse Drug Events in an Intensive Care Unit: Direct Observation Approach for Detection*, 34 CRITICAL CARE MED. 415 (2006) (revealing that adverse drug events commonly occur in hospitalized patients and are frequently associated with human error.)

[21] *See, e.g.*, David E. Newman-Toker & Peter J. Pronovost, *Diagnostic Errors—The Next Frontier for Patient Safety*, 301 JAMA 1060 (overviewing current studies about the scope of medical adverse events due to diagnostic errors.).

[22] *See, e.g.*, Richard S. Yoon et al., *Using 'Near Misses' Analysis to Prevent Wrong-Site Surgery*, 37 J. HEALTHCARE Q. 126 (noting that wrong-site procedures in the United States, including surgeries, occur at least forty times a week.).

[23] *See, e.g.*, Verna C. Gibbs et al., *Preventable Errors in the Operating Room: Retained Foreign Bodies After Surgery—Part I*, 44 CURRENT PROBS. SURGERY 281 (2007) (discussing the large scope of adverse medical outcomes due to retained surgical items in the United States).

[24] The analysis assumes that hospitals can be directly or indirectly liable for patients, and indeed that is the case. When a hospital fails to adopt reasonable practices, it can be directly liable via corporate negligence doctrine, which does not require the plaintiff to establish the negligence of a third party. *See* Thompson v. Nason Hosp., 527 Pa. 330, 339 (1991). Furthermore, hospitals are vicariously liable for the negligent practices of its surgeons, nurses, and other members of the medical staff. *See* Johns v. Jarrard, 927 F.2d 551, 556 (11th Cir. 1991) (stating that hospitals are vicariously liable for the malpractice of its emergency room physicians merely by assuming control over their time, regardless of the hospital's ability to control their performance); Atwood v. UC Health, 2018 U.S. Dist. LEXIS 146817 (same). Last, hospitals may even be liable for the negligence of an independent, private attending physician, if it creates the impression that the physician acts on behalf of the hospital. *See* I.M. v. United States, 362 F. Supp. 3d 161, 199 (2019) ("vicarious liability for the malpractice of a private attending may also be imposed upon on a hospital under a theory of apparent or ostensible agency").

[25] According to the OECD, in 2019 the U.S.'s expense on health was 16.8% of its GDP.

has a high annual rate of treatable mortality cases relative to other countries.[26] Patient safety might be in an even worse state. Preventable medical error is estimated to be the third leading cause of death in the United States.[27] The current system also fails to adequately compensate victims, with the vast majority of victims receiving either partial or no compensation for their injuries.[28]

The relationship between medical malpractice liability and the cost and safety of medical care is complex, involving several effects simultaneously. First, there are several ways in which the current legal regime affects the incentives of physicians and hospitals to invest in risk-reducing practices, for example by prioritizing attention to health risks that are more likely to trigger litigation over others that are seldom followed by a lawsuit. Second, the current system requires extensive evidence to support and defend against a claim, making it extremely expensive for the parties. Last, since winning a medical malpractice claim is expensive and difficult, few victims of medical malpractice sue, and even fewer receive full compensation.[29]

There is an extensive empirical debate over the severity of these problems, and this article is not the place to resolve them.[30] Instead, this

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The expenditure of the second highest country, Germany, is only 11.7% of its GDP. The gap is even larger when measured in dollars per capita. *See* Joint OECD, EUROSTAT and WHO Health Accounts SHA Questionnaires (JHAQ), available at https://stats.oecd.org/Index.aspx.

[26] Treatable mortality are deaths that can be avoided through timely and effective healthcare interventions. According to the OECD, all western European countries, as well as Chile, Israel, Slovenia, Canada, Australia, New Zealand, and Korea have a lower rate of treatable mortality than the United States. Data for the calculation of treatable and preventable mortality are drawn from the WHO Mortality Database available at http://www.who.int/healthinfo/statistics/mortality_rawdata/en/index.html.

[27] See John T. James, *A New, Evidence-Based Estimate of Patient Harms Associated with Hospital Care*, 9 J. PATIENT SAFETY, 122 (2013) (estimating that more than 200,000 people die annually in the United States due to medical error); John T. James, *Deaths from Preventable Adverse Events Originating in Hospitals*, 26 BMJ QUALITY & SAFETY 692, 692–93 (2017) (same); Martin A. Makary & Michael Daniel, *Medical Error—The Third Leading Cause of Death in the U.S.*, 353 BMJ (2016) (same); Kaveh G. Shojania & Mary Dixon-Woods, *Estimating Deaths Due to Medical Error: The Ongoing Controversy and Why It Matters*, 26 BMJ 423 (2017) (claiming that the estimation of one-quarter-million deaths per year is likely an underestimation, making medical error the third leading cause of death in the United States).

[28] Paul C. Weiler, *Reforming Medical Malpractice in a Radically Moderate—and Ethical—Fashion*, 54 DEPAUL L. REV. 205, 215 (2005) ("[T]here is just one paid malpractice claim for every twenty-one negligent medical injuries").

[29] The tendency of medical malpractice victims not to sue also makes medical malpractice law a poor deterrent. *See* TOM BECKER, THE MEDICAL MALPRACTICE MYTH, 22–44 (2005) (claiming that the real problem is too little litigation and too many incidents of medical malpractice).

[30] For an extensive evidence-based examination of the challenges of the medical malpractice system, as well as critical analysis of the effects of tort reforms on outcomes and medical costs, *see* BERNARD BLACK ET AL., MEDICAL MALPRACTICE LITIGATION: HOW IT WORKS, WHY TORT REFORM HASN'T HELPED (2021).

part analyzes the main shortcomings of the current medical system, namely how it distorts incentives, creates substantial implementation costs, and undercompensates victims of negligent care. The following part will then show how SLUH can be applied to medical facilities and how adopting SLUH reduces incentives for defensive medicine, encourages better safety practices, offers higher compensation to victims, and reduces administrative costs (per incident).

2.1. Distorted Incentives

Negligence law encourages injurers to take reasonable care, provided the courts can clearly define a standard of care, in term of reasonable precaution measures, and know what measures were taken. When the standard of care is unclear or there is a lack of evidence regarding the healthcare's risk-reducing measures, healthcare providers may prefer measures that reduce liability over measures that reduce actual risk to the patient. There are three typical ways in which a negligence regime can create such distortion by encouraging hospitals to: (i) reduce risks that might trigger a lawsuit while ignoring other risks that are less often the focus of litigation; (ii) perform tests and procedures that produce evidence of due care, even when they are not medically justified; and (iii) discourage physicians from engaging in conduct that is beneficial for patients but may be used as evidence of negligence.

2.1.1 Prioritizing Measures that Are Part of the Negligence Inquiry

For negligence law to successfully serve as a deterrent, courts must define a clear standard of care, accounting for all risk-reducing measures and their costs and benefits. A choice must therefore be made as to the level of abstraction at which fault will be determined.

Consider the following example.

> Example 2. *Foreign object*. Masha underwent stomach surgery. During the procedure, the surgeon used several sponges. Two nurses in the operating room independently counted every sponge used and counted the sponges again at the end of the surgery. Both nurses miscounted, and one sponge was left inside Masha's stomach and caused her harm.[31]

When courts examine such a case, they might focus on the surgeon's actions and deem negligent any surgeon who forgets a sponge inside a patient during surgery, considering that it is obviously standard practice to remove them. However, these accidents are usually caused by lapses

[31] The example is loosely based on the facts in Cefaratti v. Aranow, 138 A.3d 837 (Conn. 2016).

in attention, and there will always be at least some unavoidable lapses.[32] As errors are inevitable, we might broaden the scope of the negligence inquiry, moving away from the particular conduct (leaving the sponge) and basing the standard of care on the measures the surgeon takes to reduce the risk of errors, such as counting the sponges during the surgery.[33] Basing liability on practices designed to reduce errors means that surgeons will be considered negligent if they fail to take precautions that can reduce the risk of patient harm and are economically justifiable given the probability and magnitude of the harm.[34] In Example 2, the surgical team included two nurses tasked with reducing the risk of leaving a foreign object behind during surgery. It might be the case that placing a third nurse in the room and asking him or her to triple-check the number of sponges used at the start and end of every surgery could reduce the risk even further. But that does not mean that adding this precaution is warranted. The cost of hiring a third nurse might outweigh the benefit of doing so, both financially and in terms of drawing care away from other patients. Even if having a third nurse is justified, we can further ask about a fourth, fifth, and so forth. It is clear that at some point, which we label the standard of care,[35] further precautions are unjustified, even though some medical errors will still occur.

However, focusing only on error-reducing precautions might still miss parts of the picture. Some factors contributing to the risk of medical error are beyond the physician's control, but can be mitigated by the hospital. For example, high patient load increases the risk of error in a

[32] ALAN MERRY & ALEXANDER MCCALL SMITH, ERRORS, MEDICINE AND THE LAW, 72–97, 127–51 (2006) (discussing common reasons for medical negligence, suggesting that most medical errors are a result of a momentary lapse in attention).

[33] Indeed, not every medical error is considered a result of negligence. *See, e.g.*, Schueler v. Strelinger, 43 N.J. 330, 204 A.2d 577, 584 (1964) ("if the doctor has brought the requisite degree of care and skill to his patient, he is not liable simply because of failure to cure or for bad results that may follow. Nor in such case is he liable for an honest mistake in diagnosis or in judgment"). For a model of negligence that accommodates lapses in attention to the negligence inquiry, *see* Cooter & Ariel Porat, *Lapses of Attention in Medical Malpractice and Road Accidents*, 15 THEORETICAL INQ. L. 329, 348–50 (2014) (distinguishing between first-order precautions that affect the probability of an accident and second-order precautions that changes the probability distribution of the former acts).

[34] This, of course, is the standard conception of the calculus of negligence, also known as the Learned Hand rule. *See,* U.S. v. Carroll Towing Co., 159 F. 2d 169 (1947); *see also*, Richard A. Posner, *A Theory of Negligence*, 1 J. LEGAL STUD. 29, 29–34 (1972). For an economic comparison of negligence and other liability regimes, *see* Guido Calabresi & Jon T. Hirschoff, *Towards a Test for Strict Liability in Torts*, 81 YALE L.J. 1055 (1972); Steven Shavell, *Strict Liability versus Negligence*, 9 J. LEGAL STUD. 1 (1980); William M. Landes & Richard A. Posner, *The Positive Economic Theory of Tort Law*, 15 GA. L. REV. 851, 875–76, 905–12 (1981).

[35] For an economic analysis of the standard of care, *see* Steven Shavell, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW, 180–89 (2004); Robert Cooter & Thomas Ulen, LAW & ECONOMICS, 205–08, 211–17 (6th ed. 2016).

hospital setting.[36] If a physician must treat several patients, any time added to the treatment of one patient reduces the risk of error for that patient but increases the risk for others. Sleep deprivation is another factor that aggravates the risk of error and might be beyond the physician's control. Medical residents, for example, often work 80 hours per week, which limits their free time and ability to rest properly.[37] Hospitals can alleviate the risk of medical errors due to workload and sleep deprivation by hiring additional staff. Thus, we can reach a further level of abstraction of the negligence inquiry, from the treating physician to the hospital's investment in personnel and other error-reducing investments.[38]

Such a shift in focus from medical personnel to their institutional level has been promoted by proposals to adopt "hospital enterprise liability" as a way to remedy problems with current medical malpractice law. Enterprise liability places sole responsibility on the hospital for any

[36] *See* C. A. Bond et al., *Medication Errors in United States Hospitals*, 21 PHARMACOTHERAPY: J. HUM. PHARMACOLOGY & DRUG THERAPY 1023, 1031–32 (2001) (showing that the risk of medication errors increases substantially with workload); Jack Needleman et al., *Nurse-Staffing Levels and the Quality of Care in Hospitals*, 346 NEW ENG. J. MED. 1715, 1719–20 (2002) (patients receiving a higher proportion of hours of care per day had shorter lengths of stay and lower rates of complications); Pascale Carayon & Ayşe P. Gürses, *A Human Factors Engineering Conceptual Framework of Nursing Workload and Patient Safety in Intensive Care Units*, 21 INTENSIVE & CRITICAL CARE NURSING 284, (2005) (showing that greater nursing workload, specifically in an ICU, is associated with adverse patient outcomes); Vicki Montgomery, *Effect of Fatigue, Workload, and Environment on Patient Safety in the Pediatric Intensive Care Unit*, 8 PEDIATRIC CRITICAL CARE MED. 11, 13–14 (2007) (accumulated evidence suggests that fatigue and excessive workload have a high potential to contribute to medical error in the pediatric intensive care unit); Neil D'Souza et al., *Modern Palliative Radiation Treatment: Do Complexity and Workload Contribute to Medical Errors?*, 84 INT'L J. RADIATION ONCOLOGY–BIOLOGY–PHYSICS 43, 46–48 (increasing workload and complexity directly impacts safety and accuracy of treatment).

[37] *See, e.g.*, Sigrid Veasey et al., *Sleep Loss and Fatigue in Residency Training: A Reappraisal*, 288 JAMA 1116, 1122–23 (2002) (analyzing studies on sleep deprivation and physician performance of surgical and nonsurgical residents, suggesting that sleep deprivation negatively affect performance in both groups over time); Teodor P. Grantcharov et al., *Laparoscopic Performance After One Night on Call in a Surgical Department: Prospective Study*, 323 BMJ 1222, 1223 (2001) (demonstrating higher complication rates, longer operative times, and higher error rate when procedures are performed after a night on call); Steven W. Lockley, *Effect of Reducing Interns' Weekly Work Hours on Sleep and Attentional Failures*, 351 NEW ENG. J. MED. 1829, 1835 (2004) (demonstrating that "[t]he acute and chronic sleep deprivation inherent in the traditional schedule caused a significant increase in attentional failures in interns working at night"); Peter Bartel et al., *Attention and Working Memory in Resident Anaesthetists After Night Duty: Group and Individual Effects*, 61 OCCUPATIONAL & ENV'T MED. 167, 169–70 (2004) (associating performance deficits in resident anesthetists with the frequency of night duty and hours of work per week).

[38] A hospital's negligence inquiry should also take into account investment in equipment. If different types of preventative measures are not independent, this further complicates the inquiry into the hospital's conduct.

failure to provide reasonable care for its patients,[39] but patients still must prove either negligence on the part of the doctor or nurse, or that the hospital failed to ensure a proper standard of medical care.[40]

It is too complex for courts to review all the practices that might directly or indirectly affect risk, so they may simplify the inquiry by focusing on a physician's conduct, for example, while ignoring other factors.[41] Such simplification is not a feature of the negligence regime, under which the costs and benefits of any risk-reducing measure should be considered,[42] but it reduces litigation costs in an overly complex system.[43]

Courts simplify the problem of defining the standard of care in two ways. First, they reduce the level of abstraction, focusing, for example, on the medical staff's decisions but not reviewing the decision-making process.[44] Second, courts can reduce complexity by including only a

[39] *See* Barry R. Furrow, *Enterprise Liability and Health Care Reform: Managing Care and Managing Risk*, 39 ST. LOUIS U. L.J. 79, 109 (1994) ("The hospital is arguably in the best position to monitor conduct within its walls, to enforce adherence to policies, and to provide a source of compensation to injured patients")

[40] *See, e.g.*, Thompson v. Nason Hosp., 527 Pa. 330, 339 (1991).

[41] In actions brought against hospitals for their direct liability (as opposed to vicarious liability), plaintiffs might claim that the hospital failed to acquire a medical device that could have reduced the risk of accidents. *See, e.g.*, Washington v. Wash. Hosp. Ctr., 579 A.2d 177, 180 (D.C. 1990) (hospital was directly liable for failing to provide a device which allows early detection of insufficient oxygen in time to prevent brain injury).

[42] A negligence regime creates optimal incentives for injurers to invest in care only when all the benefits and costs of the (untaken) precaution measures are considered. *See* Robert Cooter & Ariel Porat, *Does Risk to Oneself Increase the Care Owed to Others? – Law and Economics in Conflict*, 29 J. LEGAL STUD. 19, 26 (2000) (Explaining that for the Learned Hand Rule to create efficient incentives courts should consider every reduction in marginal risk including self-risk to the tortfeasor); Ariel Porat, *Misalignments in Tort Law*, 121 YALE L. J. 82, 129–33 (2011) ("[e]fficiency would be achieved if the court, when setting the standard of care, were to take into account all risks that would have been reduced had precautions been taken").

[43] *See* Giuseppe Dari-Mattiaci, *On the Optimal Scope of Negligence*, 1 REV. L. & ECON. 331 (2005) (arguing that an increase in the administrative costs of systems reduces the number of precautionary measures that courts will view as relevant for establishing negligence); Joshua C. Teitelbaum, *Computational Complexity and Tort Deterrence*, J. LEGAL STUD. (forthcoming, 2023) (explaining that when a choice set of precautionary measures is one dimensional and convex, then optimal care is algorithmically tractable. However, when a choice set of precautionary measures is multidimensional and contains only discrete elements, optimal care is algorithmically intractable).

[44] This strategy is famously exercised in cooperate law via the business judgment rule. In *Smith v. Van Gorkom*, 488 A.2d 858, 872 (Del. 1985), the Delaware Supreme Court held as a presumption that a firm's board of directors have met their duty of care, unless the plaintiff can prove that directors did not act on an informed basis or in honest belief that the action taken was in the best interests of the company. Hence, the rule focuses on the decision-making process instead of the decision to avoid discouraging profit-maximizing decision from the fear of *ex post* negligence determinations. *See, e.g.*, Kenneth B. Davis Jr., *Once More, the Business Judgment Rule*, 2000 WIS. L. REV. 573 (2000) ("[T]he focus is not on what the hypothetical reasonable director would have done but on what some rational director might have done. . . [I]t serves as an objective confirmation of the

subset of the precautionary measures and risks in their negligence inquiry and ignoring other measures.[45]

Focusing on only some risks while ignoring others distorts healthcare facilities' incentives. In Example 2, the hospital tasked two nurses with counting the sponges at the beginning and end of a procedure. While counting the sponges reduces the risk of leaving any behind, it prolongs the procedure, thus increasing the risks posed by extended surgery.[46] If complications from prolonged surgery are not factored into the negligence inquiry, hospitals might overinvest in care measures intended to reduce the risk of leaving a foreign object in a patient while underinvesting in care measures that reduce complications from prolonged surgeries. Their incentive for doing this may be to reduce liability risk, even though such practices increase other risks to patients, which are usually not part of the negligence inquiry.[47]

Thus, this tradeoff between setting the optimal standard of care and simplifying the negligence inquiry means that negligence law cannot create optimal incentives to invest in care measures. Focusing the inquiry on particular risks and preventative measures incentivizes injurers to invest in measures that reduce liability, not necessarily those that are socially desirable.

The gap between risk-reducing and liability-reducing measures might explain why studies find that hospitals underinvest in preventing hospital-acquired infections:[48] if the risk of contracting an infection is mostly beyond the scope of the negligence inquiry, hospitals may prefer to invest in other measures that more directly affect liability.

2.1.2. Encouraging Defensive Medicine

A second problem of basing medical malpractice liability on the medical staff's conduct is that it encourages practicing defensive medicine, that is, administratively costly, medically unwarranted treatments and

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critical, but entirely subjective, requirement that the directors have a good faith belief that their decision is in the corporation's best interest").

[45] *See* Dari-Mattiacci, *supra* note 43, at 350–51 (showing how an increase in administrative costs curbs the number of precautionary measures that courts will consider relevant for a finding of negligence. the optimal scope of negligence balances the advantages of a broader scope, in terms of better incentives, with its administrative costs).

[46] There are risks associated with longer procedure time. For example, the risks from general anesthesia increase with time. Similarly, longer surgeries run a higher risk of surgical-site infection and other complications. *See, e.g.*, Eiko Imai et al., *Surgical Site Infection Risk Factors Identified by Multivariate Analysis for Patient Undergoing Laparoscopic, Open Colon, and Gastric Surgery*, 36 J. INFECTION CONTROL 727 (identifying extended duration of surgery as an independent risk factor for surgical-site infections).

[47] Removing certain measures and risks from the negligence inquiry reduces incentives to invest in these measures while simplifying the decision, meaning it requires less evidence and time to assign liability.

[48] *See supra* notes 4-5.

diagnostic tests because they may decrease liability.[49]

For example, suppose physicians fear that whenever a congenital disability that a costly prenatal test can detect is misdiagnosed, there is a high risk they will bear liability for not administering a test. These physicians might mitigate the risk by overprescribing the test, even when it is not medically needed. Many physicians believe "defensive medicine is widespread and practiced the world over, with serious consequences for patients, doctors, and healthcare costs."[50] Some empirical evidence supports this claim, showing that tort reform, intended to reduce liability risk, has reduced medical expenditure and treatment intensity while not affecting patient outcomes, suggesting that some procedures and tests were performed to reduce liability risk, and not to treat patients.[51]

However, not all defensive practices are captured by looking at expenditure. Physicians might opt for a treatment that burdens the patient more than it reduces liability risk. For example, physicians might overprescribe a prenatal diagnostic test even when the test carries more risks than it can ultimately prevent, as long as the risks are not considered in the negligence inquiry.[52] Similarly, a physician might recommend

[49] *See* Steve Boccara, *Medical Malpractice*, *in* TORT LAW AND ECONOMICS 341, §12.4.4 (Michael Faure ed., 2009) (reviewing the law and economic literature on defensive medicine both from a theoretical and an empirical perspective); Mitchell Polinsky & Steven Shavell, *Punitive Damages: An Economic Analysis*, 111 Harv. L. Rev. 869, 879–80 (1998) (considering the case of excessive spending on precautions and defensive behaviors in cases where damages exceed harm); Ariel Porat, *Offsetting Risks*, 106 MICH. L. REV. 243, 264 (2007) ("One of the most undesirable outcomes of medical malpractice liability is defensive medicine. . . When a doctor must choose between two courses of action and cannot be sure which one is more reasonable or which one a court will find reasonable in the event that the patient sues, he will choose the action that is the least risky for him").

[50] *See* Sandro Vento, et al., *Defensive Medicine: It Is Time to Finally Slow Down an Epidemic*, 6 WORLD J. CLIN. CASES 406, 406 (2008). Most claims about the spread and costs of defensive medicine are less reliable, as they are based on questionnaires. *See* Nicholas Summerton, *Positive and Negative Factors in Defensive Medicine: A Questionnaire Study of General Practitioners*, 310 BMJ 27 (1995) (98% of 300 practitioners that answered the survey reported some defensive practices). Since doctors have financial incentive to report about defensive practices, especially anonymously, there is always a fear that reports of defensive medicine are exaggerated. *See* BECKER, *supra* note 29 (claiming that blaming tort law for the failings of the medical system is based on a myth, and that there is no convincing evidence of defensive medicine).

[51] *See* Daniel Kessler & Mark McClellan, *Do Doctors Practice Defensive Medicine?*, 111 QUART. J. ECON. 353 (1996) (finding that malpractice reforms lead to reductions of 5% to 9% in medical expenditure without substantial effects on mortality or medical complications among elderly Medicare beneficiaries); Ronen Avraham & Max Schanzenbach, *The Impact of Tort Reform on Intensity of Treatment: Evidence from Heart Patients*, 39 J. HEALTH ECON 278 (2015) (finding that caps on noneconomic damages reduced the use of bypass surgery among heart patients without affecting patient outcomes). *But see* Frank A. Sloan & John H. Shadle, *Is There Empirical Evidence for 'Defensive Medicine'? A Reassessment*, 28 J. HEALTH ECON. 481 (2009) (finding that tort reform did not affect medical expenses, nor did it affect patient outcome).

[52] Amniocentesis test identifies many birth defects but carries a substantial cost and risk

surgical delivery (C-section),) which reduces risks for the newborn but causes more harm to the mother because surgical delivery reduces liability risk. Physicians are sued for not recommending surgery when it would have prevented harm to the baby, while they are rarely sued for recommending surgery as a safer alternative.[53]

Defensive medicine effectively reduces liability because current medical malpractice law focuses on conduct. If courts did not examine their conduct, physicians and hospitals would not be encouraged to invest in producing evidence attesting to their reasonableness.

2.1.3. Discouraging Risk-Reducing Practices

A third, seldom discussed concern that may be seen as a parallel to defensive medicine is that the current liability regime may adversely affect how healthcare providers behave after an accident has occurred, fearing that their behavior will constitute evidence of fault while reducing potential harm after an accident.[54] While defensive medicine refers to actions designed produce evidence of reasonable conduct, physicians can also reduce liability by avoiding actions that produce evidence of fault after an accident has occurred. This may increase the risk of harm to other patients or may further harm patients who have already suffered an accident. Consider the following example.

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of complications, not the least of which is the risk of miscarriage. *See*, *e.g*., Ann Tabor & Zarko Alfirevic, *Update on Procedure-Related Risks for Prenatal Diagnosis Techniques*, 27 FETAL DIAGNOSIS & THERAPY 1 (2010) (review of the literature, showing the risk of a miscarriage following amniocentesis is 0.5-%–1%, and that this estimation is highly dependent on the physician's experience. *C.f.*, Ryan A. Harris et al., *Cost Utility of Prenatal Diagnosis and the Risk-Based Threshold*, 363 LANCET 276 (2004) (claiming that the costs and risks of amniocentesis are exaggerated, and that the test should be offered to any expecting mother). For a case where physicians were found liable for not performing amniocentesis, *see*, *e.g*., Jenkins v. Hosp. of the Med. Coll. of Pa., 401 Pa. Super. 604, 585 A.2d 1091 (1991) (allowing a mother's wrongful birth cause of action, based on the physician's failure to perform amniocentesis test). There is empirical evidence that obstetricians prescribe excessive amniocentesis tests to avoid liability. *See* Beomsoo Kim, *The Impact of Malpractice Risk on the Use of Obstetrics Procedures*, 36 J. LEGAL. STUD. 79 (2007) (finding that amniocentesis is responsive to the threat of tort, but that C-sections and other tests are not).

[53] Some evidence suggests that obstetrics over-recommend surgical delivery to reduce liability risk. *See* Joshua D. Dahlke et al., *Evidence-Based Surgery for Cesarean Delivery: An Updated Systematic Review*, 209 AM. J. OBSTETRICS & GYNECOLOGY 308 (2013) (showing that the rate of cesarean delivery has increased dramatically since the 1990s and that this increase is associated with an increase in maternal morbidity and mortality).

[54] For a general discussion on the effects of evidentiary concerns on primary behavior, *see* Gideon Parchomovsky & Alex Stein, *The Distortionary Effect of Evidence on Primary Behavior*, 124 HARV. L. REV. 518, 524–28 (2010) (maintaining that "[e]ach actor has a strong incentive to behave in a way that generates evidence favorable to her case in court. This evidentiary motivation will often undermine substantive law's efforts to minimize harm at the lowest possible cost."); Michael S. Pardo, *Some Remarks on the Importance of Evidence outside of Trials*, 36 REV. LITIG. 443, 466–47 (2016) (same).

> Example 3. *Falling patient*. Edmond underwent surgery. During the procedure, Edmond's body was not secured to the surgical table and he fell, resulting in harm to his shoulder. Nassima, Edmond's surgeon, considers how to communicate the incident to Edmond and others in general.[55]

Example 3 illustrates how liability risk might affect the decision to engage in conduct that, while beneficial, can increase liability risk. When a medical error, negligent or not, occurs, open communication between doctor and patient is essential for continued care, as well as for the patient's psychological well-being.[56] For instance, Nassima may wish to apologize to Edmond for what happened during the procedure. Nevertheless, the hospital's legal counsel might instruct Nassima to limit communication and especially refrain from apologizing, fearing that an apology would later be viewed as an admission of fault.

Nassima might also be discouraged from informing others about what happened in the operating room. While it is necessary to report accidents to increase patient safety, accident reports can be used as evidence of fault.[57] In addition, the purchase of new equipment in the wake of an accident may be viewed as an admission that the old equipment was sub-par, so the hospital might forgo such a purchase in order to reduce its liability risk, even though it needs the new equipment to reduce a known risk for future patients.[58]

Patient safety is also promoted by sharing information with them and with others. Some hospitals might therefore adopt technology that increases patient safety by recording information, even though they know the data can also be used to prove fault. For example, electronic health records (EHRs) promote documentation and easy access to patient information, and thus improve communication between doctors. The lack of or mistaken transfer of information between physicians is a known source of errors, so simplifying communication should promote

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[55] For a case where plaintiff alleges the physician failed to take adequate care measures, resulting in the patient's body falling from the table during surgery, *see* Locklear v. Cummings, 262 N.C. App. 588 (2018).

[56] *See* Aaron Lazare, The Healing Forces or Apology in Medical Practice and Beyond, 57 DEPAUL L. REV. 251(2007).

[57] *See* Michelle M. Mello & Troyen A. Brennan, *Deterrence of Medical Errors: Theory and Evidence for Malpractice Reform*, 80 TEXAS L. REV. 1595, 1602 (2002) (claiming that while public health authorities try to use formal reporting systems to gather information about errors to increase patient safety, hospitals and practitioners object to such efforts due to fear that such reports are not insulated from legal discovery during medical malpractice proceedings).

[58] Federal rules of evidence prohibit plaintiffs from presenting evidence of actions the defendant took after the accident to prevent similar accidents as proving fault. *See* FED. R. EVID. 407 ("When measures are taken that would have made an earlier injury or harm less likely to occur, evidence of the subsequent measures is not admissible to prove: negligence. . .").

patient safety.[59] Using EHRs also allows doctors to use clinical decision support systems, which may further reduce medical errors.[60] However, EHRs also create discoverable evidence, especially metadata, which can later be used to prove liability.[61] While efficiency would require physicians to adopt EHRs based only on the system's costs and outcomes, physicians also consider the liability risks of implementing EHRs. As a result, EHR is underused.[62] Furthermore, when some information is automatically recorded in EHRs, such as monitored information in an intensive care unit, that information might be given excessive weight in treatment decisions to reduce liability risk, as recorded information can later be used as evidence in litigation.[63]

One way to overcome the disincentive to adopt such risk-reducing practices is to prohibit plaintiffs from presenting evidence of them in court. For example, many U.S. states have enacted "apology laws" that make statements of apology, sympathy, and condolence inadmissible at trial, thus eliminating the distortionary effect of using the apology as evidence of fault.[64] Similarly, the Federal Rules of Evidence state that

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[59] Communication between physicians, especially during patient hand-offs (transfers between units and shifts) in ICU, preoperative care, and emergency units is strongly connected to patient safety. The risk of errors due to miscommunication can be ameliorated by implementing EHRs. *See* Martin Muller et al., *Impact of the Communication and Patient Hand-off Tool SBAR on Patient Safety: A Systematic Review*, 8 BMJ OPEN 1 (2018) (meta-analysis of several studies found evidence that a communicational tool helped improve patient outcomes).

[60] *See, e.g.*, Mohamed Ramadan & Khalid Al-Saleh, *Development of an Expert System for Reducing Medical Errors*, 4 INT'L J. SOFTWARE ENGINEERING & APPLICATIONS 29 (2013) (describing a method for developing a support system that should reduce medical errors).

[61] Thomas R. McLean et al., *Electronic Medical Record Metadata: Uses and Liability*, 206 J. AM. C. SURGEONS 405 (2008)

[62] *See* Makary & Daniel, *supra* note 27 (noting that "[c]currently, deaths caused by errors are unmeasured and discussions about prevention occur in limited and confidential forums" and that "[t]hese forums review only a fraction of detected adverse events and the lessons learnt are not disseminated beyond the institution or department").

[63] *See* Joachim Meyer & Omer Pelled, The Risks of Collecting Medical Data in a Litigious Society: Lessons from ICU Monitor Alarms, (unpublished manuscript, on file with author) (showing that recording certain data might have an unwarranted side effect, by incentivizing staff to focus more on their recorded actions than on unrecorded ones).

[64] For a discussion on the constitutionality of laws barring healthcare providers' apologetic statements as evidence of fault, *see* Coleman v. Amon, 498 P.3d 638, 642–44 (Ariz. Ct. App. 2021) (decided that Arizona's apology law is not unconstitutional, as it serves a legitimate interest of encouraging healthcare providers to be more empathetic and candid with patients). Some argue that apology laws reduce patients' incentive to sue and thus reduce liability risk, similar to other tort reforms. *See* Yonathan Arbel & Yotam Kaplan, *Tort Reform through the Back Door: A Critique of Law and Apologies*, 90 S. CAL. L. REV. 1199 (2016) (arguing that apology laws should be viewed as further attempts to reduce medical malpractice liability, similar to other reforms). However, some evidence suggests that apology laws do not reduce the frequency of lawsuits or payments against surgeons and increase both for non-surgeons. *See* Benjamin J. McMichael, et al., *Sorry Is Never Enough: How State Apology Laws Fail to Reduce*

remedial measures taken after an accident are inadmissible as evidence that the previous conduct was negligent.[65]

While inadmissibility solves a problem that current medical malpractice law creates, it also makes it more challenging for patients to prove negligence, which reduces tort law's efficacy as a deterrent.[66]

2.2. High Administrative Costs

As we have seen, a liability regime based on negligence distorts the incentive to engage in myriad behaviors because they may produce or constitute evidence regarding prior conduct. An additional aspect of the legal procedure we need to account for is the cost of operating the system, including legal costs, experts' fees, and evidence production.[67]

In any negligence-based regime, proving conduct, establishing the standard of care, and proving causation create substantial administrative costs. These costs are exceptionally high in medical malpractice cases. According to some estimates, less than half of payments related to medical malpractice claims reach victims, while most are used to pay administrative costs.[68] That means that by reducing administrative costs, it is possible to increase compensation almost twofold and still reduce the overall cost of the liability system to insurers. These high costs harm both plaintiffs and defendants in medical malpractice cases, but the defendants are repeat players and are usually insured. Plaintiffs are therefore disproportionately affected by the high litigation costs and are likely to find it more difficult to find a lawyer to represent them as the cost of litigation increase.[69] The malpractice system's administrative costs also affect the cost of medical care: the medical industry incurs these costs (usually in the form of higher premiums paid to insurers) when dealing with claims, regardless of the outcomes and passes them on onto patients.

Furthermore, high administrative costs limit victims' access to the courts. If the cost of legal proceedings is prohibitive, victims of negligence will not sue. Even if some costs can be avoided by settling out of court early on, administrative costs may still limit patients' access to justice in two ways. First, a hospital might suspect that a plaintiff lacks

Medical Malpractice Liability Risk, 71 STAN. L. REV. 341 (2019).

[65] *See supra* note 58.

[66] We assume that some physicians will still apologize or share information about errors, even if such statements are admissible. If that is not the case, making these statements inadmissible as evidence will not affect deterrence.

[67] For a discussion on administrative cost as part of the costs of accidents that should be minimized, *see* GUIDO CALABRESI, THE COSTS OF ACCIDENTS, 26–31, 286–87 (1971).

[68] BLACK ET AL., *supra* note 30 at 105–07 (showing that it costs more than 1$ in overheads to pay $1 of compensation to the victim).

[69] *Id.* at 21–22 (increase in costs are correlated with a drop in claims of lower monetary value claims).

the resources to see the case through to trial and refuse to settle at all, knowing that the plaintiff will have no choice but to withdraw their claim.[70] Second, even if a hospital agrees to settle, the settlement amount is likely to be low since the litigation costs limit plaintiff's bargaining power.

A further burden on administrative cost is that of frivolous law suits. Proponents of tort reform claim that frivolous lawsuits lead to skyrocketing insurance premiums.[71] Opponents answer that this argument lacks empirical support and that liability risk is low, as most cases end in no compensation to the plaintiff. Nonetheless, defendants may incur high administrative costs even if they win most or all cases. Indeed, most plaintiffs who have been shown to have received reasonable care will not receive compensation.[72] However, since insurers also pay for litigation costs, the risk of frivolous lawsuits affects the premiums,[73] and high premiums may result in a shortage of practicing physicians in general and high-risk specialties (such as neurosurgery and OB/GYN) in particular.[74] Such a care shortage negatively affects all patients.[75]

2.3. Limited Victim Compensation

The last adverse effect of the current liability regime is that victims are grossly undercompensated.[76] Medical malpractice can fulfill its goal of

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[70] Philip Peters, *Twenty Years of Evidence on the Outcomes of Malpractice Claims*, 467 Clinical Orthopedic related res. 352 (2009) (showing that while physicians win 80%–90% of cases deemed weak by other physicians, they lose only 50% of the cases that other physicians believe show strong evidence of negligence). However, the more significant source of under-enforcement is the result of the patient's decision to file a claim. Most victims of negligent medical errors do not file a claim and receive no compensation. *See* Russell A. Localio et al., *Relation between Malpractice Claims and Adverse Events Due to Negligence*, 325 NEW ENG. J. MED. 245 (1992) (showing that only a small fraction of adverse events due to negligence were followed by claims of medical malpractice).

[71] See, e.g., Judy Donlen & Janet Spicer Puro, *The Impact of the Medical Malpractice Crisis on OB-GYNs and Patients in Southern New Jersey*, 100 N. J. MED. 12 (2003) (claiming that the medical malpractice crisis created an insurance affordability problem).

[72] *See* Peters, *supra* note 70, at 352 ("malpractice outcomes bear a surprisingly good correlation with the quality of care as judged by other physicians").

[73] Real defense costs have risen substantially over the years, and more than doubled since the 1980s (in real costs). Furthermore, payouts, changes in hourly legal fees, and litigation time do not account for this increase in defense costs. *See* BLACK ET AL., *supra* note 30, at 89–104 (showing that defense costs increased between 1988 to 2005 in all personal injury cases, but in medical malpractice cases the increase was more rapid, rising almost four times higher)

[74] *See, e.g.*, John H. Chi, *Neurosurgery Tops Malpractice Risk*, 69 NEUROSURGERY n.18 (2011) (neurosurgeons were the most likely to be sued, but not the most likely to pay damages following a malpractice claim).

[75] *See* Donlen & Puro, *supra* note 7171 (claiming that insurance affordability problems lead to limited access for patients).

[76] Low expected compensation also affects the efficacy of the current medical

compensating victims only if all victims of negligent care file a claim and receive full compensation.

In practice, however, most patients who suffer injury due to negligence are never compensated, and the rest receive only partial compensation for their harm. Studies have shown that only 6% of medical negligence victims receive compensation[77] and that most of those victims settle out of court and receive only partial compensation.[78] Even the relatively few cases that reach a final verdict do not result in full compensation. A recent study shows a considerable gap between jury verdicts and payouts, as plaintiffs agree to receive reduced compensation post-verdict, limiting damages to the amount covered by insurance.[79]

There are several reasons for the underenforcement of verdicts.

First, as illustrated above,[80] the substantial cost of litigating a medical malpractice case can discourage many patients from filing a claim. In addition, lawyers working on a contingency fee basis may be reluctant to represent plaintiffs in medical malpractice cases, knowing the substantial cost they must incur.[81]

Second, to win a case against a physician or medical facility, plaintiffs must prove that the care they received did not meet the applicable standard. When evidence of the physician's conduct is unavailable, patients cannot build a case even if they have the resources to do so and the case has a positive expected value. This might seem like a general problem with negligence law, but it is especially worrisome with regard to medical care, where physicians are in charge of recording the treatment in the patient's medical records and informing the patient of

malpractice law as a deterrent. To create efficient incentives, all negligent treatment victims must be fully compensated. Tortfeasors who know that they will have to pay less in compensation, on average, than the harm they caused, are undeterred. *See* Polinsky & Shavell, *supra* note 49, at 888–89 (explaining that when a tortfeasors know that on average they will have to pay in damages less that the actual harm caused, then they will have inadequate incentive to take the precaution, because the precaution cost will exceed his average liability cost).

[77] *See* BLACK ET AL., *supra* note 30, at 73 ("about 97 percent of the paid claims in our dataset are in cases that are settled prior to a verdict").

[78] *See* Localio et al., *supra* note 70 (showing that only a small fraction of adverse events due to negligence were followed by claims of medical malpractice).

[79] *See* BLACK ET AL., *supra* note 30, at 55–66 (showing that doctors rarely pay the full awarded compensation).

[80] *Supra* Part 2.2.

[81] *See* Ronen Avraham and John M. Golden, *'From PI to IPIP': Litigation Response to Tort Reform*, 20 AM. L. & ECON. REV. 168 (2018) (suggesting that one potential side effect of tort reform is migration of in-state plaintiff attorneys' lawyers to IP, since caps on damages limit their fees, and their willingness to take on medical malpractice cases and their litigation costs); BLACK ET AL., *supra* note 30, at 195 (noting that some reforms are designed to make medical malpractice lawsuits more costly and less remunerative, explaining the drop in cases in general and small claims in particular).

any errors.[82]

Last, even when negligence is evident, many patients will still fail to prove that it was the cause of their injury. Patients seek medical attention because they already face some risk of harm. In many, if not most, cases, it is impossible to know if the patient's harm resulted from the negligence or was an inevitable result of the underlying health condition.[83] Under prevailing law, the plaintiff must establish factual causation by showing that it is more likely than not that the negligent care caused the injury.[84] In probabilistic terms, the defendant will have to pay for the harm only if the negligent treatment increased the risk at least two fold, making it more likely than not that the added, unreasonable risk was the but-for cause of the adverse outcome. This standard solution leads to significant underdeterrence, as the need to prove causation effectively bars high-risk patients from obtaining compensation regardless of conduct. Several states have therefore adopted the *loss of chance* doctrine, which allows courts to award partial compensation discounted by the reduced probability that the patient would have recovered had they received reasonable treatment.[85]

One might think that under-enforcement and partial compensation mean that current medical malpractice law does not affect how physicians practice medicine, as argued earlier. However, while under-enforcement reduces liability risk, it does not (necessarily) negate the possible distortionary effects of malpractice liability. Even when their liability risk is low, physicians may adopt practices that further reduce that risk rather than the risk of accidents.[86]

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[82] For a discussion on the disincentive to inform patients of medical errors, *see supra* Part 2.1.2

[83] *See, e.g.*, Merrell Dow Pharm., Inc. v. Havner, 953 S.W.2d 706 (Tex. Sup. J. 1997) (in a mass tort case, parents claimed that pharmaceutical company's drug caused birth defects. Texas Supreme Court denied compensation, because plaintiffs failed to prove that the defendant's drug increased the risk of such birth defects by more than 50%); *see also* Maytal Gilboa, *Multiple Reasonable Behaviors Cases: The Problem of Causal Underdetermination in Tort Law*, 25 Leg 77 (2019) (explaining why the problem of causal underdetermination was overlooked by tort scholars and is perceived by courts as lack of causation).

[84] This is in accordance with the preponderance of the evidence rule. *See* Dumas v. Cooney, 235 Cal. App. 3d 1593, 1611 (1991) (stating that California prefers the established rule of tort law causation, denying compensation for loss of chance).

[85] For further discussion concerning the acceptance of the *loss of chance* doctrine, see, e.g., Alice Ferot, *The Theory of Loss of Chance: Between Reticence and Acceptance*, 8 FIU. L. REV. 591 (2013); Matthew Wurdeman, *Loss-of-Chance Doctrine in Washington: From* Herskovits *to* Mohr *and the Need for Clarification*, 89 WASH. L. REV. 603 (2014).

[86] *See* Leonard Berlin, *Medical Errors, Malpractice, and Defensive Medicine: An Ill-Fated Triad*, 4 DIAGNOSIS 133, 137 (2017) (arguing that defensive medicine became a part of medical culture and education so while defensive medicine was a response to an increase in liability risk, these practices are unlikely to decrease as litigation risk decreases).

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This part explored several ways in which current medical malpractice law fails to achieve its goals of promoting patient safety and compensating victims. It showed that the need to delineate the standard of care and to establish that the treatment fell below the standard, distorts the incentives of physicians and hospitals, creates substantial costs, and results in grossly low compensation to victims.

These shortcomings may explain why the U.S. health system produces poor outcomes. While medical costs are higher in the United States than in any other country,[87] medical outcomes fall below those of many developed countries.[88] There are many possible reasons for this gap, but if medical malpractice law is part of the problem, it is worth exploring possible solutions.

The next part shows that SLUH may solve many of the problems discussed above, at least when applied to medical facilities.

3. STRICT LIABILITY FOR UNREASONABLE HARM

We can now turn to examine SLUH as an alternative liability regime. To understand how the suggested regime might work, consider the following variation on Example 1 above.

> Example 4. *Hospital-acquired infections*. Alex was admitted to the hospital due to a spinal injury that required simple surgery and a short hospital stay. Other than the spinal injury, Alex was generally healthy. While hospitalized, Alex developed an infection that caused permanent harm. A total of sixty patients contracted a similar infection during their stay in the orthopedic unit during the same month in which Alex was hospitalized. Should Alex and the other patients be compensated for their harm?

To apply SLUH to the circumstances of Example 4, we need to ask how many patients would have contracted an infection had the hospital taken reasonable care. For now, let us assume that, given reasonable care, it is likely that only forty-five patients would have contracted an

[87] *See, e.g.*, Irene Papanicolas et al., *Health Care Spending in the United States and Other High-Income Countries*, 319 JAMA 1024 (finding that the United States spent in 2016 nearly twice as much as ten high-income countries on medical care, and performed less well on many population health outcomes).

[88] *Id*. *See also* Luca Lorenzoni et al., *Health-Care Expenditure and Health Policy in the USA versus Other High-Spending OECD Countries*, 384 LANCET 83, 89 (2014) ("The USA is an outlier in the scenery of OECD health-care systems, for its staggering levels of expenditure, the extent of fragmentation of its system and the sheer complexity of its administration, the power of vested interests, and the large number of people left without adequate health insurance coverage").

infection. Applying SLUH would simply mean that the hospital is liable for the harm to fifteen patients. That is the unreasonable harm.

Stating that the hospital is required to pay for the harm of fifteen unidentified patients means little in terms of monetary value. Compensation varies depending on each victim's age, income, pain and suffering, and other factors.[89] SLUH does not call for compensating specific victims fully. Instead, each receives a fraction equal to the unreasonable harm divided by the entire harm. In this case, all sixty patients who contracted an infection should receive compensation equal to 25% of their harm (15/60), as part of a collective litigation. After thus establishing the share of the harm for each patient, estimating damages is usually a relatively simple process. Furthermore, if there is any uncertainty regarding harm, courts can use statistical tables to estimate average harm without negatively affecting deterrence.[90]

To implement SLUH as an alternative liability regime, we first need to know how courts might determine the reasonable level of harm because if they are unable to make this determination, SLUH cannot be applied. The following sections address the informational requirements for determining reasonable harm. They show that it is possible to implement this liability regime in large medical facilities and how implementing SLUH solves many of the problems created by current medical malpractice law.

3.1. Determining Reasonable Harm

To implement the SLUH regime, courts must determine the reasonable harm from accidents and decide if and by to what extent the harm resulting from the injurer actual involvement in accidents exceeded the reasonable level.

Determining the reasonable level of harm is similar, in some respects, to determining the standard of care under a negligence regime. To assess the standard of care, courts must determine how much each precaution measure reduces the risk and magnitude of injuries. Theoretically, after a court determines the risk to be reasonably expected from each interaction between hospital and patient (e.g., each day of hospitalization, surgery, or diagnostic test), it simply multiplies the expected harm from each interaction by the number of interactions to determine the level of reasonable harm. For example, assuming there is

[89] *See* DAN B. DOBBS, PAUL T. HAYDEN AND ELLEN M. BUBLICK, THE LAW OF TORTS, §479 (2d ed., 2011) (describing the elements of damages for personal injury).

[90] *See* Louis Kaplow & Steven Shavell, *Accuracy in the Assessment of Damages*, 39 J.L. & ECON. 191, 192–93 (1996) (arguing that when injurers lack information concerning level of harm, setting damages equal to the average level of harm, is more efficient than an accurate assessment of harm).

a 1% chance of contracting an infection for each day of hospitalization when a hospital takes reasonable measures to prevent that risk, then a hospital that admitted patients for a total of 5,000 days should reasonably only have fifty cases of hospital-inquired infections.[91]

Note that, unlike the negligence inquiry, determining the level of reasonable harm requires information about patients with no adverse events during their hospital stay. To start, the court needs to know the total number of hospitalization days for all patients, including patients who did not suffer from an infection or any other adverse event during their stay.[92] This information is not required under the negligence regime because that regime focuses on the hospital's conduct with respect to patients who had adverse outcomes and disregards other patients. However, information about hospitalization days is not enough. In addition, determining reasonable harm also requires information about each patient's underlying (reasonable) risk. Since the reasonable risk to each patient might vary due to his or her characteristics, if the reasonable harm is not adjusted, hospitals may try to avoid liability by denying care to high-risk patients instead of investing in risk-reducing measures.

For example, the risk of pulmonary complications after an abdominal surgery depends on the measures the medical staff implements before, during, and after surgery.[93] The risk may also depend on patient characteristics such as age, gender, and smoking. To adjust reasonable harm, courts will require information about actual victims as well as potential victims who have never suffered any harm. If the reasonable level of harm is not adjusted to match patients' risk, surgery units would prefer to operate on young, female, nonsmoking patients to avoid liability.[94] Adjusting for known risk factors minimizes this incentive to avoid liability by selecting low-risk patients (an adverse selection problem).[95]

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[91] *See supra* note 19 and accompanying text.

[92] *See* Shavell, *supra* note 34, at 2 ("By definition, under the negligence rule all that an tortfeasor needs to do to avoid the possibility of liability is to make sure to exercise due care if he engages in his activity. Consequently, he will not be motivated to consider the effect on accident losses of his choice of whether to engage in his activity or, more generally, of the level at which to engage in his activity."); STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW, 197-–99 (2004) (same); *see also* RESTATEMENT (THIRD) OF TORTS: LIAB. FOR PHYSICAL & EMOTIONAL HARM, § 3 at para. H (2010).

[93] Chun Kevin Yang et al., *Pulmonary Complications after Major Abdominal Surgery: National Surgical Quality Improvement Program Analysis*, 198 J. SURGICAL RES. 441 (2015) (finding that pulmonary complications after an abdominal surgery depends on patient characteristics such as age, gender, and smoking).

[94] Victims that suffer harm are not chosen at random, as those with higher risk are more likely to be represented than those with a lower risk.

[95] Nevertheless, the problem may persist if some risk factors are non-verifiable. If a surgeon can estimate that a patient is at higher risk than what can be estimated based on the patient's known characteristics, hospitals might still try to reduce liability be turning

To complete the inquiry, the court must determine the level of harm actually caused by the tortfeasor over the relevant period (to all victims). It might seem that this part of the factual inquiry requires the same information as under current medical malpractice law, which bases compensation on the actual harm victims suffer. There is a significant difference, however. SLUH requires the court to know the sum of the harm to all patients who suffered an adverse event, not just those who decide to file a claim. This requirement might constitute an obstacle when patient information is unavailable without cooperation.[96] When such information is readily available, the SLUH regime is best viewed as a collective litigation mechanism, similar to a class action.[97]

After the total level of harm has been established, awarding compensation is a simple matter of subtracting the reasonable harm from the total harm and dividing the compensation among patients who suffered harm.

3.2. Dealing with Uncertainty and Errors

We have seen how courts can estimate reasonable harm and compare it to actual harm. However, as in any factual inquiry, courts might be uncertain about both. Even when information about reasonable and actual harm is readily available, it might be inaccurate.[98] The risk of error

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down these patients.

[96] The problem persists if we allow victims to opt out of SLUH litigation. David Rosenberg made a similar observation, discussing class action litigation of mass torts. *See* David Rosenberg, *Mandatory-Litigation Class Action: The Only Option for Mass Tort Cases*, 115 HARV. L. REV. 831 (2002) (arguing that *ex ante* potential victims prefer collective litigation but after learning of their individual harm, some victims prefer individual litigation, thwarting efforts to achieve optimal deterrence).

[97] In most countries that adopted class action litigation it is designed as an opt-out mechanism, meaning that all members of a group holding similar claims are assumed to be part of the litigation unless they opt- out. *See* John E. Kennedy, *Class Actions: The Right to Opt Out*, 25 ARIZ. L. REV. 3 (1983) (tracing the historical development of the right to opt- out of alternative offers). In practice, it is rare that members of the group opt- out of the litigation. However, for SLUH to work it is important that compensation to all victims will be adjudicated together, or at least the harm to the victim who opted-out will be considered as part of the actual harm, even if that victim is not entitled to compensation as part of the collective litigation. If SLUH replaces the current medical malpractice regime, then group members will have no incentive to opt- out, since they cannot sue for negligence and receive more compensation.

[98] These risks mirror the risks of errors in setting the due care standard and in assessing the injurer conduct. *See* THOMAS J. MICELI, ECONOMICS OF THE LAW: TORTS, CONTRACTS, PROPERTY, AND LITIGATION, 45–46 (1997) (discusses the effects of uncertainty over the determination of fault, showing it may cause over or underdeterrence); STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 224–28 (2004) (showing that uncertainty about the determination of the standard of care causes overdeterrence); Mark F. Grady, *A New Positive Economic Theory of Negligence*, 92 Yale L. J. 799, 806–13 (1983) (uncertainty regarding the standard causes overinvestment in care when causation does not limit liability while uncertainty when the causation requirement limits liability causes underinvestment); Richard Craswell & John E. Calfee, *Deterrence and Uncertain Legal*

in the estimation of unreasonable harm may distort the incentives that the SLUH regime creates.

Hospitals' incentives are distorted if they know that courts systematically overvalue the reasonable level of harm. For example, if a hospital's reasonable harm is 100 but courts consider 130 to be reasonable, the hospital will have no incentive to reduce harm below 130.[99]

The same argument cannot be made for errors in the other direction: if courts systematically undervalue the reasonable level of harm, hospitals will have to pay damages even when taking reasonable care. Nevertheless, they will not invest in measures risk-reducing measures. For example, if a hospital's reasonable harm is 100 (meaning that any measure that further reduces harm costs more than the harm itself)[100], but courts consider only 70 to be reasonable, the hospital will opt to pay 30 in damages as any further reduction in harm (by definition) costs more than it saves in damages.

Even assuming courts estimations are unbiased, so they are correct on average, errors in assessing reasonable harm can distort incentives since the effects of errors are one-sided. If the court (erroneously) decides that actual harm exceeded reasonable harm, the injurer will be held liable for the difference. However, if the court (again, erroneously) decides that actual harm did not exceed reasonable harm, the hospital will not be rewarded for causing less harm than is reasonable.[101] Thus, even if courts generally value reasonable harm correctly, errors may lead hospitals to underinvest in care. To see why, let us assume that while the reasonable harm is 100, there is an equal probability that a court will err and decide

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Standards, 2 J. L. ECON. & ORG. 279, 283–87 (1986) (showing that uncertain standards may cause overdeterrence or underdeterrence, depending on the mean and standard deviation of the error function); Omer Y. Pelled, *All-or-Nothing, or Something—Proportional Liability in Private Law*, 22 THEORETICAL INQ. L. 159, 178–84 (2021) (classifying uncertainty regarding fault as a case of unilateral uncertainty, and showing that unilateral uncertainty may result in over or underdeterrence).

[99] This assumes that there are no other costs to liability, such as reputational costs. For the effect of such costs on optimal damages calculations, *see* Robert Cooter & Ariel Porat, *Should Courts Deduct Nonlegal Sanctions from Damages?*, 30 J. LEGAL STUD. 401 (2001) (discussing how nonlegal sanctions affect deterrence and suggesting when it is suitable to deduct the value of these sanctions from damages).

[100] *See supra*, note 34 and accompanying text.

[101] Compensation is generally restricted to positive values, so whenever the tortfeasor's conduct can stochastically result in positive and negative externalities restricting compensation to positive values may distort the incentives. *See* Urs Schweizer, *But-for Causation and the Implementability of Compensatory Damages Rules*, 36 J. L. ECON. & ORG. 231, 247 (2020) (showing that correctly applying the causation requirement leads to efficient equilibrium even when the standard of care is not set efficiently, but only if negative damages are allowed); Zhiyoung Liu, et al., *Unrequested Benefits, Damages Assessment, and Information Acquisition*, 23 AM. L. & ECON. REV. 207 (2021) (investigating the interaction between the prohibition on recovery for unrequested benefits with the incentives to acquire information when an activity potentially creates both negative and positive externalities).

that it is 70 or 130. Hospitals can invest 15 in measures that reduce harm from 120 to 100, but would not do so. If they invest in such measures, their expected liability is 15 (50% chance they will have to pay 30 in damages), and) 25 if they do not invest in such a measure (50% chance they will have to pay 50 in damages). That means a hospital must invest 15 to reduce its expected liability by 10. Table 1 illustrates the problem.

Table 1: Errors in the estimation of reasonable harm

	Cost to Reduce Harm	*Actual Harm*	*Liability if Reasonable Harm $70*	*Liability if Reasonable Harm $130*	*Expected Liability*	*Total Cost*
No measures	$0	$120	$50	$0	$25	$25
Measures	$15	$100	$30	$0	$15	$30

It is clear from the table that the hospital reduces its total costs, in this example, by not investing in care even though the estimation of the reasonable harm is correct on average. This is because the hospital gains nothing by investing in care when courts overvalue the level of reasonable harm.

A straightforward solution to the distortion of incentives caused by errors is to allow negative damages, meaning that if the court determines that the harm a hospital creates falls below the reasonable level of harm, the hospital will receive a subsidy equal to the difference.[102] Negative damages offset the overvaluation of reasonable harm. For example, if a hospital's reasonable harm is 100 but the courts consider 130 to be the reasonable level, the hospital will invest in care and reduce the harm to 100 to receive the subsidy.

Negative damages also solve the problem of underinvestment in care when courts make symmetric errors. Consider Table 2 (a variation on Table 1).

[102] *See* David Gilo & Ehud Guttel, *Negligence and Insufficient Activity: The Missing Paradigm in Torts*, 108 MICH. L. REV. 277, 319 (2009) (suggesting subsidizing activity to correct otherwise distorted incentives).

Table 2: Errors in the estimation of reasonable harm with negative damages

	Cost to Reduce Harm	*Actual Harm*	*Liability if Reasonable Harm $70*	*Liability if Reasonable Harm $130*	*Expected Liability*	*Total Cost*
No care measures	$0	$120	$50	−$10	$20	$20
Care Measures	$15	$100	$30	−$30	$0	$15
Excessive Care Measures	$30	$90	$20	−$40	−$10	$20

As is clear from the table, when negative damages are allowed, the effects of errors are symmetrical - the hospital bears an additional cost when courts undervalue reasonable harm, and it receives a benefit when courts overvalue it. This symmetrical effect means that a hospital's incentives are unaffected by the risk of error. It will therefore prefer to invest in care, as doing so reduces its total expected costs. It will not overinvest in care, however. Even though taking excessive measures reduces liability when reasonable harm is set too low and increases the subsidy when reasonable harm is set too high, the additional costs exceed the benefit.[103]

A second way to overcome the effect of errors is for courts to purposefully set reasonable harm at a low level, thus eliminating or reducing the risk of setting it too high. As we have seen, when reasonable harm is undervalued, hospitals will bear some liability even if they take reasonable care, but they will not overinvest or underinvest in care measures. Thus, if hospitals that cause less harm than the reasonable level do not receive a subsidy, courts should set the reasonable harm at the lowest level supported by evidence.

A second source of errors in applying SLUH comes from uncertainty about the harm that occurred. Even if the courts accurately determined the reasonable level of harm, there is a risk of random variation in actual harm. We have assumed, for simplicity, that hospitals that take adequate care can foresee the number of accidents that will happen. For example, if all medical staff members regularly wash their hands and take other precautions to prevent infections, *exactly* forty patients will suffer from infection over the relevant period. However, there is always variation in the harm that materializes, even when we control for factors that affect the risk.

We can think of SLUH as a regime that determines the mean level of

[103] Mathematically, the result is unsurprising. When negative damages are allowed, SLUH is identical to a strict liability regime, minus a fixed sum, equal to the courts' assessment of reasonable harm. Since the fixed sum is unaffected by a hospital's actions, it does not distort hospital's incentives.

harm from the inurer's conduct by using a sample: the actual harm over a specified period.[104] As with all samples, the level detected may vary randomly, but variance decreases as the sample size increases.[105] This means the assessment is more accurate for larger injurers, which are involved in more accidents.

Consider the example of hospital-acquired infections again. Assume that if a hospital takes reasonable care, on average, 100 patients will contract an infection during hospitalization in a year. Two problems may arise. First, after some time, say eleven months, the hospital might realize that despite acting reasonably, due to bad luck, 130 patients have already contracted an infection. Alternatively, the hospital might realize that despite acting reasonably (without taking excessive care), due to good luck, only seventy patients contracted an infection. In both cases, the actual harm indicates a level of care that does not match the hospital's investment.

Both strategies for dealing with uncertainty about the reasonable level of harm can also be applied to the variance in actual harm. If negative damages are allowed, regardless of the harm that occurred beforehand, the hospital will take adequate care during the last month, knowing that that is the best strategy to reduce its liability (if, due to bad luck, the harm was high) or to maximize the subsidy (if due to good luck, the harm was especially low).

If negative damages are unavailable, the risk of underestimating actual harm (i.e., erroneously deciding that the injurer's harm fell below the reasonable threshold) is more harmful than overestimating it, for the same reason that overvaluing reasonable harm is more harmful than undervaluing it. When a court overestimate actual harm, the hospital will pay damages even though it invested optimally in care, but it will still have adequate incentives to invest in care. However, when a court underestimates the level of harm, the hospital will not have an adequate incentive to invest in care. In the example above, if only seventy patients contract an infection after eleven months, the hospital might neglect to take care measures in the future, knowing that it will probably not bear any liability.

The second strategy presented above, setting a low reasonable level of harm—can also solve the problem of variance in the occurrence of harm. By lowering the reasonable harm threshold to reflect the variance,

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[104] The class of victims in SLUH litigation is not strictly a sample, since it involves everyone who was injured. The use of a sample, i.e., examining a randomized subgroup, was used in class action litigation to prove the cause of action of the entire class. *See* Hillel J. Bavli, *Aggregating for Accuracy: A Closer Look at Sampling and Accuracy in Class Action Litigation,* 14 L. PROBABILITY AND RISK 67, 70–73 (2015) (discussing the use of sampling as means of increasing accuracy in class action litigation)

[105] This variation can be statistically estimated by the standard error of the sample mean, which is affected by the sample size.

courts can decrease the chances that actual harm will be below the threshold unintentionally.[106] Statistically, the need to reduce the level of reasonable harm to reflect the variance decreases as the number of patients increases.[107] This effect of the number of patients explains why SLUH can only apply to large injurers. Smaller samples have a higher standard error, meaning that the outcome is more likely a result of chance than of a physician's investment in care. If a sample is too small the court will have to set reasonable harm at zero to avoid overestimating the mean, making the regime identical to a conventional strict liability regime.

3.3. Available Data About Reasonable Harm in Medicine

The previous sections laid out the theoretical foundations of the SLUH regime and showed what information is required to implement it. To replace current medical malpractice law, we need to know whether the information required to implement SLUH is currently available. Even if it is not, the foregoing theoretical exercise has value: it may persuade us that the information is worth gathering. Once the data have been compiled, we can examine the practical use of SLUH once more.

We will not have to wait long. Legislators can already apply SLUH instead of current medical malpractice law to most risks. In fact, although no one has suggested examining the outcomes of hospital units to determine legal liability, the safety and efficacy of various hospital departments has been assessed based on outcomes for some time. For example, the American Heart Association (AHA) has long suggested comparing heart surgery patient outcomes with the anticipated risk-adjusted rate of complications to assess efficacy and safety in cardiovascular surgery departments.[108] In addition, the State of New York, the U.S. Veterans Administration, and the Society of Thoracic Surgeons have created cardiac surgery registries that record risk-adjusted outcome data based on these suggestions. These datasets have been used to conduct several performance assessments and interventions at the hospital level.[109]

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[106] Statistically, experts can assess the standard error of the expected harm, given the number of patients the hospital treated, and set the reasonable level of harm to make sure that the probability that the harm will be below the reasonable level given reasonable care is very low.

[107] I.e., according to the central limit theorem, sample size is negatively correlated with the standard error of a sample. Hence, as the sample size gets larger, the mean of the distribution is closer to the population mean. *See generally* ALAN AGRESTI & BARBARA FINLAY, STATISTICAL METHODS FOR THE SOCIAL SCIENCES 88-–94 (5th ed. 2018).

[108] *See* Hillis et al., *supra* note 16, at § 5.1 (finding that "the common denominator among successful performance improvement strategies is the implementation of a formal quality assessment and feedback program benchmarked against regional or national results").

[109] *Id*. (noting that these datasets where developed "[t]o address the need for valid and reliable risk-adjusted outcomes data").

The American College of Surgeons (ACS) has implemented a much more robust voluntary program known as the National Surgical Quality Improvement Program (ACS NSQIP). Participating hospitals send detailed reports of their surgeries, including outcomes and complications, and in return receive an assessment of patient safety based on risk-adjusted outcomes.[110]

The massive dataset that ACS NSQIP has created allows physicians to assess the risk of any complication following surgery, as well as the risks of specific complications, according to the surgery type, the patient's comorbidities (e.g., hypertension, diabetes, or cancer), and personal characteristics that might affect the risk of complications, such as age, sex, weight, and smoking habits.[111] Since these risk calculations assume reasonable care, we can assess a unit's risk-adjusted rate of complications, such as surgical-site infection,[112] and compare them to the actual rate a unit experiences.

These risk management programs are very similar to SLUH. Programs such as ACS NSQIP use the data to provide recommendations for specific interventions. For example, an analysis of a particular unit might show a higher risk of surgical-site infection in the hospital than predicted, assuming reasonable care, but a lower than predicted risk of urinary tract infection. From a management standpoint, information about both risks is valuable: the information about the surgical-site infection risk suggests that the unit's doctors and nurses can adjust their procedures to reduce that risk. The information about urinary tract infection risk might suggest that a practice used in the unit can effectively reduce such risk and should be studied further. Alternatively, assuming the reasonable risk assessment is accurate (meaning that there are no cost-justified ways to reduce the risk further), such information might suggest that the staff is over-investing in reducing one type of risk, thus creating excessive, unjustified medical expenses, or increasing other risks to patients.[113]

There are two ways to apply the information to the SLUH regime. The first is to determine the rate of harm from medical errors, infections,

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[110] *See* Mark E. Cohen et al., *Improved Surgical Outcomes for ACS-NSQIP Hospitals Over Time*, 362 ANNALS OF SURGERY 267 (2016) (describing the methodology of data collection in ACS-NSQIP and showing that participating in the program led to a reduction in postoperative complications).

[111] The ACS NSQIP surgical risk calculator is available at https://riskcalculator.facs.org/RiskCalculator/

[112] *Id*. (the risk calculator uses twenty patient predictors and the planned procedure to predict the chance that patients will have any of eighteen different outcomes, one of which is surgical-site infection).

[113] *See* Parchomovsky & Stein, *supra* note 54, at 538 (arguing that "[i]ndependently of the chosen liability standard, doctors will continue to generate evidence demonstrating that they went beyond the call of duty and took extra measures to protect the health of their patients").

complications, and other relevant risks in each department separately (assuming each department has enough patients). The second is to have the courts determine the total harm from any complication in the entire hospital rather than focus on different risks in different units.

The first option resembles the negligence inquiry under current medical malpractice law. We usually think of reasonable care vis-à-vis a specific risk that precautions might prevent.[114] If we take the same approach to harm, we should look at specific types of harm rather than the total harm suffered by patients in the hospital. This approach also provides valuable information to the hospital (and other hospitals) about the risks it needs to decrease further.[115]

The second option has several advantages. First, dividing risk types might obscure cases of unreasonable harm because the risk of specific complications might be too low to detect deviations in hospitals smaller than a certain size. Second, from an incentives standpoint, we care about total harm, not the rate of one type of complication. When a practice reduces one type of risk but increases another, it should be encouraged if it lowers the total expected harm (i.e, from both complications combined). By examining each complication separately, we might discourage such practices.

Interestingly, negative damages allow us to enjoy the benefits of both options. Courts should assess each risk and unit separately, thus informing the hospital about unreasonable harm and indicating that it should adopt specific practices. At the same time, if the hospital realizes it can reduce one type of risk below the reasonable harm threshold while creating another less substantial risk, it will do so, knowing it will receive the subsidy for lower-than-reasonable harm.

Courts can use the rich data regarding risks to further adjust the reasonable harm assessment to match hospital characteristics unrelated to patients.[116] For example, smaller-volume hospitals may have a higher risk of surgery complications than high-volume ones.[117] Courts should

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[114] *See* RESTATEMENT (THIRD) OF TORTS, *supra* note 94, at §29 ("an actor's liability is limited to those harms that result from the risks that made the actor's conduct tortious").

[115] *See* Teitelbaum, *supra* note 43, at §4 (showing that when optimal care is algorithmically intractable, searching for more efficient precautions involves learning-by-experimentation).

[116] Some hospitals serve certain types of patients. For example, veterans' health facilities cater to a very specific type of patients (veterans), who might have different risks of complications (given reasonable care) than other patients. As long as these patient-related risks, however, are already a part of the risk-adjusted reasonable harm assessment, the fact that the medical facility treats veterans should not be further taken into account.

[117] See, e.g., Moschini et al., Critical Review of Outcomes from Radical Cystectomy: Can Complications from Radical Cystectomy Be Reduced by Surgical Volume and Robot Surgery?, 2 EURO. UROLOGY FOCUS 19 (2016) (finding correlation between hospital volume and patient outcomes and complications).

consider only those characteristics related to the cost of care measures.[118] If low-volume hospitals have higher complication rates because volume is correlated with resources, and hospitals with fewer resources cannot invest as much in care, the reasonable level of harm should be adjusted according to resources, not volume. If a high volume of surgeries provides experience in performing surgeries, which affects the success rate, reasonable harm should be adjusted accordingly.

Programs such as ACS NSQIP thus show that it is possible to assess reasonable harm, at least regarding complications and medical errors. This conclusion should not come as a surprise. Medical care, in general, and particularly in hospitals, is information intensive. Hospitals record information about treatment and outcomes in the patient's medical records and submit that information to insurers for payment. The collected data include treatments and outcomes of all patients, allowing us to compare reasonable harm to actual harm.[119]

One of SLUH's limitations is that it requires continuous access to data about patients' characteristics and outcomes. ACS NSQIP and similar programs gather data based on the continuous cooperation of participating hospitals. These hospitals receive advice about how to improve patient safety, so they have no incentive to send misleading information. It might be feared that once the information is used to assign liability, hospitals will no longer willingly share information and that some might even try to hide complications or overestimate patients' risks. This fear is justified as some complications, such as infections, are recorded properly in patients' charts but underreported in insurance claims.[120] The risk of this happening, however can be mitigated, however. First, if legislators decide to apply SLUH, hospitals should be required to grant access to patients' data directly from their medical charts (it is difficult to underreport a complication in aa patient's chart). These data can be supplemented with post-discharge patient surveys,[121] and the data's accuracy can be assessed by reviewing a random sample from the patient pool.

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[118] A similar discussion has been raised concerning the personalization of the standard of care under negligence. *See* Omri Ben-Shahar & Ariel Porat, *Personalizing Negligence Law*, 91 N.Y.U. L. REV. 627 (2016) (suggesting that court would set a personalized standard of care for each injurer, based on the injurer characteristics).

[119] *See* Cohen et al., *supra* note 110 and accompanying text.

[120] Steven M. Steinberg, et al., Comparison of Risk Adjustment Methodologies in Surgical Quality Improvement, 144 SURGERY 662 (2008) (finding that ACS NSQIP identified 61 % more complications than what is reported to insurers, including 97 % more surgical-site infections than a similar program that is based on claims data).

[121] For a study suggesting that post-discharge interviews can reveal preventable events which were not documented in patients' records, *see* Joel S. Weissman et al., *Comparing Patient-Reported Hospital Adverse Events with Medical Record Review: Do Patients Know Something That Hospitals Do Not?*, 149 ANNALS INTERNAL MEDICINE 100 (2008).

3.4. Advantages of SLUH over Medical Malpractice Law

Tort reform became a popular legislative tool for addressing the shortcomings of the medical malpractice liability regime.[122] The most common reform used to decrease medical malpractice liability risk is placing caps on damages.[123] Even the ban on apologies as evidence of negligent treatment was recognized as a (soft) form of tort reform.[124] The data suggest these reforms failed to significantly reduce the cost of medical care, increase access to care, or improve safety. The current system's limitations include inadequate incentives to invest in reasonable precautions,[125] high administrative costs,[126] and a low compensation rate.[127] SLUH solves all these problems.

3.4.1 SLUH Creates Better Incentives to Invest in Care

Unlike SLUH, current law distorts incentives in three ways: (i) it encourages hospitals to prioritize care measures that are more likely to be part of the negligence inquiry; (ii) it encourages defensive medicine; and (iii) it discourages risk-reducing practices that may later be used as evidence of prior negligence.

First, under the current medical malpractice regime, when some practices reduce risk but are not included in the negligence inquiry, hospitals have no incentive to invest in them. Under SLUH, however, liability depends only on outcomes. SLUH thus incentivizes hospitals to take all measures that reduce patient harm at a low cost, regardless of whether such measures are seen to be taken or can be proven in court.

Consider, for example, the response time at an intensive care unit (ICU). Patients in the ICU are connected to a monitor that sounds an alarm if the patient's vital signs cross a threshold. The nursing staff's response time affects patient outcomes and is easy to monitor and record. In such cases, the court might examine only the staff response time and ignore other, less salient circumstances. In response, nursing staff at the ICU might try to reduce the response time to every alarm, resulting in more harm than good. For example, sterilization might be impaired if a nurse abruptly stops a sterilized treatment for one patient to respond

[122] For an extensive examination of the challenges of the medical malpractice system, as well as critical analysis of the effects of tort reforms on outcomes and medical costs, *see* generally BLACK ET AL., *supra* note 30.

[123] *Id*,. at 111–21 (reviewing the use of capping noneconomic damages in Texas); *see also* Avraham & Schanzenbach, *supra* note 51.

[124] *See* Arbel & Kaplan, supra note 64, at 1201 (maintaining that apology laws are structured as "de facto tort reform"); W. Kip Viscusi, *Medical Malpractice Reform: What Works and What Doesn't*, 96 DENV. L. REV. 775 (2019) (same).

[125] *See supra* Part 2.1.

[126] *See supra* Part 2.2; BLACK ET AL., *supra* note 30, at 168–70 (showing that while tort reform in Texas during 2003 did limit physicians' exposure to liability, it had little effect on improving access to care for patients).

[127] *See supra*, Part 2.3.

quickly to the alarm from another patient's monitor.[128] If liability depends solely on outcome, as is the case under SLUH, nursing staff and physicians will try to minimize adverse events instead of response time.

Second, SLUH eliminates the incentives to adopt defensive practices. These practices are supposed to reduce liability risk at a reasonable cost without affecting patient outcomes. Since under SLUH, liability is solely determined by patient outcomes, physicians will be encouraged to prescribe only those tests and treatments that are likely to (efficiently) affect outcomes.

Third and last, SLUH reduces the disincentive to collect and share information about mistakes. Under current medical malpractice law, information about preventable harm and errors can lead to litigation and liability.[129] As a result, even though sharing information about mistakes is essential to reduce future mistakes and for healthy communication with the patient, hospitals may refrain from doing so. Under SLUH, sharing information becomes a vital tool to reduce liability. While it is true that physicians might still be reluctant to tell their colleagues about their mistakes for reputational reasons,[130] the legal system under SLUH works against this tendency instead of encouraging it.

Adopting SLUH might even indirectly promote patient safety and care. Currently, ACS NSQIP and similar programs are primarily voluntary and are limited to a subset of medical practices and participating hospitals. Nevertheless, the massive amount of information gathered by ACS NSQIP allows researchers to explore numerous questions regarding care practices,[131] staff management,[132] and risk

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[128] *See* Yuval Bitan, et al., *Nurses' Reactions to Alarms in a Neonatal Intensive Care Unit*, 6 COGNITION, TECH. & WORK, 239 (2004) (shows that nurses prioritize responses to alarms, treating patients in need quickly but ignoring alarms to focus on other tasks when these alarms are not likely to have medical significance).

[129] See, e.g., Sandra Petronio et al., Disclosing Medical Mistakes: A Communication Management Plan for Physicians, 17 PERMANENTE J. 73 (2013) (despite a consensus that disclosure of medical error is ethically and legally appropriate, concern about medical malpractice suits, among other concerns, make disclosure difficult).

[130] *See, e.g.*, Tsachi Keren-Paz, *Liability Regimes, Reputation Loss, and Defensive Medicine*, 18 Medical L. Rev. 363 (2010) (analyzing the effects of negligence and strict liability on physicians' reputation).

[131] See, e.g., Angela M. Ingraham, et al., Comparison of Outcomes after Laparoscopic versus Open Appendectomy for Acute Appendicitis at 222 ACS NSQIP Hospitals, 148 SURGERY 625 (2010) (analyzing data of 32,683 appendectomy patients from 222 participating hospitals to find the relative risk of different approaches given patients' characteristics).

[132] *See, e.g.*, Hadiza S. Kazaure, Sanziana A. Roman & Julie A. Sosa, et al., *The Resident as Surgeon: An Analysis of ACS-NSQIP*, 178, J. SURGICAL RES. 126 (2012) (analyzing data of patient outcomes based on whether the operation was conducted by resident, a resident guided by an attending, or attending operating alone found that residents had longer operating time, but selection of surgeries to residents and supervision prevented compromising patient outcome for medical education).

factors for diseases or complications.[133] Under SLUH, data will be collected from more hospitals, thus covering more procedures and risks. This great mass of information will constitute an a extensive database for future studies than ACS NSQIP, further advancing patients' safety and care.

3.4.2 Reducing Administrative Costs

The current liability system creates high, often prohibitive, litigation costs for plaintiffs, with increasing costs for defendants as well.[134] One reason for this high cost is plaintiffs' tendency to sue multiple defendants, including physicians and hospitals.[135] Under SLUH, only the hospital is sued, since the individual physician and her or his conduct are irrelevant.

More importantly, the high cost of litigation stems from the need to collect evidence and produce expert reports regarding conduct and causation.[136] The cost of litigating these issues is substantial even relative to the stakes of the average case.[137] SLUH eliminates some of these costs. For example, since the court compares the actual harm to a level of harm determined to be reasonable, without trying to identify which incident resulted from which conduct, there is no need to prove causation in any individual case. Furthermore, since conduct is never examined, there is no need to collect evidence regarding the standard of care applicable to each incident or the actual conduct.

SLUH creates its own costs, of course, including the cost of collecting and assessing patient data. And if the data may be manipulated by hospitals, plaintiffs' lawyers should sample it, reviewing patients and comparing their information to the data collected from the hospital. Nevertheless, this all costs much less per case than the current regime. Assessing a sample of patients is costly, but the information is readily available. Examining conduct requires much more evidence, and that evidence is likely unavailable.

3.4.3. Better Enforcement

The last major concern regarding the current liability regime is that most victims never receive any compensation.[138] This well-known phenomenon can be attributed, at least partially, to the high litigation

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[133] *See, e.g.*, Hadiza S. Kazaure, et al., *Cardiac Arrest Among Surgical Patients: An Analysis of Incidence, Patient Characteristics, and Outcomes in ACS-NSQIP*, 148 JAMA SURGERY 14 (2013) (analyzing data of 6,382 patients who underwent CPR following surgery to find risk factors to and from postoperative heart failure).

[134] *Supra* Part 2.2

[135] Hospital enterprise liability was considered as a way to reduce these costs by making the hospital the sole defendant in each case involving care inside a hospital.

[136] *See supra*, notes 83–85 and accompanying text.

[137] *See supra*, notes 68-69 and accompanying text.

[138] *See supra*, notes 70, 77-78, and accompanying text.

costs and difficulty in proving negligent conduct and causation. Since the expected liability from negligence is much lower than the expected harm, the current law is a poor deterrent.

SLUH solves the problem of underenforcement by operating as a form of aggregate litigation, similar to a class action. Like in class actions, lawyers and class representatives collect the evidence and manage the litigation for all the class members. Victims do not necessarily have to even know that their case is being litigated until the court assigns liability and the compensation stage commences.

One concern about enforcement in aggregate litigation is that after deciding to award damages, a court may be unable to locate all of the class members. Class actions undistributed funds are dealt with in several ways, such as diverting them applying the cy pres doctrine to distribute unrequested funds to charitable projects. Under SLUH, since each victim receives only partial compensation, the court should simply increase the damage awards of the class members that can be located.

4. CRITICISM AND OBJECTIONS

The main objection to the SLUH regime may be that victims of negligent treatment will receive only partial compensation for their harm. Partial compensation may seem especially troubling for patients who can easily prove that their harm resulted from negligent treatment, even though the hospital's total rate of harm was under the reasonable harm threshold. Another possible objection to the SLUH regime is that it might encourage practices that reduce harm in the short run while discouraging practices that temporarily increase patient risk while substantially improving patient safety over time. Finally, one could argue that other liability regimes can overcome some or all the inefficiencies created by the current medical malpractice regime. The discussion below addresses each of these objections in turn.

4.1. Compensating Victims

When hospitals are found liable under the SLUH regime, the amount paid in damages is close to the amount the hospital would have paid under the negligence regime, assuming perfect enforcement, that is, if every patient with a valid claim sued the hospital and received full compensation. However, the distribution of compensation among patients is entirely different. While under the negligence regime, only victims of negligent care receive compensation, under SLUH, every patient who suffered from an adverse event is (partially) compensated.

There are two possible objections to such a partial compensation mechanism. First, victims of negligent care are denied some or even most of the compensation they would have received under the negligence regime. Second, one could argue that, in the normative sense, the hospital, as a tortfeasor, harmed only those patients who received

negligent care and suffered harm as a result. Other patients may have had undesirable outcomes, but since the hospital and its workers treated them reasonably, these adverse outcomes result from bad luck, not a violation of their right to due care. It is not easy to reconcile these characteristics of the SLUH regime with corrective justice principles, which require tortfeasors to compensate victims of negligence for their normative losses.[139] In this regard, SLUH may be deemed unfair to both hospitals and victims. It is unfair to hospitals that compensate patients who did not sustain a normative loss, and it is unfair[140] to victims of negligent care whose normative losses are not fully compensated. There are nevertheless several reasons, beyond the incentivizing rationale discussed above, to prefer the SLUH compensation system to the existing system.

The first is that the distinction between negligent and nonnegligent treatment is unclear. For tort law to promote corrective justice principles, we need to delineate the scope of reasonable care. However, as was discussed earlier,[141] even if the definition of negligent care is clear, because it is too complex a task to examine all the relevant factors, including every risk and risk-reducing measure, the courts exclude some risks from the negligence inquiry. This means that the courts determine fault inaccurately under current malpractice law.

The second reason partial compensation to all patients might be preferable to compensating only some patients is that risk-averse patients prefer to receive partial compensation with certainty than partial compensation with some probability.[142] Patients always face some risk regardless of the hospital's care level. Let us assume that out of 1000

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[139] Ernest J. Weinrib, *The Gains and Losses of Corrective Justice*, 44 DUKE L.J. 277, 283 (1994) (distinguishing between material loss and normative loss, and stating that "if you injure me nontortiously, the loss I suffer falls under the material conception, but because you have breached no norm, the normative conception of norm is inapplicable").

[140] *Id*. at 290 ("one cannot justify tort liability by reference to the need both to deter actors and to compensate sufferers. To be sure, such a combination produces a normative gain for the defendant and a normative loss for the plaintiff. But because the reason for thinking the defendant to have gained is not the same as the reason for thinking the plaintiff to have lost, the gain and the loss are not normatively correlative"); *see also* ERNEST J. WEINRIB, THE IDEA OF PRIVATE LAW 157 (2012) ("Corrective justice requires not factual but normative loss consisting in wrongful infringement of the plaintiff 's right").

[141] *See supra*, Part 2.1.

[142] *See* David Rosenberg, *Individual Justice and Collectivizing Risk-Based Claims in Mass-Exposure Cases*, 71 N.Y.U. L. REV. 210, 246 n.90 (1996) (noting that risk-averse individuals "would, of course, prefer an averaging rule that conformed to the insurance model as against the standard, all-or-nothing rule that, depending on the fortuitous availability of a preponderance of evidence showing specific causation, awards the individual claimant 100% of the loss or nothing."); *see generally* Steven Shavell, ECONOMIC ANALYSIS OF ACCIDENT LAW 186–87 (1987) (explaining that as opposed to risk-neutral parties, risk-averse parties "care not only about the expected value of losses, but also about the possible magnitude of losses").

patients, 50 suffer harm from reasonable risk and an 50 others suffer harm from negligent care. *Ex ante*, risk-averse patients will say they prefer compensation for half of the harm whenever harm is done to full compensation in half of the accidents.[143]

Another reason for patients to prefer SLUH to the current system is that patients pay for the distorted incentives that the current regime creates When physicians and hospital pay high insurance premiums and adopt defensive practices, the costs are directly borne by patients. Adopting SLUH will decrease the cost of care and improve outcomes while retaining a (limited) right of compensation when negligent care increases harm caused to patients.

Last, and most importantly, while SLUH might not fully adhere to the principles of corrective justice, it is undoubtedly better than the current medical malpractice regime. Today, only a tiny fraction of patients receives any compensation, and only a very small fraction of those patients receive full compensation.[144] It is difficult to argue that the current system promotes justice when in practice, many patients are injured by negligent care and almost no one is compensated.[145] Under SLUH, a hospital's duty to compensate is closely related to its violations of patients' rights, such that when it does cause unreasonable harm, victims receive at least partial compensation.

4.2. Short-Termism Under SLUH

Short-termism refers to the tendency to give excessive weight to short-term outcomes over long-term outcomes. In the medical malpractice context, short-termism would be to adopt practices that reduce risk in the short term instead of practices that might not affect short-term risk or might even increase it, but that significantly decrease risk in the long term.

The SLUH regime assigns liability according to the harm the hospital creates over some period. A problem arises when investments in care may increase harm during that period but significantly decrease it over the next several periods.

For example, a hospital might consider purchasing a new EHRs system. These systems improve information sharing between different departments treating the same patients, and thus reduce the risk of errors when patients are transferred from one department to another. However,

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[143] Patients (and their medical insurers) might even prefer negligent physicians over reasonable ones because of the insurance received alongside negligent care. For an analysis suggesting that victims might induce injurers to act negligently, *see* Alon Cohen, Avraham Tabbach & Ariel Porat, Inducing Negligence (unpublished manuscript, on file with author).

[144] *See supra*, note 70 and accompanying text.

[145] One might argue that corrective justice is only concerned with those patients who file a claim, since an important aspect of the right to autonomy is the person's right to decide whether to enforce.

it takes time for staff to learn to use and become proficient on these systems and during that time the number of accidents may increase.

Interestingly, if the state institutes a negative damages system (i.e., a subsidy for hospitals that create less harm than is deemed reasonable) or set a low level of reasonable harm, hospitals will still have an incentive to invest in precautions because they will know that while they might pay more damages in the short run, decreasing harm will translate to lower (or even negative) damages in the long run.

However, a significant problem might arise with respect to physicians' training. New doctors learn to treat patients by doing so during residency (albeit under some supervision). As doctors-in-training, residents naturally pose a higher risk of error than experienced physicians. While limiting what residents are allowed to do may reduce that risk in the short run, it hinders their training and thus increases the risk to (other) patients in the long run. The problem is that, unlike when it acquires new technology, when a hospital invests in training physicians, assuming the risk of more errors and paying more compensation, it may not recoup any return that investment because physicians often change workplaces, especially after residency. Training physicians is a public service, and hospitals should be encouraged to do so.[146]

The specific problem of physician training can be solved under SLUH through the determination of reasonable harm. We have already seen that the reasonable level of harm should be adjusted to fit a hospital's specific characteristics. Having a training program is one such characteristic. Taking it into consideration when determining the reasonable level of harm will encourage hospitals to train physicians.

4.3. Other Alternatives

SLUH is not the only regime that can overcome the shortcomings of current medical malpractice law. In this section I briefly discuss some other options.

The first and most obvious alternative to SLUH is a simple rule of strict liability, or a no-fault system. Under such a rule, hospitals will pay for every adverse event in their facilities, regardless of fault. Such a system is even less expensive to implement than SLUH because no determination of the reasonable level of harm is required. Furthermore, since hospitals will pay for both harm and harm prevention, strict liability

[146] *See* Ariel Porat, *Private Production of Public Goods: Liability for Unrequested Benefits*, 108 MICH. L. REV. 189, 190-–91 (2009) (reviewing the different legal treatment of negative and positive externalities, and proposing an "'"expanded duty of restitution, under which, when certain conditions are met, recipients would compensate benefactors for unrequested benefits"). *See also* Giuseppe Dari-Mattiacci, *Negative Liability*, 38 J. LEGAL Stud. 21, 22–23 (2009) ("In general, positive-externality problems are commonly regarded as a justification for public goods provision, subsidies, or regulation rather than for liability").

creates efficient incentives to invest in care. This regime also eliminates incentives for defensive practices, since fault is not dependent on evidence of conduct. Moreover, since patients do not need to litigate complicated issues, such a system would likely solve the problem of under-enforcement.

However, strict liability creates other problems that might make it less efficient than the current, negligence-based regime, and clearly less desirable than SLUH. As mentioned above, SLUH can be applied to any adverse event, including errors, complications, and hospital-acquired infections, whereas it is impossible to apply a no-fault regime to these risks. The cost of paying for all adverse events in a hospital, most of which are beyond the hospital's control, would be astronomical. Furthermore, hospitals might decide not to treat high-risk patients or to require them to pay high premiums to cover the liability risk they pose.

In theory, the courts may apply strict liability only to medical errors (negligent or not), not to every adverse result of medical care. Strict liability thus creates two problems similar to those plaguing the current negligence regime. First, even if they can, hospitals will have no incentive to reduce risks that fall outside the scope of what is considered medical error under the regime. Programs such as ACS NSQIP show that some hospitals fail to use simple measures to reduce the risk of complications, and these failures are not considered medical errors.

Second, to determine whether an adverse event was caused by medical error or not, courts must assess the medical care provided and determine causation. In many instances, patients do not know if their harm came about due to medical error. Having to prove causation aggravates the problem. Many patients face an inherently high risk, which is why they seek medical care in the first place. Since patients face risk regardless of care, it is difficult for them to prove that medical error rather than inherent risk caused their harm. These evidentiary constraints limit patients' ability to obtain compensation for medical errors under a strict liability regime.

Last, we need to consider how the liability regime night affect the costs of medical care. While in many cases patients suffer harm, and often die, from errors committed in the provision of care and from preventable infections, in many more cases these outcomes are not preventable. Holding doctors and hospitals accountable for harm in these instances increases the cost of providing care. Higher medical costs may limit access to care, and being unable to obtain care is much more detrimental than receiving care that might be inadequate.[147]

[147] *See* Andis Robeznieks, *Wary Physicians*, 35 MOD. HEALTHCARE 8 (2005) (finding that defensive clinical practices lead to a high degree of avoidance of treating risky patients); John Adwok & Ellen Hope Kearns, *Defensive Medicine: Effect On Costs, Quality & Access to Healthcare*, 3 J. BIOLOGY, AGRIC. & HEALTHCARE 29, 31 (2013) ("Perhaps the practice of over investigating patients provides an element of protection for the doctor

One last alternative worth exploring is a negligence regime coupled with proportional liability. In a proportional liability regime, plaintiffs need not prove causation to obtain compensation. Instead, if they prove they received negligent care, they will receive compensation discounted by the probability that the harm was caused by a physician's negligent conduct.[148]

In some ways, the SLUH regime is similar to proportional liability. Under SLUH, each victim receives compensation discounted by the probability that his or her harm would have been avoided had the hospital acted reasonably when treating all its patients.[149] However, SLUH has an informational advantage since it does not require the court to assess the conduct and the probability of causation in each case. Instead, SLUH averages the ratio between reasonable and unreasonable harm across all cases. Thus, while proportional liability likely creates better incentives than the current negligence-based regime,[150] SLUH is less expensive to implement and creates better incentives for hospitals to reduce the risks posed to patients.

5. APPLYING SLUH TO OTHER AREAS OF TORT LAW

Thus far we have explored the advantages of SLUH as an alternative to medical malpractice law. This regime, however, can apply to other areas of tort law.

In general, the SLUH regime should be considered whenever (i) due

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and a marginal benefit for the patient, but the overwhelming evidence suggests it increases the cost of care and may increase patient risk."); W.T. Oosthuizen & P.A. Carstens, *Medical Malpractice: The Extent, Consequences and Causes of the Problem*, 78 THRHR 269, 277 (2015) (arguing that "increased liability costs are eventually passed on to the patient in the form of more expensive healthcare services").

[148] In medical malpractice cases, proving causation is inherently difficult since patients require medical treatment because of some inherent risk. Some jurisdictions allow for proportional liability under the loss of chance to recovery doctrines. *See, e.g.*, Herskovits v. Group Health Coop. of Puget Sound, 664 P.2d 474, 476–77 ("The ultimate question raised here is whether the relationship between the increased risk of harm and Herskovits' death is sufficient to hold Group Health responsible. Is a 36 percent (from 39 percent to 25 percent) reduction in the decedent's chance for survival sufficient evidence of causation. . . We answer in the affirmative."); for further discussion, *see* Porat, *supra* note42, at 110–11.

[149] *See supra*, Part 3.1.

[150] *See* Steven Shavell, *Uncertainty over Causation and the Determination of Civil Liability*, 28 J.L. & ECON. 587, 589 (1985) (stating that whenever there is uncertainty over causation, liability in proportion to the probability of causation creates better incentives than any threshold criterion); John Makdisi, *Proportional Liability: A Comprehensive Rule to Apportion Tort Damages Based on Probability*, 67 N.C. L. REV. 1063, 1067–75 (1989) (claiming that proportional liability promotes both efficient incentives and corrective justice principles); Porat, *supra* note42, at 108–14 ((same); Pelled, *supra* note 100, at 173–78 (arguing that uncertainty over causation should be treated the same as uncertainty regarding the level of harm, and allow for proportional liability).

to risks inherent in the injurer's business, it causes harm frequently and the victims are different each time; and (ii) it is difficult and expensive to set the standard of care, observe the conduct, and prove causation in each incident.

One type of case that meets these criteria is mass exposure to pollution. Environmental torts pose a significant causation problem. Even if a court can determine that a tortfeasor increased the risk to the people exposed, it is impossible to determine whose illness was caused by the exposure. If the law allows the polluter to create some harm from pollution,[151] it would be even more difficult to decide who developed the disease because of the excessive pollution. SLUH solves this problem by awarding damages according to the excess harm, without requiring victims to prove causation.

Product liability might be another prominent example. Liability for design defects presents many of the same difficulties as liability for negligence.[152] Plaintiffs must prove that the design is defective and that their accident was in fact caused by the defective product.[153] When the use of a particular product might reasonably result in accidental harm, it is easier for a court to determine whether the harm crossed a reasonable harm threshold, and make the manufacturer pay damages for the difference between reasonable harm and actual harm than it is to determine if an alternative, safer design is reasonable.

This is especially true for smart AI devices and driverless vehicles (AVs). The design of these devices raises challenging questions regarding tort liability. Automobile accidents (including nonlethal accidents) are very common.[154] While AVs should be safer than cars with

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[151] *See* Polinsky & Shavell, *supra* note 4949, at 888 (discussing different general reasons tortfeasors sometimes escape liability for harms for which they should be liable").

[152] *See, e.g.*, Prentis v. Yale Mfg. Co., 365 N.W.2d 176, 184 (Mich. 1984) (the court explained that "in a design defect case, the issue is whether the manufacturer properly weighed the alternatives and evaluated the trade-offs and thereby developed a reasonably safe product…[. . . [t]he risk–utility balancing test is merely a detailed version of Judge Learned Hand's negligence calculus."); Castro v. QVC Network, 139 F.3d 114, 116 n.3 (2d Cir. 1998) (holding that the risk–utility calculus in product liability cases "is in many ways similar to the Learned Hand negligence test"); Liriano v. Hobart Corp., 132 F.3d 124, 131 n.12 (2d Cir. 1998) (the risk–utility test involves the making of a cost–benefit analysis to gauge the benefits of a product in relation to its dangers. In this respect, it is very similar to the Learned Hand cost–benefit analysis undertaken to determine whether negligence exists).

[153] *See, e.g.*, Blair v. Eagle-Picher Indus., Inc., 962 F.2d 1492, 1495 (10th Cir. 1992) ("[i]n order for a plaintiff in Oklahoma to prevail in a products liability action such as this one, the plaintiff must first prove that the defendant's product actually caused the injury. The mere possibility that the product caused the injury is not enough."); Cole v. Janssen Pharm., Inc., 759 F. App'x 518, 519 (7th Cir. 2019) (holding that in product liability cases, a plaintiff has the burden of proving that a defective product is a legal cause of an injury, so the plaintiff must show that the defect in the product was a "cause in fact" of the injury).

[154] *See supra* note 22.

human drivers (because robots are not prone to lapses in attention and other human failings), it is difficult to design a system that can determine when such a device malfunctions or is defective in the sense that another design would have prevented a particular accident. There are two main issues with finding an smart AI device defective. First, most devices use learning algorithms that render their decision-making process a "black box."[155] The device learns patterns from information not easily translated to considerations humans can readily follow.[156] For example, if an AV swerves, it may be because of a malfunction or it may be that swerving was the best thing to do to reduce harm from a collision. It is unlikely that future inquiry could easily distinguish between the two options.

Second, looking at the actions of a smart device or other AI-driven device in a particular instance challenges how we would usually define a design defect.[157]AI-based systems make decisions that until recently were reserved for human actors, but they follow a different decision-making process. The only practical way to determine whether their design is not reasonably safe is to examine their accident rate rather than a decision in a particular instance. Again, think of road accidents involving AVs. Assume that one manufacturer designed a system that reduces the risk of road accidents by 50% relative to human drivers, but it does so by avoiding all accidents that human drivers would not have avoided and creating a new risk of road accidents that reasonable human drivers would always avoid. By focusing only on accidents that AVs in, courts might determine that the design is defective since even the alternative of human drivers is safer. Only by comparing the total harm these vehicles cause over time to a level of harm determined to be reasonable is it possible to determine whether the design is reasonably safe compared to the alternative (be it a reasonable human driver or a

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[155] Alice Guerra, et al., *Liability for Robots I: Legal Challenges*, 18 J. INSTITUTIONAL ECON. 331 (2022) (describing the challenges of attributing fault to an AI device).

[156] Suhrid A. Wadekar, *Autonomous Vehicles: As Machines Learn to Drive, What Must We Learn?*, 27 B.U. J. Sci. & TECH. L. 345, 361 (2021) (noting that "even if functionality testing shows that the AV Software would behave as specified, that in itself would generally not provide adequate assurance about the safety of the AV"); Rick Salay & Krzysztof Czarnecki, *Using Machine Learning Safely in Automotive Software: An Assessment and Adaption of Software Process Requirements in ISO 26262*, ARXIV ABS/1808.01614, 7 (2018) (explaining that autonomous driving requires perception of the environment, and this functionality may not be completely specifiable. Since a vehicle must move around in a human world, advanced functionality must involve perception of human categories, such as pedestrians. There is evidence that such categories can only partially be specified using necessary and sufficient conditions).

[157] For the restatement's definition of defect in design, *see* RESTATEMENT (THIRD) OF TORTS: PROD. LIAB. § 2 (1998) ("[a product] is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the alternative design renders the product not reasonably safe").

differently designed other AV).

Theoretically, strict liability can be applied in all cases involving AI-driven devices, regardless of whether there are design defects. However, this might stifle innovation and create entry barriers, harming competition between manufacturers.[158] Furthermore, strict liability may disincentivize people from using use such devices. Last, when devices interact with human actors, strict liability disincentivizes the human counterpart to invest in care. For example, in road accidents placing strict liability on autonomous vehicles harms the incentives of human drivers to invest in care, which makes little sense if human drivers are generally more dangerous than their AI counterparts.[159]

6. CONCLUSION

Tort liability is a peculiar way to regulate behavior. It aims to reduce accidental harm but does not try to observe the overall harm tortfeasors create over time, even when such information is readily available. Instead, the tort system imposes liability based solely on conduct. For the paradigmatic injurer and victim, there are no practical alternatives. When an injurer is involved in only a few accidents in his or her lifetime, it is impossible to draw any meaningful statistical inferences from such accidents. For example, most car drivers will be involved in only a few accidents, if that, over their driving life. Similarly, most physicians might make a medical error, but very few are involved in several serious incidents over a short period. The only liability regimes available when dealing with small-scale injurers are therefore based on conduct or strict liability.

The same is not true for large organizations that are involved in many incidents and for which it makes little sense to examine the level of care in every instance. This article therefore analyzed the use of the SLUH regime and examined how applying it to medical facilities can promote patient safety and reduce the cost of medical care.

As mentioned above, the SLUH regime is designed for largescale

[158] Theoretically, it is possible to use strict liability for all AI devices, regardless of defects. Strict liability, however, may stifle innovation and create entry barriers, harming competition between manufacturers. *See* Yavar Bathaee, *The Artificial Intelligence Black Box and the Failure of Intent and Causation,* 31 HARV. J. L. & TECH. 899 (2018). The fear is that manufacturers will have adequate incentives to reduce risk given available technology, but they will not invest enough in developing new, safer technologies, increasing accident costs in the long run.

[159] Another question, that is beyond the scope of this article, concerns liability of human drivers when AVs are available. One could argue that once AVs are significantly safer than humans. The existence of AVs offers a cost-effective precaution measure, so any human driver should be liable for not adopting the accident-preventing technology. *See* RYAN ABBOTT, THE REASONABLE ROBOT: ARTIFICIAL INTELLIGENCE AND THE LAW (2020).

injurers. In the medical context, the regime applies to hospitals, not private practices. It nonetheless significantly changes the medical malpractice system. Hospitals employ around 40% of the doctors operating in the United States and more than half of the physicians in most EU member states.[160] Furthermore, many of the high-risk procedures, which are the kinds of procedures that would benefit most from a functioning tort system, are done in hospitals. The current liability system fails most patients. It offers little in terms of compensation while distorting treatment decisions. Patients should welcome the shift to the SLUH regime. Doctors should welcome it as well. Many complain about the fear of liability and the incentive it creates to overprescribe, overtest, and overtreat.[161] SLUH should make these phenomena a thing of the past.

[160] *See* BUREAU OF LABOR STATISTICS, U.S. DEPARTMENT OF LABOR, *Occupational Outlook Handbook: Physicians and Surgeons*, https://www.bls.gov/ooh/healthcare/physicians-and-surgeons.htm ; WHO Reginal Office for Europe, *% of Physicians Working in Hospitals*, EUROPEAN HEALTHCARE FOR ALL DATABASE, https://gateway.euro.who.int/en/indicators/hfa_506-5270-of-physicians-working-in-hospitals/.

[161] *See, e.g.*, Summerton, *supra* note50.