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Hospital Responses to the Emergency Medical Treatment and Labor Act (EMTALA): Noncompliance, Hospital Utilization and Readmissions, and Strategic Ambulance Diversions

Author
Hsuan, Charleen

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Hospital Responses to the Emergency Medical Treatment and Labor Act (EMTALA): Noncompliance, Hospital Utilization and Readmissions, and Strategic Ambulance Diversions

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Health Policy and Management

by

Charleen Hsuan

2016

ABSTRACT OF THE DISSERTATION

Hospital Responses to the Emergency Medical Treatment and Labor Act (EMTALA): Noncompliance, Hospital Utilization and Readmissions, and Strategic Ambulance Diversions

by

Charleen Hsuan

Doctor of Philosophy in Health Policy and Management

University of California, Los Angeles, 2016

Professor Jack Needleman, Chair

EMTALA requires Medicare-participating hospitals to provide emergency care to all patients regardless of payer. We examine the effect of EMTALA in three studies.

(1) In key informant interviews, we examine causes for and solutions to EMTALA noncompliance. We find that hospitals may violate EMTALA for five reasons: financial pressure, complexity/lack of knowledge about the law, a high referral burden that makes it difficult to comply with EMTALA, inter-hospital relationships that discourage reporting on borderline inappropriate transfers, and a principal-agent problem with differing physician and hospital priorities. We propose several ways to strengthen the Act, including requiring Medicaid to fully reimburse required EMTALA screening exams and amending EMTALA to permit informal mediation sessions between hospitals.

(2) We measure changes in hospital utilization and readmissions when EMTALA is extended to inpatients. In 2009, the Federal Court of Appeals for the Sixth Circuit ruled that EMTALA

obligations continued until a patient was stabilized, regardless of whether s/he was admitted. However, hospitals outside the court's jurisdiction continued to follow 2003 regulations that EMTALA obligations cease after a good faith admission. This study uses a difference-in-difference-in-differences design, comparing Medicaid/uninsured with commercially-insured patients before and after the case in hospitals inside and outside the Sixth Circuit. We find that although more unprofitable inpatients are discharged with a short length of stay after extending EMTALA to inpatients, they are substantially less likely to be readmitted. These results suggest that extending EMTALA to inpatients may encourage hospitals to fully stabilize unprofitable patients admitted from the emergency department (ED).

(3) We explore whether hospitals strategically avoid treating uninsured and Medicaid patients by temporarily closing part of their EDs (through an ambulance diversion) when nearby safety net hospitals declare diversion. We find that hospitals are more likely to declare diversions when nearby safety net hospitals go on diversion, as compared to when nearby non-safety safety net hospitals (matched by size and distance) do so. Furthermore, hospitals that divert when a nearby safety net hospital diverts have a slightly lower ED occupancy than hospitals that divert when a nearby non-safety net hospital diverts. In addition, we theorized that, like musical chairs, hospitals do not want to be last one with an open ED after a nearby safety net hospital declares a diversion. Consistent with this theory, when multiple hospitals in a market are on diversion, the third hospital in a market to declare a diversion does so sooner if the first hospital declaring a diversion is a safety net hospital than if the first hospital is a non-safety net hospital.

Hospitals also end their diversions differently depending on whether the nearby diverting hospital was a safety net hospital or non-safety net hospital. Specifically, hospitals are on diversion longer and end their diversions later after a nearby safety net hospital ended its

diversion than after a nearby non-safety net hospital ends its diversion. Perhaps hospitals that are strategically diverting are waiting to make sure that the nearby safety net hospital will not go back on diversion.

Our results suggest that hospitals engage in strategic diversions, reducing access to emergency services to unprofitable patients and circumventing the goals of EMTALA.

The dissertation of Charleen Hsuan is approved

Jill Horwitz

Renee Hsia

Ninez A. Ponce

Thomas H. Rice

Jack Needleman, Committee Chair

University of California, Los Angeles

2016

Dedication

To my family (Matt, Drea, my parents and my sister) for their unwavering support and inspiration

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Acknowledgements

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Vita/Biographical Sketch

EDUCATION

Columbia University School of Law, New York, NY
J.D., May 2008

Yale University, New Haven, CT
B.S. (Molecular, Cellular, and Developmental Biology), May 2002

HONORS AND AWARDS

A. At UCLA Fielding School of Public Health

Fellowships

- UCLA Dissertation Year Fellowship, 2015-2016
- National Institutes of Health/National Center for Advancing Translational Science UCLA TL1 Translational Science Fellowship, 2012-2015
- Agency for Healthcare Research and Quality Fellowship, 2010-2012

Awards/Prizes

- Celia and Joseph Blann Fellowship, 2016
- National finalist for 2016 Delta Omega scientific poster competition of the American Public Health Association Annual Meeting, 2016
- UCLA Raymond Goodman Scholarship, 2013
- Recipient of Public Health Systems Research (PHSR) Student Scholarship (AcademyHealth) and winner of best student poster for PHSR Interest Group, 2012
- UCLA Chancellor's Prize, 2010-2012

B. At Columbia University School of Law

- Harlan Fiske Stone Scholar, 2006-2007 and 2007-2008

PUBLICATIONS

Rodriguez HP, McCullough JM, **Hsuan C.** Local Health Department Collaborative Capacity to Improve Population Health. Frontiers in Public Health Services & Systems Research 2014; 3(4).

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PRESENTATIONS

"Influence of Paid Sick Leave Laws on Foodborne Illnesses."

- Poster: Delta Omega scientific poster competition at Annual Meeting of the American Public Health Association, Denver, CO November 1, 2016 (accepted)

"Extending the Emergency Medical Treatment and Labor Act (EMTALA) to Inpatients May Improve Patient Safety"

- Presentation to the Tennessee Department of Health, Nashville, TN January 29, 2016
- Poster: AcademyHealth Annual Research Meeting, Boston, MA June 27, 2016

"Improving Compliance with the Emergency Medical Treatment and Labor Act (EMTALA): A Qualitative Study"

- Poster: AcademyHealth Annual Research Meeting, Minneapolis, MN June 14, 2015

"Differences in Urban and Rural Public Health System Influences on Changes in County-Level STD Rates"

- Oral: AcademyHealth Annual Research Meeting, San Diego, CA June 10, 2014

"EMTALA Policy & *Moses v. Providence Hospital"*

- Guest lecture for UCLA Law 326. Health Law and Policy, January 14, 2014

"The Adoption and Abandonment of Clinical Services by Local Health Departments"

- Oral: Public Health Services & Systems Research Keeneland Conference, Lexington, KY April 18, 2012
- Poster: Agency for Healthcare Research and Quality - National Research Service Award Trainees Research Conference, Orlando, FL June 23, 2012
- Poster: AcademyHealth - Public Health Systems Research Interest Group Annual Meeting, Orlando, FL June 26, 2012 [winner, best student poster]

GRANTS

- Agency for Healthcare Quality and Research R36 Dissertation Year Fellowship, **"**Predictors of Ambulance Diversions: Do Hospitals Strategically Divert to Avoid Medicaid and Uninsured Patients?", Sept 2015-June 2016
- Robert Wood Johnson Foundation-HCFO, "The Effect of Changes in the Emergency Medical Treatment and Labor Act (EMTALA) Policies on Hospital Utilization and Patient Safety", Dec 2013-Dec 2015
- Robert Wood Johnson Foundation- Public Health Law Research, "Assessing the Public Health Impact of Laws and Ordinances Regulating Paid Sick Leaves on Preventing and Controlling Infectious Diseases", Dec 2013-May 2015

Chapter 1. Introduction

> "In Alameda County, Sharon Ford, a Medi-Cal recipient, was turned away from two private hospitals last December while in labor, because a hospital computer erroneously showed that she did not have insurance. Hours later, her baby was born dead at Highland General Hospital in Oakland, the county facility…
>
> In San Bernardino last winter, a patient with a stab wound to the heart was sent to the San Bernardino County Medical Center after being examined and declared 'stable' by a cardiac surgeon at another hospital…the patient arrived moribund, had a cardiac arrest and died."
>
> -Steinbrook R. Hospital 'Dumping' of Poor: Lawmakers Seek a Cure. Los Angeles Times. April 7, 1986.

In the 1980s, a flurry of news articles reported about uninsured and Medicaid patients being refused emergency treatment by private hospitals and being transferred — "dumped" — onto public hospitals for economic reasons. (1-4) These articles, along with several empirical studies about patient dumping, (5-8) suggested that hospitals across the country were engaging in these economic transfers. One back-of-the-envelope estimate was that 250,000 patients in need of emergency care were transferred every year for economic reasons. (8)

In 1986, Congress passed the Emergency Medical Treatment and Labor Act (EMTALA) to reduce economic transfers of emergency department (ED) patients (9) by requiring Medicare-participating hospitals to provide emergency care to all patients, regardless of insurance status. (10) Although the law was passed thirty years ago, little is known about how widely its goals have been internalized.

On one hand, emergency physicians and staff are widely aware of EMTALA's requirements. In a 2001 survey by the Department of Health and Human Services, more than eighty percent of ED personnel were familiar with at least 12 of 15 EMTALA provisions listed on the survey. (11) In addition, there are only about 575-650 investigations into EMTALA

violations every year, with approximately 40% of investigations finding violations. (12, 13) This number is much lower than the 250,000 estimate of economic transfers from three decades ago, suggesting that providers may have dramatically reduced the number of economic transfers.

On the other hand, the number of investigations likely underestimates the number of EMTALA violations, as investigations are only initiated only after a complaint. (14) Egregious EMTALA violations continue, and even egregious violations are difficult to detect. A recent example is a psychiatric hospital in Nevada that gave more than 1500 patients commercial bus tickets to cities in other states, including allegedly unstable patients who had no connections to the city they were bused. (15) An investigation by the Centers for Medicare and Medicaid Services (CMS) that sampled several dozen charts found that 40% of these discharges violated EMTALA. (16) The hospital engaged in this behavior over five years. (15) The fact that it took five years before these violations were discovered, despite the scope of the violations, highlights the extent of the difficulty in detecting EMTALA violations is. Furthermore, the statistics quoted above would consider this as one investigation and one violation, even though many patients are affected.

Are the EMTALA violations that still occur the result of a few "bad apples"? In other words, have the goals of the EMTALA been internalized by most providers, (13) such that the Act is important historically but not contemporarily? Or is EMTALA still relevant today, encouraging hospitals to protect patient safety in ways that they might not in the Act's absence?

A. Overview of EMTALA

Under the common law (i.e. law established by judicial precedent), hospitals and physicians are not required to provide services unless an existing physician-patient relationship

already exists. (17) There were some statutory exceptions before 1986. For instance, hospitals that received federal support under the Hill-Burton Act were required to provide some charity care, although by the mid-1980s, many hospitals had or were about to phase out of their Hill-Burton obligations.[1] (19) Several states and municipalities also required hospitals to provide some emergency care. For instance, Texas, which was the model for EMTALA, prohibited hospitals from refusing to diagnosis or provide emergency care to patients based on age, sex, physical condition, or economic status, (20) while Los Angeles attempted to regulate economically-motivated transfers by requiring that all transfers from private hospitals be approved by a medical alert center. (4)

However, because there was no general federal requirement that hospitals provide emergency care to patients, this led to public hospitals treating uninsured and Medicaid patients, and private hospitals treating commercially-insured patients. (13)

Unfortunately, by the 1980s, this led to the instances described above, of uninsured and Medicaid patients being refused emergency treatment and dumped at public hospitals. To address patient dumping, Congress passed EMTALA as part of the Consolidated Omnibus Reconciliation Act of 1985.[2]

EMTALA is a condition of participation for Medicare that requires that hospitals screen ED patients for an emergency medical condition. (22) If such a condition is found, hospitals must stabilize the patient before transferring or discharging. (23) The Act also restricts transfers of unstable patients, for instance requiring a physician certification that the risks of transfer are

[1] Some hospitals were also perpetually obligated under the "community service assurance" of Hill-Burton to provide emergency services to patients living in their service areas even if the patients cannot afford those services. As of June 2016, there were 26 general hospitals with these obligations. (18)

[2] Despite the name, EMTALA was passed in 1986. EMTALA's original name was the Emergency Medical Treatment and Active Labor Act; the "Active" was dropped in 1989. (21)

outweighed by its benefits (or a written patient request for transfer). (24) Additionally, EMTALA requires hospitals with specialized capabilities, such as those with neonatal intensive care units, burn units, or trauma centers, to accept EMTALA transfers if they have capacity. (25) Confirmed EMTALA violations may result in a civil fine to the hospital of up to $50,000 per violation (or $25,000 for hospitals with fewer than 100 beds) or termination from participation in Medicare, and to the physician of up to $50,000 per violation. (26) Termination is rare; only 2% of hospitals with confirmed EMTALA violations since its passage have been terminated from participating in Medicare, although about half were later reinstated. (27) In addition, the last hospital terminated from Medicare for an EMTALA violation was in 2007. (13)

B. Previous Empirical Research

Previous empirical research into EMTALA has focused on describing investigations by CMS into EMTALA violations (12, 13, 27); case studies regarding potential EMTALA violations at a single hospital (28); analyses of provider surveys about reported perceptions of inappropriate patient transfers (29, 30); and medical record reviews or registry-based analyses of transferred patients, focusing on those who were transferred into hospitals with specialized capabilities. (7, 31-46)

Although EMTALA applies to all patients, providers and scholars often focus on the Act's requirements to provide uncompensated (or under-compensated) emergency care. For instance, the American College of Emergency Physicians claims that the enactment of EMTALA led local and state governments to "abdicate responsibility for charity care," leaving EMTALA to be the "de facto national health care policy for the uninsured." (47)

Thus, previous empirical research into EMTALA has focused on comparing emergency care provided to uninsured and Medicaid patients with the care provided to commercially-insured patients. Most empirical studies about EMTALA have focused on patterns of transfers and describing how differences in these patterns appear to be consistent with EMTALA noncompliance. For instance, one study described transfers from a for-profit hospital to a tertiary care hospital (one with specialized capabilities). The for-profit hospital transferred primarily uninsured patients to the tertiary care hospital, citing the lack of an on-call gastroenterologist, while admitting insured patients who require those services. (32) Another study examined the odds of being designated a transfer with an emergency medical condition, i.e. being a patient transferred under EMTALA. As compared to commercially-insured patients, uninsured patients had 2.3 times the odds of being designated as an EMTALA transfer with an emergency medical condition. (36)

A few studies examined the appropriateness of transfers, and whether this varied by a patient's insurance status. The majority of these studies suggest that economic transfers may still occur, although these studies may be subject to publication bias (e.g. journals may be more likely to publish studies finding economic transfers than those that do not find these results). Compared to commercially insured patients, uninsured trauma patients were more likely to be transferred from Level III hospitals. (41) This trend continues in studies focusing on Medicaid and uninsured patients with low injury severity. For instance, compared with commercially-insured patients, Medicaid patients with low injury severity trauma are more likely to be transferred; (37) uninsured patients with a mild head injury are more likely to be transferred out of hospitals, and less likely to be accepted as transfers from Level II or III trauma centers. (42) Similarly, trauma patients with noncommercial insurance (those with charity care, self-pay,

Medicaid, or Medicare) compared to commercial insurance were more likely to be transferred, and this appeared to be moderated by severity of injury, with less-severely injured uninsured patients being more likely to be transferred, although the moderation was not statistically significant. (43)

Several studies examined the appropriateness of transfers, focusing on patients who were transferred to one hospital (or two). While the results of these studies are suggestive, these have small sample sizes, and results may not be generalizable, particularly because results seemed to vary based on the hospital. For instance, compared to commercially insured patients, some studies found that uninsured patients with orthopaedic injuries, (38) hand and microsurgical emergencies, (40) and primary hand or upper extremity abnormality, (44) were more likely to have been inappropriately transferred. However, other studies did not find any statistically significant differences between transfers of commercially insured patients and uninsured patients with orthopaedic injuries. (39) Similarly, a few studies also compared the payer mix of transferred patients with patients admitted directly from the primary catchment area, finding no statistically significant difference in payer mix between the two for trauma (45) or hand patients. (46)

C. Overview of Dissertation

This dissertation explores the role of EMTALA, and whether providers have internalized the Act's goals. In Chapter Two, we examine provider perceptions about EMTALA compliance and potential solutions using key informant interviews. In this chapter, we find that although some providers think that the Act's goals have been internalized, others recounted transfers that were borderline inappropriate or patterns of transfers that they thought were consistent with

EMTALA noncompliance. After synthesizing results from the interviews, we propose several possible solutions to strengthen the law, including requiring Medicaid to fully reimburse screening exams required under EMTALA and amending EMTALA to permit informal mediation sessions between hospitals.

In Chapters Three and Four, we empirically explore whether hospitals have internalized the goals of EMTALA.

Chapter Three examines whether hospitals change their behavior when the scope of EMTALA is extended to inpatients. Specifically, CMS promulgated regulations in 2003 stating that EMTALA obligations end upon a good faith admission. We focus on a court case by the Federal Court of Appeals for the Sixth Circuit (Kentucky, Michigan, Ohio, and Tennessee), which ruled in 2009 that EMTALA obligations may continue beyond inpatient admission. Hospitals outside the jurisdiction of the Sixth Circuit still continue to follow the 2003 CMS regulations.

If the goals of EMTALA have been internalized, then hospitals should not change their behavior even when the scope of EMTALA changes, and we should not see a difference in hospital utilization and readmissions for Medicaid and uninsured patients after we control for temporal and geographic trends. Instead, we find some evidence suggesting that, though hospitals are more likely to discharge unprofitable ED patients with a short length of stay, the patients are substantially less likely to be readmitted. These results suggest that extending EMTALA to inpatients may encourage hospitals to fully stabilize unprofitable patients who are admitted from the ED. We do not find any statistically significant increase in transfers, either ED or inpatient.

In Chapter Four, we explore behavior that is permitted under EMTALA, but that is contrary to the goals of the Act. Specifically, we focus on whether hospitals in California strategically close their EDs to ambulances (by declaring an ambulance diversion) when a nearby safety net hospital is on diversion. These "strategic diversions" are not prohibited by EMTALA, (48-50) but are contrary to the Act's goals of ensuring emergency care to all patients.

In evaluating whether hospitals engage in strategic diversions, we examine whether a hospital's decision to divert (measured by the probability of diversion and its timing and duration) is related to whether a nearby hospital that diverts is a safety net or non-safety net hospital. We find that after a nearby hospital declares a diversion, a hospital is more likely to declare a diversion if the nearby hospital is a safety net hospital, compared to a non-safety net hospital. In addition, hospitals that divert when a nearby safety net hospital diverts have slightly lower ED occupancy than hospitals that divert when a nearby non-safety net hospital diverts. In other words, hospitals are more likely to declare a diversion, and more likely to do so with a slightly lower ED occupancy. Furthermore, we theorize that, like musical chairs, hospitals do not want to be the last one with an open ED after a nearby safety net hospital declares a diversion. Consistent with that theory, we find that the third hospital in a market to declare a diversion does so sooner when the first hospital declaring a diversion is a safety net hospital than when the first hospital declaring a diversion is a non-safety net hospital.

Hospitals also end their diversions differently depending on whether the nearby diverting hospital is a safety net hospital or non-safety net hospital. Specifically, hospitals are on diversion longer and end their diversions later after a nearby safety net hospital ended its diversion than after a nearby non-safety net hospital ends its diversion. We had expected a difference in the opposite direction (i.e. we had expected diversions to be shorter and to end

sooner after the nearby hospital ended its diversion if the nearby hospital was a safety net compared to a non-safety net hospital), suggesting that we may not fully understand the mechanisms behind strategic diversions. As we discuss in that chapter, hospitals may engage in two different decisions for strategic diversions, differentially declaring and ending diversions based on the perceived insurance mix of patients that will be diverted to them. One hypothesis is that hospitals that are strategically diverting are waiting longer to make sure that the nearby safety net hospital will not go back on diversion.

Thus, our results suggest that hospitals may engage in strategic diversions, reducing access to emergency services to uninsured and Medicaid patients and circumventing the goals of EMTALA.

Chapter 2. Complying with the Emergency Medical Treatment and Labor Act (EMTALA): Challenges and Solutions

A. Introduction

During the 1980s, newspapers reported that hospitals were turning away uninsured patients, "dumping" unstable patients on safety net hospitals, and even letting them die on the street to avoid treating nonpaying patients. (51) In response, Congress passed the Emergency Medical Treatment and Labor Act (EMTALA) in 1986. Although EMTALA is meant to prevent patient dumping (9) and ensure access to emergency care (52) for all patients, it is particularly important for patients whom hospitals have financial incentives to avoid treating. Even if the Patient Protection and Affordable Care Act achieves near universal insurance, EMTALA will remain an important protection for patients who remain uninsured or whose insurance provides inadequate reimbursement. (53)

Despite physicians' (11) and patients' (54) self-reported familiarity with EMTALA, and public and professional concern about compliance, (55-59) hospitals continue to violate the Act. (12, 28, 32) In the first decade after it was passed, approximately a third of hospitals were investigated for EMTALA violations (27, 60) and, as of 2011, almost 30 years after the Act was passed, 40% of investigations still found violations. (61)

Understanding why hospitals do not comply with EMTALA would help policymakers and hospitals address noncompliance and, ultimately, improve access to care. However, to our knowledge, previous research has only conjectured about the root reasons for noncompliance. Two common suggestions for noncompliance offered are that: (i) hospitals find the costs of

compliance greater than benefits, particularly because detection is unlikely; and (ii) hospitals do not understand or have inadequate systems to comply with the complexity of EMTALA. (12, 13)

This qualitative study explicitly explores systematic reasons for EMTALA noncompliance through semi-structured interviews with hospitals, hospital associations, and patient safety organizations that review clinical data on EMTALA violations. During the course of these interviews, the respondents also offered suggestions on approaches that may reduce noncompliance. In the conclusion, we reflect upon these suggestions, and propose our own recommendations for improving EMTALA noncompliance.

B. Background

Overview of EMTALA

Under EMTALA, which is a condition of Medicare participation, hospitals with an emergency department (ED) must provide all patients who come to the ED with an appropriate medical screening exam to detect an emergency medical condition (EMC). (22) An exam is not deemed appropriate if the hospital provides different tests for patients with the same symptoms because of a patient's insurance status.[3] The Act also requires hospitals to provide patients with treatment sufficient to stabilize the emergency condition or an appropriate transfer to another hospital, (23) including providing pre-transfer patients with treatment (within the hospital's capacity) that minimizes the risks to the patient's health. (24, 65) Stabilization under the Act means that either no material deterioration is likely to result from or occur during the transfer or, for women in active labor, that the infant and placenta have been delivered. (10) The Act further

[3] Courts in most jurisdictions consider providing different tests for patients with the same symptoms to be sufficient to establish an EMTALA violation. (62, 63) However, the Federal Court of Appeals for the Sixth Circuit requires that an improper motive also be present; in the example above, this improper motive is insurance status, but it might also be race, sex, or other similar motive. (64)

requires hospitals with specialized capabilities such as burn, neonatal intensive care, or trauma units ("hospitals with recipient responsibilities") not only to accept an EMTALA transfer if it has capacity (25) (defined as the ability to accommodate the patient in terms of occupancy, qualified staff, and equipment), (66) but also to file complaint with the Centers for Medicare and Medicaid Services (CMS) or the state survey agency if the EMTALA transfer patient it receives was transferred in an unstable medical condition. (67) The Act does not include any such requirement for non-EMTALA transfer patients.

Any individual or organization may file a complaint with CMS or the state survey agency for any type of potential violation, including physician violations such as an on-call physician refusing or failing to appear within a reasonable time or a physician negligently signing a certification that a transfer is appropriate when s/he knew or should have known that the benefits did not outweigh the risks. (68) After the CMS regional office authorizes an investigation (61), the state survey agency conducts an unannounced, on-site investigation and reports the results back to the CMS regional office, which, along with the Office of Inspector General, decides whether there was an EMTALA violation and what the administrative penalties should be. (14)

EMTALA violations can result in hospital fines of up to $50,000 per violation ($25,000 for hospitals with fewer than 100 beds) or termination from participating in Medicare. (68) Only 2% of hospitals violating EMTALA are excluded from Medicare, and about half are later reinstated. (27) Further, it does not appear that any hospital has been excluded from Medicare since 2007. (13) Physician fines are $50,000 per violation and exclusion from Medicare. (68)

Patients may file civil claims against hospitals, but not physicians, for EMTALA violations. (68) An EMTALA claim may be in addition to malpractice claims, even if the two arise from the same facts. For example, a patient could sue a hospital both under malpractice for

negligently failing to detect an emergency medical condition and under EMTALA if s/he was not screened according to the hospital's policies. Filing both claims may be attractive to patients because, although the Act expressly limits financial recovery for EMTALA claims to the damages recoverable for state malpractice claims, (68) other state tort reform laws may not apply to EMTALA claims. Thus, courts have suggested that some reforms such as prior review by malpractice review panels, shorter statute of limitations, or protection of peer review proceedings do not apply to EMTALA claims. (69-74) In addition, federal courts have applied other sections of the Act (75) in such a way that a hospital may have greater liability under EMTALA than malpractice. Specifically, because the Act permits patients to sue hospitals, but not physicians, courts suggest that a hospital may be directly liable to patients for an EMTALA violation even if the hospital is indemnified by the physician for the malpractice claim, i.e. even if the physician is responsible for the malpractice claim. (76, 77)

Despite these legal risks, hospitals continue to violate the law. Some violations may reflect uncertainty about the application of EMTALA, such as its continued application when a patient is on observation status. (78) Other situations may appear suspicious but are not clear EMTALA violations. For example, some cases may reflect an EMTALA violation, an inaccurate diagnosis, or just a change in patient condition, such as a patient discharged from one hospital's ED for cholelithiasis (gallstones) and being admitted the next day by another hospital's ED for the more serious cholecystitis (gallbladder inflammation). (28) Although each individual case may not indicate a violation, when many such cases occur at a hospital, a pattern may arise suggesting that at least some cases included violations. Thus, a safety net hospital may be suspicious that a transferring hospital is violating EMTALA if that hospital appears to be

transferring primarily indigent patients under EMTALA, citing the lack of an on-call gastroenterologist, while admitting insured patients who require those services. (32)

Egregious violations have also been widely reported. For instance, an uninsured patient died from lack of treatment because a doctor allegedly refused to leave the sleep room (59) and an ED director hung up on a paramedic seeking help when the paramedic could not assure him that the patient was insured. (50) Over five years, a psychiatric hospital discharged over 1500 patients with commercial bus tickets to other cities where the patients had no connections (15); CMS determined that 40% of the discharges constituted EMTALA violations. (16) This example highlights the difficulty of detecting EMTALA violations, and emphasizes the importance of determining systematic reasons for violations and possible ways to prevent these violations.

C. Methods

We conducted eleven semi-structured, key informant interviews with nonprofit hospitals, hospital associations and patient safety organizations. Because preliminary informational interviews suggested that respondents preferred talking informally and indirectly about EMTALA compliance, we did not ask about specific examples of EMTALA noncompliance at the respondent's hospital that might have raised the risk of liability. Instead, we asked general questions about experiences, knowledge, and perceptions of EMTALA by physicians and hospitals in the respondent's state. We also asked respondents questions designed to determine the depth of their EMTALA knowledge by asking about their exposure to a complex legal issue, whether EMTALA obligations cease upon inpatient admission. (See Appendix 2 for the of interview guide).

The study sample consisted of organizations within five states (Georgia, Kentucky, North Carolina, South Carolina, and Tennessee). These states are within CMS region 4, which has the highest number of EMTALA complaints filed among all CMS regions, accounting for 41% of all complaints nationally in 2007. (61) We generated the study sample from web searches and respondents identified through snowball sampling. After identifying state hospital associations and patient safety organizations that conduct clinical reviews of EMTALA violations, we identified physicians who served on the board of directors of the hospital association, and added these physicians' hospitals to the sample.

We continued to add potential respondents until we reached saturation, meaning the point where additional interviews did not generate new themes. (79) To ensure that we did not prematurely conclude we had reached saturation, we continued interviews until the sample included at least one each of religious, network, community, rural, urban, academic, and non-academic hospitals.

The author made up to three attempts to contact 23 potential respondents through phone calls or e-mail before dropping them from the study. Seven (of the 23) potential respondents were at for-profit hospitals, none of which responded to our three separate requests for participation. (Table 2-1) Eleven potential participants agreed to participate, including seven participants at nonprofit hospitals. Respondent roles at these hospitals included general counsel (1), ED director (2), ED physician (1), associate chief of staff (1), Chief Medical Officer (1), and Chief Nursing Officer (1). The author conducted half-hour semi-structured interviews by phone from March to August 2014 and took notes during interviews, including short direct quotes, but did not record the interviews to keep them informal.

The author analyzed the interview notes for themes related to potential causes of or solutions to EMTALA violations. We borrowed from grounded theory to do this, specifically in our use of initial and focused coding, (80) but did not engage in formal grounded theory analysis because the lack of a recording or transcript precluded close coding. Similarly, we did not use formal qualitative software because of the lack of a transcript.

D. Results

1. Knowledge and Perception of EMTALA

The respondents' views regarding the significance of EMTALA for medical care varied. Some respondents reported that EMTALA obligations have been internalized by providers as the standard of care, and thus the Act has little ongoing importance. Others said that EMTALA continues to safeguard patient access and safety, creating a "baseline" level of care and providing ED physicians and hospitals with a "useful lever" to improve patient safety, such as by requiring specialists to follow on call obligations.

Respondents who thought EMTALA remains significant tended to be hospital administrators at recipient hospitals (i.e. those most likely to receive EMTALA transfer patients). They recounted transfers that were borderline inappropriate or that they suspected might be inappropriate. They also related seeing "general" patterns that they thought were consistent with EMTALA noncompliance, such as a higher percentage of EMTALA transfer patients who are uninsured, EMTALA transfer patients being sicker than reported, and a colleague (pediatric surgeon) who had never had an *insured* EMTALA transfer patient (prior to Medicaid managed care). Respondents were unsure whether these general patterns were actually inappropriate, as

most indicated that they would not be aware of an EMTALA investigation at another hospital or its results (unless it was widely publicized).

The respondents believed that ED physicians had high general knowledge of EMTALA, and they themselves showed a high level of specific knowledge about the law. To evaluate this knowledge, we asked about the 2009 case *Moses v. Providence Hospital and Medical Centers*, a decision by the Federal Court of Appeals for the Sixth Circuit ruling that EMTALA obligations may continue after inpatient admission. (81) This decision overruled 2003 CMS rules, which end EMTALA obligations upon a good faith inpatient admission. (82) The effect of the *Moses* case and the CMS regulations (which the agency decided not to reconsider even after *Moses*) (83) is that there are essentially two different rules in place. In the Sixth Circuit (within our sample, Kentucky and Tennessee), EMTALA obligations extend beyond admissions, while outside of the Sixth Circuit (within our sample, Georgia, North Carolina, and South Carolina), it does not. (See Chapter Three for further details).

Our respondents within the Sixth Circuit's jurisdiction were generally aware of *Moses* or of the controversy regarding whether EMTALA extends to inpatients. Most understood the case to mean EMTALA obligations might extend to inpatients. However, they disagreed about the extent to which other hospitals were aware of the case. Some respondents doubted that employees at other hospitals knew about the case, while others thought there was "a lot of buzz" about *Moses* when the case was decided, and that even if physicians did not know the case by name "they do talk about the holding"; since *Moses,* "we know that we can't avoid EMTALA obligations simply by admitting [the patients]." One hospital association within the Sixth Circuit discussed the case "at length" with their member hospitals.

In contrast, the respondents outside the Sixth Circuit knew of the CMS regulations, but only a few knew about the controversy regarding EMTALA's application to inpatients. One respondent said that key individuals within her hospital network were aware of the case, but they did not disseminate information about the case to the network's ED physicians because the administration did not think the case applied since they are outside the Sixth Circuit's jurisdiction. One state hospital association disseminated educational information about the case when it was first decided.

2. Why Hospitals Do Not Comply with EMTALA

Our respondents suggested several potential causes for EMTALA violations more specific than the commonly ascribed reasons – economic cost and lack of fear of enforcement. We classified these into five themes: financial pressure, complexity/knowledge of the law, perception of referral burden, inter-hospital relationships, and different hospital and physician priorities about EMTALA. Table 2-2 summarizes these themes, and the potential causes of and solutions to EMTALA noncompliance that our respondents suggested for each theme.

Financial Pressure. The respondents stated that hospitals may be financially interested in avoiding Medicaid and uninsured patients because reimbursement rates are typically too low to cover the hospital's costs. This finding is consistent with research suggesting low margins in the ED for Medicaid and uninsured patients (-54.4% and -35.9%) compared to Medicare and commercially-insured patients (-15.6 and 39.6%). (84) Because EMTALA requires hospitals to treat patients they might otherwise avoid for financial reasons, respondents described EMTALA as an "unfunded mandate." As such, they may view EMTALA obligations as "painful" or "potentially burdensome," particularly in states that have not expanded Medicaid. Some

respondents thought the opposite; one said that hospitals, if left on their own, would "literally put in a credit card swipe on the front door."

The financial pressure experienced by hospitals may be aggravated by states' Medicaid reimbursement policies and rates. EMTALA requires hospitals to use the same screening procedures for all patients presenting with comparable symptoms regardless of insurance status. (62-64) However, state Medicaid agencies did not always agree that all the screening procedures were necessary, resulting in the agency providing minimal reimbursements for care required by EMTALA. One respondent gave an example of a MRI being conducted on a baby who had fallen on the sidewalk. According to the hospital, giving an MRI was standard care, and forgoing it because of the patient's Medicaid status would violate EMTALA. However, the respondent's state Medicaid agency reimbursed the hospital only the $25 EMTALA screening fee, claiming that the MRI was unnecessary. Respondents in a bordering state agreed that the first respondent's state Medicaid agency had such difficult reimbursement policies and rates that hospitals in the bordering state were reluctant to accept EMTALA transfers from the first respondent's state, with one hospital even asking requesting hospitals from the first respondent's state if there was an in-state alternative available unless the patient was from very near the border.

Complexity/knowledge. The respondents generally agree that ED physicians are knowledgeable about EMTALA, but that some aspects are still "mysterious" and difficult to understand, such as EMTALA obligations for psychiatric patients. Respondents complained that non-ED physicians and staff, particularly subspecialists, lacked knowledge about EMTALA; one respondent said that a subspecialist from a transferring hospital "acted as though he had never even heard about EMTALA before." (That respondent subsequently filed an EMTALA

complaint against the transferring hospital). The respondents suggested that EDs of rural hospitals may be particularly vulnerable to gaps in knowledge about EMTALA, as these EDs may be staffed with family physicians who are not as familiar with the Act.

Because of the law's complexity, physicians sometimes disagreed with hospitals about EMTALA's requirements. A respondent at one regional referral center (level 4) said that EMTALA sometimes delayed transfers because physicians believed the Act requires full diagnostic workups before transferring a patient to the local level 1 hospital.

Referral Burden at Recipient Hospitals. Several respondents indicated that the referral burden at recipient hospitals has increased the past few years, making EMTALA compliance for these hospitals increasingly difficult. The respondents described two causes: smaller hospitals handling general medical problems only; and smaller hospitals no longer contracting for on-call services because specialty physician groups require high fees to be on-call. One respondent suggested that certain sub-specialty groups like orthopaedics may charge a hospital "millions of dollars just to be on call." Paying specialists (particularly orthopedic, trauma, and general surgery) for on-call emergency coverage has become more prevalent in the past decade, with a 2007 report suggesting that on-call payments may have cost one hospital $10 million a year. (85)

A high referral burden at recipient hospitals may indirectly affect EMTALA noncompliance at other hospitals. Specifically, a high referral burden in the ED may make recipient hospitals "very reticent" to accept inpatient transfers. Knowing that inpatient transfers may be difficult, other hospitals may be less likely to admit sicker indigent ED patients that they want to transfer, resulting in uninsured patients "get[ting] stuck" while waiting for an EMTALA transfer. Thus, some EMTALA transfer patients may be sicker than receiving hospitals were told; one receiving hospital stated that these patients were so often sicker than what the hospital

was told (once a month, an EMTALA transfer patient would need to be moved to an ICU) that that hospital shifted from directly admitting EMTALA transfer patients to making ED-to-ED transfers.

Inter-hospital Relationships. The respondents indicated that physicians at recipient hospitals report inappropriate transfers that are egregious EMTALA violations. However, they often refrain from reporting transfers that may be borderline inappropriate or those that they only suspect may be EMTALA violations but are not certain about. They shy away from being characterized by other hospitals as being even "a little bit difficult" since they do not want to lose the other hospital as a transfer partner. Thus, in order to maintain existing inter-hospital relationships, hospitals may be reluctant to file EMTALA complaints.

Physician/Hospital Priorities. Our interviews suggest that physicians may emphasize EMTALA less than hospitals do, creating a potential principal-agent problem. Hospitals are "acutely aware" of the importance of EMTALA; they want to "stay out of EMTALA jail" and are very concerned about losing Medicare certification even though termination is rare. In contrast, physicians think of EMTALA as primarily a hospital liability issue; many respondents indicated that ED physicians may be more concerned with malpractice ("their hair turns on end") or professional obligations than EMTALA, and may be unaware that physicians may also be fined under EMTALA.

This difference in priorities might lead to EMTALA violations. Even if hospitals want to accept a transfer patient to avoid EMTALA liability, our respondents suggest that physicians may refuse because they are too busy or because the eligible medical expenses payment may not be enough.

3. Ways to Improve EMTALA Compliance

The respondents suggested several strategies to prevent EMTALA violations related to the themes described above (Table 2-2).

Financial Pressure. The hospital association of the state with particularly restrictive Medicaid reimbursement policies and low rates said that the state legislature appeared to misunderstand EMTALA requirements, thinking that hospitals were "gouging the system" by providing medical screenings, and appearing to be of the opinion that, "if we manage the money, hospitals will figure out how to divert patients [away from the ED]." One legislator wanted to repeal EMTALA because he could "walk through the ER and figure out who isn't an emergency case." Thus, one way to improve Medicaid reimbursement policies and rates may be to increase state policymakers' understanding about EMTALA, which in turn may result in states requiring Medicaid agencies and managed care organizations (MCOs) to cover EMTALA screening exams.

Complexity/knowledge. The respondents suggest that a key strategy to address EMTALA complexity is to implement internal hospital processes to encourage EMTALA compliance. Among our respondents, hospitals developed such systems after being investigated for an EMTALA violation, even if the investigation did not find a violation. During and after an EMTALA investigation, the hospital leadership involved different managers and created new approaches that "hardwire" compliance. For instance, hospitals revised intake forms or integrated EMTALA compliance into electronic health records, potentially averting EMTALA complaints that are focused on specific formalities being met. Some recipient hospitals go further, creating systematic processes to manage ED transfer requests, such as routing all such requests through the ED. If EMTALA is implicated, either the chief of staff makes the transfer

decision or transfer denials are recorded, reviewed post-hoc, and feedback provided to the ED physician if there is an issue.

In addition, the respondents gave examples of relying on hospital associations to help clarify EMTALA requirements with CMS. Such reliance could be formalized and expanded.

Referral Burden at Recipient Hospitals. As described above, an increased referral burden at recipient hospitals may lead to transferring hospitals being less likely to admit sicker indigent EMTALA patients because these patients are more likely to be accepted as transfer patients if they remain in the ED. To ease the referral burden at recipient hospitals, one respondent suggested amending EMTALA to require a transferring hospital to pay a receiving hospital for transfers.[4]

Inter-hospital Relationships. The respondents stated that receiving hospitals used three different strategies to address borderline EMTALA violations: "very gently" providing informal education about EMTALA to requesting hospitals' physicians; phone calls from the associate chief of staff to the requesting hospital; or holding formal "come to Jesus" meetings with other hospitals confronting them about the borderline violations, and questioning the appropriateness of a suspicious transfer. Unfortunately, these strategies may trigger miscommunication between hospitals, which itself may lead to a suspected EMTALA violation. For instance, one hospital filed an EMTALA complaint against another when a physician at the receiving hospital asked the requesting physician whether there was a certain on-call specialist at the requesting hospital; the requesting hospital thought this was a denial of transfer (an EMTALA violation) but the other hospital thought this was clarification (consistent with EMTALA).

[4] Note that this would expand the Act's current scope, which permits a receiving hospital to sue in court a transferring hospital that makes an inappropriate transfer for the direct "financial loss" of the receiving hospital, 42 USC §1395dd(d), but makes no provision for appropriate transfers.

Physician/Hospital priorities. Our respondents suggested that better educating physicians about EMTALA may help address differences in hospital and physician priorities. Although many network hospitals offered EMTALA trainings directly or arranged for the hospital association to offer them, other (non-network) hospitals assumed without verifying that hospital associations would train their physicians; in fact, one hospital association thought that hospital legal and risk managers provide this training, while another declined to participate in our study because it did not offer any EMTALA training at all. Hospitals should more formally arrange training from hospital associations. In addition, because respondents suggested that new graduates and residents do not have a good understanding about EMTALA, medical schools should offer more EMTALA training to non-ED physicians.

E. Conclusion

Although EMTALA continues to be an important way to improve patient safety and access, hospitals still violate the Act. Despite not being specifically asked about EMTALA violations, our respondents, particularly those at receiving hospitals, volunteered examples of suspected EMTALA violations. However, concern over pre-existing hospital relationships may deter hospitals from reporting these suspected or borderline violations. This suggests that EMTALA complaints filed likely underestimate the number of actual EMTALA violations, even in the CMS region with the highest number of EMTALA complaints. In addition, this suggests that attempting to increase emphasis on reporting suspected inappropriate transfers in order to improve EMTALA compliance would likely not be successful. Our study proposes several alternative strategies that may better improve EMTALA compliance.

Limitations

This study has several limitations. First, because we wanted to identify the causes of noncompliance and potential responses, we focused on the CMS region with the highest number of EMTALA complaints filed. This focus may limit the generalizability of our findings to other regions. However, it may be that hospitals in other geographic regions have the same, or even lower, levels of compliance but have less stringent enforcement, making the results more broadly applicable. We attempted to address generalizability concerns by excluding Florida, the state with the highest number of complaints within CMS region 4, (61) which we thought might be least similar to other states if there were a generalizability issue.

Second, as is common with qualitative interviews, our sample was composed of willing respondents. Furthermore, with the exception of one hospital, we only interviewed one respondent at each organization. Thus, our results may reflect opinions of individuals and organizations that are particularly interested in EMTALA or most likely to comply with the terms of the Act, and may not reflect the opinions of those that may be less concerned with EMTALA. Third, the study sample only includes nonprofit hospitals; we were unable to speak with for-profit hospitals directly. However, the majority of ED visits in the states making up our study sample are to nonprofit hospitals (62%). (86-88) Finally, while we spoke with participants from all five states, we did not speak with representatives of every type of hospital for each state. However, the themes from our participants applied across the five states.

Policy Changes to Improve EMTALA Compliance

Despite its importance, EMTALA compliance continues to be a challenge. In this study, we spoke with a representative sample of nonprofit hospitals, hospital associations, and patient

safety organizations within the region with the highest EMTALA investigation rate. We explored systematic causes and solutions to EMTALA compliance and classified them into five themes, three of which (referral burden for recipient hospitals, inter-hospital relationships, and differences in priorities between hospitals and physicians) have not been previously discussed at length.

After reflecting on our interviews, we propose several policy changes to improve EMTALA compliance.

Require Medicaid agencies to reimburse EMTALA screening exams. Financial pressure to avoid uninsured and Medicaid patients may be aggravated by Medicaid reimbursement policies and rates. Increasing Medicaid reimbursement for all services would likely improve EMTALA compliance, but is unlikely given fiscal and political constraints. Instead, we focus on a particular issue identified by our respondents – nonpayment (or nominal payment) for mandated EMTALA screening exams. Specifically, both Medicaid agencies and MCOs are required to pay for the services involved in an EMTALA screening exam only if a physician diagnoses a clinical emergency; otherwise, they have discretion to determine whether the services used in the screening exam were necessary. (89-91) Our respondents suggested that this was particularly contentious, as an EMTALA "screening exam" may include expensive diagnostic tests. Thus, Medicaid reimbursement could be mandated for an EMTALA screening exam. Because these services may vary between hospitals, this change would also encourage hospitals to better document their screening procedures, a change that might itself reduce EMTALA violations.

Permit Informal "Mediation" Sessions Between Hospitals. As discussed, hospitals' pre-existing relationships may negatively affect EMTALA compliance by dissuading hospitals from

reporting borderline violations. Unfortunately, existing strategies (such as informal education or phone calls/meetings between hospitals) may lead to miscommunication that may themselves be interpreted as EMTALA violations.

We propose amending EMTALA to permit informal mediation sessions between hospitals where hospitals may raise concerns about borderline EMTALA violations. These sessions may serve as a middle ground between the informal education hospitals currently undertake and filing a formal complaint, and may result in disseminating information about EMTALA while still preserving trust and relationships between hospitals. One way of framing these sessions so that they are more acceptable to both parties is to emphasize the fact that permitting an inappropriate transfer (or transfer denial) exposes the other hospital to EMTALA liability.

Increase Hospital Role in EMTALA Training and Dissemination. Although hospitals may be more motivated by EMTALA concerns than physicians, hospitals seem mostly passive about EMTALA compliance (at least until they are investigated for an EMTALA violation), even though hospitals may be subject to EMTALA liability in lawsuits even if the hospital is indemnified by a physician for the malpractice claims. (76, 77)

In addition to implementing EMTALA-compliant processes or more formally relying on hospital associations to train their physicians, as our respondents propose, we suggest that hospitals may want to take a more active role in evaluating and disseminating knowledge about EMTALA. They can proactively identify which physicians need to be aware of new developments about EMTALA, and examine whether these physicians actually know of them. In addition, hospitals can focus on requiring contracted specialty physician groups to show that they are trained in EMTALA. Finally, in order to better align hospital and physician interests,

hospitals may wish to emphasize that physicians are also subject to fines and exclusion for EMTALA violations.

Increase Role of Hospital Associations. Our results suggest that although hospitals rely heavily on hospital associations, both to provide EMTALA training and to clarify complex EMTALA issues, it is unclear whether this collaboration includes key hospital decision-makers. For instance, although hospital associations in our sample disseminated written updates about the *Moses* case, respondents outside the Sixth Circuit's jurisdiction were mostly unaware of the case, while those within knew about the case but doubted whether physicians at other hospitals were as knowledgeable. We recommend that hospital associations that provide EMTALA training survey physicians at member hospitals about specific EMTALA knowledge in order to gauge how much training is actually being disseminated to physicians.

In addition, hospital associations should collect best practices that help hospitals develop their own strategies for improving EMTALA compliance. Finally, the associations could work with CMS to disseminate examples of close cases that were ultimately deemed violations.

Discussion

Despite its importance, EMTALA compliance continues to be a challenge. In this study, we spoke with a representative sample of nonprofit hospitals, hospital associations, and patient safety organizations within the region with the highest EMTALA investigation rate. We explored systematic causes and solutions to EMTALA compliance and classified them into five themes, three of which (referral burden for recipient hospitals, inter-hospital relationships, and differences in priorities between hospitals and physicians) have not been previously discussed at length. In addition to outlining practical suggestions from our respondents on addressing EMTALA compliance, we synthesized results from the primary data collection and suggest four

major policy solutions that may improve EMTALA compliance: (i) require Medicaid agencies to reimburse EMTALA screening exams; (ii) explicitly permit informal mediation sessions between hospitals to address concerns about borderline EMTALA violations; (iii) increase the hospital role in EMTALA training and dissemination of information; and (iv) increase the role of hospital associations.

Table 2-1. Respondents by organization type

Organization Type	Contacted	Agreed to Participate
For-profit hospital	7	0
Nonprofit hospital	10	7
Hospital association	4	3
Patient safety organizations	2	1
Total	23	11

Table 2-2. Themes, suggested reasons for EMTALA noncompliance, and proposed solutions as suggested by qualitative interview respondents.

Theme	Suggested Reason for Noncompliance	Suggested Solutions from Respondents
Financial pressure	Hospitals feel great financial pressure to avoid Medicaid and uninsured patients, a pressure which may be aggravated by some states' difficult Medicaid reimbursement policies and rates	Increase state policymakers' knowledge of EMTALA to encourage states to require Medicaid reimbursement of EMTALA screening exams
Complexity/ knowledge	Although ED physicians are generally knowledgeable about EMTALA, there are still some areas about EMTALA that are "mysterious" and difficult to understand. Non-ED physicians and staff are less knowledgeable about EMTALA. This may leave rural hospitals particularly vulnerable, as those EDs may be staffed with family physicians unfamiliar with the Act.	Implement EMTALA-compliant processes within the hospital, such as revising forms or integrating EMTALA compliant processes into electronic health records. Some receiving hospitals use systematic processes to control ED transfer requests, routing all transfer requests through the ED and relying on the chief of staff to make the transfer decision or reviewing transfer decisions post-hoc and providing feedback to the ED physician.
Referral burden at recipient hospitals	Receiving hospitals may be overwhelmed by an increased referral burden, making it difficult to comply with EMTALA. The increased referral burden for these hospitals may also indirectly increase EMTALA noncompliance at other hospitals; because recipient hospitals are less willing to accept inpatient transfers, other hospitals may be reluctant to admit sicker indigent patients who they wish to transfer.	Amend EMTALA to require a transferring hospital to pay a receiving hospital when an EMTALA transfer is made
Inter-hospital relationships	Hospitals report egregious or obvious EMTALA violations, but will shy away from being even "a little bit difficult" about borderline inappropriate transfers because they do not want to lose other hospitals as transfer partners.	Provide informal education about EMTALA to requesting hospitals or formal meetings with other hospitals about potentially inappropriate transfers.
Physician/hospital priorities	Although EMTALA is very important to hospitals, it may be less important to ED physicians, who may be more concerned with malpractice or professional obligations. This might create a principal-agent problem where, even if a	Better educate physicians about EMTALA and the importance of the law; more formally arranging for hospital associations to provide EMTALA training; encourage

	hospital would want to accept a transfer patient to avoid EMTALA liability, physicians might refuse because they are too busy or because the payment may not be enough.	medical schools to offer EMTALA training to non-ED physicians

Chapter 3. Extending EMTALA to Inpatients May Improve Patient Safety

A. Introduction

The Emergency Medical Treatment and Labor Act (EMTALA) requires Medicare-participating hospitals to provide emergency care to all patients, regardless of insurance status. Little is known about the effect the Act has on hospital behavior. Some providers claim that EMTALA has been internalized as the standard of care in the thirty years since its passage, while others suggest that without the Act, hospitals would "literally put in a credit card swipe on the front door." (Chapter Two) If EMTALA has actually been internalized, then that would imply that changes in the scope of the Act would have little effect on hospital utilization and readmission, particularly toward Medicaid and uninsured patients.

One key question related to the scope of the Act is when EMTALA obligations end. Specifically, do EMTALA obligations end after an EMTALA patient has been admitted? In 2003, the Centers for Medicare and Medicaid Services (CMS) promulgated regulations stating that a hospital's EMTALA obligations terminates when a hospital in good faith admits an emergency patient as an inpatient (the "CMS regulation"). (92) However, in the 2009 case *Moses v. Providence Hospital and Medical Centers, Inc.*, (81) the Federal Court of Appeals for the Sixth Circuit disagreed with CMS' interpretation of the Act, stating that EMTALA obligations do not end until an emergency patient is stabilized, regardless of whether the patient has been admitted as an inpatient (the "Sixth Circuit rule").

This study examines differences in hospital utilization and readmissions under the two rules. In other words, is extending EMTALA to inpatients associated with different hospital behavior? More specifically, we use a difference-in-difference-in-differences (DDD) approach

to compare hospital utilization and readmissions between Medicaid/uninsured patients and commercially insured patients in hospitals before and after the *Moses* case in states governed by the Sixth Circuit rule and those not.

Our findings suggest that extending EMTALA to inpatients may improve patient safety. Namely, hospitals under the Sixth Circuit rule are substantially less likely to readmit Medicaid and uninsured patients who were admitted from the ED, a finding which is consistent with the theory that extending EMTALA to inpatients may encourage hospitals to fully stabilize unprofitable patients admitted from the ED. While these patients are also more likely to be discharged with a short length of stay, we suggest that this may reflect that hospitals are providing them with services sooner than they would under the CMS regulation.

Under the Sixth Circuit rule, Medicaid and uninsured patients are also more likely to be admitted in hospitals where ED transfers are difficult. This may suggest that the Sixth Circuit rule encourages hospitals to admit unprofitable patients because it is easier to transfer them even after they have been admitted (since EMTALA obligations continue to apply).

Despite concerns that the rule would lead to more admitted Medicaid and uninsured patients being transferred, (93) our results did not find a significant increase in Medicaid and uninsured inpatients being transferred. Thus, our study suggests that extending EMTALA to inpatients may enhance patient safety.

B. Background

EMTALA and the Scope of EMTALA Obligations

Hospitals have a significant financial incentive to limit or avoid treatment of unprofitable patients, such as uninsured and Medicaid patients. In the ED, margins for these patients are

estimated at -54.4% and -35.9%, respectively, as compared to 39.6% for commercially insured patients, (84) and adjusted mean payments are 50 percent lower for Medicaid patients and 30 percent lower for uninsured patients than for commercially insured patients. (94) For inpatients, profitability is approximately 14 percent lower for Medicaid and 9 percent lower for uninsured patients than for commercially insured patients,[5] (95) and average standardized payment rates for inpatient hospital stays are about 70 percent lower for Medicaid patients than for commercially insured patients. (96)

To restrict what hospitals could do to avoid these unprofitable patients, and amidst news stories of hospitals "dumping" unstable uninsured patients onto public hospitals, (1-3) Congress enacted EMTALA in 1986. EMTALA obligates Medicare-participating hospitals to screen patients entering the ED for an emergency medical condition, (97) and to either transfer or stabilize the patient if an emergency medical condition is found. (98) Before a hospital can transfer an unstable ED patient with an emergency medical condition (for brevity, an "EMTALA patient"), it must obtain agreement from the receiving hospital to accept the transferred patient and either a physician must certify that the medical benefits of transfer outweigh the risks or the patient must request the transfer in writing. (99) In addition, the Act requires hospitals with specialized capabilities or facilities, such as those with burn units, neonatal intensive care units, or trauma units, to accept EMTALA transfers if they have capacity. (25) The Act does not require hospitals to accept non-EMTALA transfers, and hospitals report restricting non-EMTALA transfers when they do not restrict EMTALA transfers. (Chapter Two)

The scope of EMTALA obligations therefore changes hospitals' obligations. Prior to 2003, federal courts of appeal ruled differently about when EMTALA obligations ended. Two

[5] Profitability for uninsured patients was higher than for Medicaid patients because uninsured patients had a less costly mix of services. (95)

found that EMTALA obligations ended upon inpatient admission, (100, 101) one found that no stabilization requirement except for transfers, (102) one found that the EMTALA obligation to stabilize applied regardless of whether a patient was in the ED, (103) and one suggested in *dicta* (i.e. in language that was non-binding) that EMTALA obligations continued regardless of inpatient admission. (104)

The 2003 CMS regulations, which state that a hospital's EMTALA obligations terminate when the hospital admits an emergency patient as an inpatient in good faith, (92) was meant to establish a single rule about the scope of EMTALA obligations. In justifying the regulation, the agency stated that state medical malpractice laws and Medicare rules requiring discharge planning evaluation would be sufficient to ensure patient safety, since both apply to inpatients. (82) In 2008, CMS further clarified that the termination of EMTALA obligations applies both to the original hospital and to hospitals with specialized capabilities to which the original hospital may be attempting to transfer patients. (105)

However, in 2009, the Sixth Circuit ruled in *Moses* that EMTALA obligations survived beyond admission. In that case, which involved a psychiatric patient who was released from a hospital after a four-day, inpatient stay, the court found that EMTALA "requires more than the admission and further testing of a patient; it requires that actual care, or treatment, be provided as well… a hospital may not release a patient with an emergency medical condition *without first determining that the patient has actually stabilized,* even if the hospital properly admitted the patient." (106) Thus, for patients in the treatment states, EMTALA obligations do not end until the ED patient is stabilized, regardless of whether the patient has been admitted.

In states under the jurisdiction of the Sixth Circuit, the *Moses* case surprised providers because it expanded the scope of EMTALA, (107) and hospital associations quickly spread word

of the new rule. (Chapter Two) Yet outside of the Sixth Circuit, many hospitals were either unaware of the *Moses* case or declined to follow it because it only affected hospitals within the Sixth Circuit's jurisdiction. (Chapter Two) Although CMS requested comments in 2010 about whether the CMS regulation should be reconsidered in light of the *Moses* case (93), the agency reaffirmed the original CMS regulations in 2012; it decided to monitor the need for extending the rules, stating that there was not current need for change because there was no evidence that the Sixth Circuit rule affected patient treatment. (83)

Thus, two rules regarding EMTALA obligations remain in effect: 1) hospitals in the jurisdiction of the Sixth Circuit (Kentucky, Tennessee, Michigan, and Ohio) are subject to the Sixth Circuit rule, and EMTALA obligations continue until stabilization, even if the patient has been admitted, and 2) hospitals outside of the jurisdiction of the Sixth Circuit follow the CMS regulations and EMTALA obligations cease upon admission.

1. Hypotheses

We test three related hypotheses about how the Sixth Circuit rule extending the scope of EMTALA influences the behavior of hospitals governed by the Sixth Circuit rule compared to those governed by the CMS regulations. The first two hypotheses examine the direct effect of the *Moses* case by exploring hospital behavior after an ED patient has already been admitted. The third hypothesis examines the indirect effects of the *Moses* case, and explore hospital behavior when a patient is still in the ED.

H1. As compared to hospitals under the CMS regulations, hospitals under the Sixth Circuit rule discharge fewer unstable inpatients with Medicaid or no insurance who are admitted from the ED

Hospitals face financial incentives under both rules to limit treatment to unprofitable patients, such as by discharging inpatients before they have been fully stabilized. While CMS believed that malpractice liability and discharge planning requirements were sufficient to protect inpatients, (83) studies suggest these may not be sufficient: hospitals provide fewer medically-necessary procedures to uninsured and Medicaid patients than commercially-insured inpatients, (108-111) and uninsured and Medicaid inpatients are more likely to die in the hospital, (108, 109, 111) although some argue these findings reflect inadequate risk-adjustment. (112) We expect that the risk of extended EMTALA liability, in addition to malpractice risk and discharge planning requirements that apply to all hospitals, may differentially deter Sixth Circuit hospitals from unstably discharging inpatients. This is because EMTALA liability raises risks to hospitals in addition to malpractice risk, (76, 113) particularly in cases in which hospitals may be indemnified from malpractice liability such as when a physician accused of negligence is an independent contractor. (17) Furthermore, EMTALA violations raise particularly onerous penalties, such as the potential termination from participation in Medicare. (68) Although these penalties are rarely imposed, (27) hospitals are "acutely aware" of this threat and therefore want to "stay out of EMTALA jail". (Chapter Two) Thus, the expansion of EMTALA protections to inpatients may add extra encouragement to hospitals under the Sixth Circuit rule to stabilize admitted EMTALA patients before discharge. Therefore, we expect hospitals under the Sixth Circuit rule to discharge fewer unstable, uninsured or Medicaid inpatients who were admitted from the ED than hospitals under the CMS regulations. (H1) Thus, under the first hypothesis, the DDD (comparing Medicaid/uninsured patients to commercially insured patients, after and

before *Moses*, in hospitals in the Sixth Circuit and outside) should reflect fewer early discharges and fewer readmissions for Medicaid and uninsured patients admitted from the ED under the Sixth Circuit rule than the CMS regulations. (Table 3-1)

H2. As compared to hospitals under the CMS regulations, hospitals under the Sixth Circuit rule transfer more uninsured and Medicaid inpatients who are admitted from the ED.

Under both rules, hospitals with specialized capabilities with capacity are required to accept transfers of EMTALA patients from hospitals without these capabilities. This obligation does not exist for non-EMTALA patients. In fact, because CMS defines "capacity" stringently, requiring hospitals to do whatever they customarily do to accommodate patients when they are beyond their occupancy limits, (78) these recipient hospitals may be required to accept the transfer of unprofitable EMTALA patients even if they would usually deny a transfer of those patients if they were not protected by EMTALA. Indeed, recipient hospitals report denying non-EMTALA transfers when inpatient bed availability is low. (31) Under the CMS regulations, once an ED patient is admitted in good faith, EMTALA obligations cease. In contrast, under the Sixth Circuit rule, EMTALA obligations continue even after admission, for both the admitting hospital and for hospitals with specialized capabilities to which the admitting hospital may want to transfer patients. Therefore, under the Sixth Circuit rule, it is easier for hospitals without specialized capabilities to transfer EMTALA patients to hospitals with these capabilities, even after these patients have been admitted. Thus, our second hypothesis is that hospitals without specialized capabilities transfer more uninsured and Medicaid inpatients who are admitted from the ED under the Sixth Circuit rule than the CMS regulations. (H2) We expect the DDD for inpatient transfers should be positive. Hospitals with specialized capabilities raised this concern

about the Sixth Circuit rule (83), concerned that other hospitals would exploit the expanded scope of the Act by transferring their unprofitable inpatients.

H3. Compared to hospitals under the CMS regulations, hospitals under the Sixth Circuit rule admit more uninsured and Medicaid ED patients if transfers are difficult

Because of constrained bed supply, transfers may be more difficult in some markets compared to others. In these markets, hospitals under the CMS regulations may decide to keep unprofitable patients in the ED (e.g. under observation status or extended stay) while arranging for transfer, since other hospitals are no longer obligated to accept these patients if they have been admitted. (Chapter Two)

In contrast, because the Sixth Circuit rule makes inpatient transfers easier (see H2), hospitals under the Sixth Circuit rule may instead admit these patients, as they may still transfer the patients even after admission. In other words, hospitals under the Sixth Circuit rule may be less likely to delay admission because admission no longer precludes transfer. Thus, our third hypothesis is that in markets where transfers are difficult, Sixth Circuit hospitals admit more uninsured and Medicaid ED patients than hospitals under the CMS regulations. (H3) We expect the DDD for admissions in hospitals without specialized capabilities in markets where transfers are difficult to be positive.

C. Methods

Empirical strategy. We use hospital discharge data from four states, Kentucky, Tennessee, North Carolina, and South Carolina. Kentucky and Tennessee are the only two states within the Sixth Circuit's jurisdiction that make hospital data during the study period available to

researchers. We match these two states with North Carolina and South Carolina, which are outside the Sixth Circuit's jurisdiction, based on approximately similar demographic and hospital characteristics (Appendix 3-A). All four states are within the same CMS region to control for differences in regulatory interpretation by the regional CMS office. For instance, CMS regional offices differ in the volume of their EMTALA investigations, the percent of investigations that are confirmed EMTALA violations, and their aggressiveness in screening complaints, which may reflect differences in regional standards and EMTALA compliance or inconsistencies in understanding and applying EMTALA guidelines. (14) The two comparison states (NC and SC) are within the jurisdiction of the same federal court of appeals to minimize differences in the judicial interpretation of EMTALA. Differences in regulatory and judicial interpretation might otherwise confound analyses.

Using these discharge data, we use a DDD approach to compare hospital utilization (admission, length of stay, ED and inpatient transfers) and readmissions: (a) after and before the court case extending EMTALA obligations to inpatients in the Sixth Circuit; (b) within hospitals under the jurisdiction of the Sixth Circuit versus hospitals outside; (c) for Medicaid/uninsured patients versus commercially-insured patients. Although EMTALA applies to all patients, providers commonly perceive EMTALA to require care to unprofitable patients, particularly uninsured and Medicaid patients. (47, 114) (Chapter Two) We combine Medicaid and uninsured patients to avoid bias that may arise from previously-uninsured patients being more likely to apply for Medicaid after being hospitalized. We exclude Medicare patients (including patients dually eligible for Medicare and Medicaid) and patients over 65 because the payments for Medicare patients fall between those of Medicaid and commercial insurance, making it difficult to predict how hospitals responds to these patients.

Identification Strategy. The first hypothesis is that hospitals under the Sixth Circuit rule are less likely to unstably discharge unprofitable inpatients who are admitted from the ED compared to hospitals under the CMS regulations. We use having an early discharge (i.e. having a short length of stay) and being readmitted as proxies for being discharged unstably.

The second hypothesis is that hospitals transfer more uninsured and Medicaid inpatients who were admitted from the ED under the Sixth Circuit rule than the CMS regulations. We examine inpatient transfers among patients admitted from the ED.

The third hypothesis is that in markets where transfers are relatively difficult, hospitals without specialized capabilities admit more uninsured and Medicaid inpatients from the ED under the Sixth Circuit rule than the CMS regulations. This is because hospitals without specialized capabilities may be less likely to delay admission under the Sixth Circuit rule because admission does not preclude a later transfer. (See above) Because hospitals with specialized capabilities report limiting ED transfers when inpatient capacity is high, (31) we define markets where transfers are relatively difficult as those where hospitals with specialized capabilities have high average occupancy ("high occupancy market").

We use hospital referral regions (HRRs) defined by the *Dartmouth Atlas* to determine whether a hospital was in a high occupancy market. HRRs represent a regional health care market, based on where patients were referred for major cardiovascular surgical procedures and neurosurgery. We examine the average occupancy of the hospitals with specialized capabilities within the HRR (weighted by bed size) and define a high occupancy market as a HRR with the weighted average occupancy at the 66^{th} percentile or higher (depending on year, threshold was over 0.57-0.64 for the Sixth Circuit and 0.67-0.68 for non-Sixth Circuit). Because HRRs in the Sixth Circuit have lower weighted average occupancy of hospitals with specialized capabilities

than HRRs outside the Sixth Circuit (0.54 vs. 0.68), we separately define the 66th percentile for hospitals within the Sixth Circuit versus those outside. We exclude one HRR that spanned across both jurisdictions.

Data. This study uses 2008-10 discharge-level inpatient and ED data, obtained from Tennessee, (115) South Carolina, (116) and for Kentucky and North Carolina from the State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality (117, 118) for non-federal, adult general medical and surgical hospitals with EDs.

We merge the discharge data by hospital with data on hospital characteristics from the American Hospital Association's (AHA) Annual Survey for 2008-10, (119) and by county with data on urbanicity from the Area Health Resources File. (120) For hospitals that do not appear in the AHA data, we conduct web searches to provide the missing information, preferentially relying on licensure information from state Departments of Health, if available, or from the hospital's own website. We could not find complete hospital information for three hospitals, which are dropped from the analysis. We use crosswalks from the Dartmouth Atlas to define HRRs. (121)

The sample varies depending on hypotheses. (See Appendix 3-B)

Outcomes. The outcome measures are dichotomous variables for: an early discharge (H1); having a 30-day all-cause readmission (H1); an inpatient transfer (H2); and admissions in hospitals within high occupancy markets (H3).

An early discharge is a proxy for a patient being discharged without being fully stabilized. However, it is an imprecise proxy: it is both over-inclusive, as some patients with a short inpatient stay may be appropriately discharged after a short time, and under-inclusive, as

some patients with a longer length of stay may require still more treatment. For instance, some studies find that uninsured patients are less likely to receive expensive procedures than insured patients, (95, 108-111, 122) which would lead to a shorter length of stay, while others find that uninsured patients are more likely to have delays in receiving necessary procedures, (123) which would lead to a longer length of stay.

Because this proxy may be imprecise, we use three different definitions to capture a short inpatient stay. The first definition is having a length of stay that falls within the diagnosis-specific 25th percentile among all inpatients (compared to the interquartile region). We use the multi-level Clinical Classification Software (CCS) diagnosis categories level three. The CCS was developed by AHRQ to classify diagnoses and has been used in risk adjustment, including in the Medicare readmissions policy. (124) The second definition is having a non-diagnosis specific 25th percentile length of stay (compared to the interquartile region). The third definition is having a one or two-day length of stay when the diagnosis-specific median length of stay among all inpatients is 5 days or longer. All lengths of stay analyses exclude patients who died in the hospital. In additional analyses, we exclude inpatient transfers from the early discharge measures. We also examine the diagnoses associated with the different measures for early discharge.

We rely on the methodology used by Medicare in calculating 30-day all-cause readmissions. (124) Inpatient stays are classified as an index admission (i.e., included in the denominator) if the patient survives hospitalization; is not transferred to another acute care facility; is not admitted for medical treatment of cancer, primary psychiatric disease, or rehabilitation care; and not discharged against medical advice. The admission must also have a discharge date that would permit at least thirty days follow-up (for consistency, we use

admission quarter, as not all data sources provided admission month). Inpatient stays are then grouped into cohorts based on procedure or primary diagnosis (ICD-9), and we calculate 30-day unplanned readmissions to any hospital after excluding planned readmissions based on cohort-specific definitions from Medicare. The cohorts are: surgical/gynecological; cardiorespiratory; cardiovascular; neurology; and general medicine.

We define an inpatient or ED transfer as any of the following: a disposition indicating that the patient is transferred to a different acute care hospital; a visit that begins the same day as discharge for the same patient at a different hospital; or a visit that begins the next day as a discharge for the same patient at a different hospital if the next day visit has a point of origin code or admission source indicating that the patient is transferred in from a different acute care hospital. Because hospitals with specialized capabilities are required to accept transfers and thus are less able to transfer their patients to other hospitals, we exclude those hospitals in analyses involving transfers. We rely on the definition from CMS to classify hospitals with specialized capabilities, which are hospitals with burn units, shock-trauma units, neonatal intensive care units, or regional referral centers in rural areas. (25)

We do not have patient identifiers for Kentucky, and thus could not track patients across hospitals or across time. Given the inaccuracy of disposition status, we exclude that state for both readmissions and inpatient transfers.

Analyses. We compare patient and hospital characteristics during the "pre" period for hospitals within the Sixth Circuit versus those in the non-Sixth Circuit, testing for significance using t-tests or chi-square tests. We also calculate the raw unadjusted DDD by comparing rates before and after the *Moses* case for patients with Medicaid or no insurance as compared with patients with commercial insurance, and within the Sixth Circuit as compared with outside.

In adjusted analyses, we use a linear probability model with hospital random effects, adjusting for patient-level risk adjustment and hospital-level characteristics. Specifically, our model is:

$$Y_{ij} = \gamma_{00} + \gamma_{1j} DDD_{ij} + \beta_{1j} risk_{ij} + \gamma_{2j} hosp_j + \beta_{2i} year_{ij} + u_{0j} + \epsilon_{ij},$$

where *DDD* represents the DDD and main effects, *risk* represents patient-level risk adjustments; *hosp* represents hospital characteristics; *year* represents year fixed effects to account for temporal trends; and u_{0j} is hospital-level random effects (Table 3-2). The DDD compares: (a) whether the patient has Medicaid/no insurance or was commercially insured, (b) whether the visit or admission occurrs after or before *Moses* was decided, and (c) whether the visit or admission is in a hospital that is within the Sixth Circuit or outside of the Sixth Circuit.

Patients are classified as having Medicaid or being uninsured if they have a payer listed as Medicaid, self, indigent, or no charge, and do not have any other payer that is listed as private, Medicare, or other government. They are classified as having commercial insurance if they have a payer listed as private, commercial, or HMO, and do not have any other payers listed as Medicaid or Medicare. Thus, our sample excludes dually-eligible Medicare-Medicaid patients (since these patients may be sicker) and patients with both commercial and Medicaid listed as payers.

Discharges are classified as post or pre depending on whether the visit or admission occurred after or before the *Moses* decision, which was issued April 6, 2009. Visits in April 2009 are excluded from the sample.

The patient-level risk adjustment characteristics (Table 3-2) are: sex, age, comorbidities, and diagnoses. We use Elixhauser comorbidity measures (125) for all outcomes, including ED transfers and admissions, following previous literature that adapted the use of Elixhauser

comorbidities for ED records (126, 127). To risk-adjust for diagnoses, we use multi-level CCS diagnosis categories level two. We use level two diagnosis categories (instead of level three) in order to minimize collinearity for the early discharge outcomes (which rely on level three diagnosis categories). We control for primary diagnoses, grouping diagnoses together if they appear in less than 0.1% of the sample. We exclude patients with diagnoses that do not vary with the outcome.

We adjust for four main hospital-level characteristics (Table 3-2): financial status (profit or public status compared to nonprofit); bed size; urbanicity; and safety net status. We use bed size as a proxy for hospital size. Urbanicity is defined using the rural-urban continuum code from the Economic Research Service of the United States Department of Agriculture, which we group into three categories: metropolitan urban, non-metropolitan urban, and rural area. Safety net status is defined as having one standard deviation above the mean inpatient Medicaid/uninsured caseload in the HRR. This definition is based on previous literature, which uses this definition but relied on state (128, 129); we use HRR in order to capture market-level behavior.

Additional Analyses. We conduct several additional analyses to check the robustness of our results. (Appendix 3-C) We compare uninsured patients to commercially-insured patients (i.e. exclude Medicaid patients);[6] use 7-day all-cause readmissions instead of 30-day; use an alternate definition of a safety net hospital;[7] and use county to define a hospital's market. We

[6] Although EMTALA is commonly interpreted as requiring hospitals to provide care to uninsured and Medicaid patients, (47, 114) (Chapter Two) some consider EMTALA as requiring care to uninsured patients only (i.e. not Medicaid patients) (130). Thus, in additional analyses, we examined whether restricting the comparison to uninsured patient vs commercially-insured patients changed the analysis. (Note that we combined uninsured and Medicaid patients in the main analysis to avoid bias, as described above)

[7] The alternate definition of safety net relied on the CDC definition, which classified hospitals as safety net if at least 30% of ED patients had Medicaid; at least 30% of ED patients had no insurance; or at least 40% of ED patients had either Medicaid or no insurance. (131)

also exclude inpatient transfers before August 2008, which is when CMS clarified that (under the CMS regulations) the obligation to accept an EMTALA transfer patient ceases upon admission for hospitals with specialized capabilities. (132)

D. Results

Descriptive Statistics and Unadjusted Results. Hospitals are similar in terms of mean bed size and occupancy, the percent of hospitals with specialized capabilities, the urbanicity, and the percent of safety net hospitals from the Sixth Circuit and the non-Sixth Circuit. However, they differ on financial status ($p=0.001$), with the Sixth Circuit having significantly more for-profit hospitals (27.3% vs. 14.0%) and fewer public hospitals (17.1% vs 30.4%). (Table 3-3)

Patients admitted from the ED in hospitals within the Sixth Circuit differed significantly from those outside the Sixth Circuit by age, percent female, and the mean number of comorbidities ($p<0.001$ for all). (Table 3-4) Patients in Sixth Circuit hospitals have a slightly higher mean number of comorbidities than in non-Sixth Circuit hospitals (1.9 versus 1.8). These differences persist when we separately compare patients with the same insurance in hospitals under the two rules.

Except for early discharge, unadjusted differences between Medicaid and uninsured patients and commercially-insured patients under the two rules are consistent with our hypotheses. (Table 3-5; see Appendix 3-D for detailed exposition of table) After comparison to commercially-insured patients and adjusting for differences in non-Sixth Circuit hospitals, Medicaid and uninsured patients under the Sixth Circuit rule are more likely to have an early discharge for two of the three outcomes (Table 3-5a), whereas we predict that Medicaid and uninsured patients under the Sixth Circuit rule would be less likely to have an early discharge.

Adjusted Models. We hypothesize that the Sixth Circuit rule would result in fewer Medicaid and uninsured patients being discharged unstably. (H1) We proxy an unstable discharge by a patient being discharged early and being less likely to be readmitted. In the adjusted models, hospitals under the Sixth Circuit rule compared to the CMS regulations discharge two percentage points more uninsured and Medicaid patients within two days (for diagnoses with a median length of stay of 5 days or longer), after adjusting for the differences in trends in commercially-insured patients (p=0.002). (Table 3-6) With a baseline unadjusted rate of 29.2%, this increase represents an 8.0% policy effect, i.e. early discharges increases 8.0% after accounting for temporal trends. The other two measures for early discharge (diagnosis- and non-diagnosis-specific 25th percentile length of stay) show small, non-significant decreases in early discharges under the Sixth Circuit rule compared to the CMS regulations.

The difference in sign for the three measures of early discharge persists even after we exclude inpatient transfers from the analyses. (Table 3-7) Approximately 6.9% (N=216,042) of discharges associated with the measure for discharge within two days (for diagnoses with a median length of stay of 5 days or longer) experience an inpatient transfer; excluding these observations does not substantively change the results. Approximately 3.1% (N=42,175) and 3.7% (N=40,898), respectively, of inpatients are transferred in the samples associated with the diagnosis-specific and non-diagnosis specific 25th percentile measures of early discharge. The measure for early discharge that uses non-diagnosis specific 25th percentile has a larger policy effect (-1.1% versus -0.7%) after excluding inpatient transfers, but the results are still not statistically significant (p=0.365).

The diagnoses associated with the different measures of early discharge vary. Almost half (47.3%) of the discharges associated with a two-day length of stay (for diagnoses with a

median length of stay of five days or longer) have a primary diagnosis of a primary psychiatric disease.[8] In comparison, 5.5% and 3.2% of discharges associated with a diagnosis- and non-diagnosis-specific 25th percentile have a primary diagnosis of a primary psychiatric disease. Excluding these patients do not substantively change our results. (Appendix Table 3-C7)

Unprofitable inpatients admitted from the ED in hospitals under the Sixth Circuit rule, compared to the CMS regulations, are less likely to be readmitted even after comparing to trends in commercially-insured patients. This decrease is experienced by all five cohorts, with a two percentage point decrease in readmissions of neurology inpatients (p=0.016) being statistically significant, and a 0.6 percentage point decrease in both surgical/gynecological inpatients and general medicine inpatients being marginally significant (p=0.101 and p=0.072). These decreases are equivalent to policy effects of -19.5%, -8.9%, and -4.4% for neurology, surgical/gynecological, and general medicine inpatients, respectively.

Our second hypothesis is that hospitals without specialized capabilities under the Sixth Circuit rule would be more likely to transfer Medicaid and uninsured inpatients who were admitted from the ED. (H2) This is because the Sixth Circuit rule extends EMTALA beyond admission, and EMTALA requires hospitals with specialized capabilities to accept EMTALA transfers. After accounting for trends in commercially insured patients, inpatient transfers of Medicaid and uninsured patients non-significantly increased 0.02 percentage points under the Sixth Circuit rule compared to the CMS regulations (p=0.998). Inpatient transfers of unprofitable patients at baseline in Sixth Circuit hospitals was 4.9%, suggesting that the Sixth

[8] Relying on (124), we classify primary psychiatric disorders as CCS 650 (adjustment disorder), 651 (anxiety disorder), 652 (Attention-deficit, conduct, and disruptive behavior disorders),654 (Developmental disorders), 655 (Disorders usually diagnosed in infancy, childhood, or adolescence), 656 (Impulse control disorders, NEC), 657 (Mood disorders), 658 (Personality disorders), 659 (Schizophrenia and other psychotic disorders), 662 (Suicide and intentional self-inflicted injury), 670 (Miscellaneous disorders).

Circuit rule is associated with a 0.4% increase in inpatient transfers, after adjusting for temporal trends.

Our third hypothesis is focused on markets where transfers are difficult because of constrained bed supply, i.e. in high occupancy markets. In these markets, hospitals under the CMS regulations may be more likely to keep unprofitable ED patients in the ED, such as under observation status or through extended stay, since other hospitals are no longer obligated to accept these patients once they have been admitted. (Chapter Two) In contrast, because the Sixth Circuit rule makes transfers of inpatients easier, we hypothesize that in high occupancy markets, hospitals without specialized capabilities under the Sixth Circuit rule instead may admit these patients. In these markets, hospitals without specialized capabilities admit 0.07 percentage points more Medicaid/uninsured patients under the Sixth Circuit rule than the CMS regulations ($p=0.007$), which corresponds to a policy effect of 1.8%.

E. Conclusion

For all but one measure for early discharge, our results are in the same direction as our hypotheses. (Table 3-1) The results that are statistically significant are consistent with the suggestion that extending EMTALA to inpatients may enhance patient safety (H1 & H3) without harming it (H2), although our conclusion should be tempered by our mixed results on early discharge.

First, we find some evidence consistent with the hypotheses that hospitals may be less likely to unstably discharge unprofitable inpatients. (H1) Specifically, our results suggest that hospitals under the Sixth Circuit rule are more likely to discharge some unprofitable patients early but that patients are less likely to be readmitted. The adjusted results suggest that the Sixth

Circuit rule extending EMTALA to inpatients is associated with lower readmission rates for unprofitable patients, even after controlling for temporal and geographic trends. Readmission rates for neurology, surgical/gynecological, and general medicine inpatients with Medicaid/no insurance are between 0.5 and 2 percentage points lower under the Sixth Circuit rule than under the CMS regulations, after accounting for temporal and geographic trends. For comparison, Medicare's Hospital Readmissions Reduction Program, which is targeted at reducing readmissions by applying financial penalties for higher-than-expected Medicare readmission rates for specific conditions, may have decreased readmissions from 0.01 to 1.95 percentage points, depending on condition and the comparison group used. (133)

However, these results should be tempered by the observation that, contrary to our prediction, the only measure for early discharge that is statistically significant (having a discharge within two days for diagnoses with a median length of stay 5 days or longer) suggests that early discharges under the Sixth Circuit rule increased, although the other two measures showed a non-significant decrease.

One explanation may be that under the Sixth Circuit rule, hospitals may modify their discharge behavior depending on diagnosis. In other words, hospitals under the Sixth Circuit rule may discharge unprofitable patients with certain diagnoses early in order to accommodate unprofitable patients with other diagnoses, who are kept longer. This does not necessarily mean that patient safety is compromised. In fact, two results suggest that patient safety is maintained. First, readmissions rates are lower under the Sixth Circuit rule. Second, excluding patients with primary psychiatric disease (who are explicitly excluded from the readmission sample as index visits) do not change the results, suggesting that these patients are not solely driving the trends seen in the early discharge measures. Instead, hospitals under the Sixth Circuit rule may be more

efficiently managing inpatient capacity. Such management practices may include strategies like "reverse triage" to selectively discharge patients who are at low risk of serious complications. (134, 135) A second, related, explanation for the early discharge results coupled with the fall in readmission rates is that hospitals under the Sixth Circuit rule may be more likely to timely provide Medicaid and uninsured patients with services that they may have otherwise delayed providing. (123) More study should be conducted to see whether either of these explanations are true.

Second, our results suggest that the Sixth Circuit rule is associated with a 3.9% increase in admissions in hospitals without specialized capabilities in markets where inpatient transfers are relatively difficult (H3). Elsewhere, we find that hospitals under the CMS regulations may keep unprofitable patients in the ED in order to preserve the ability to transfer them: uninsured patients may "get stuck" while waiting for an EMTALA transfer, particularly if these patients are sicker. (Chapter Two) The result from this study suggests that the Sixth Circuit rule may be protective of patients, as it is consistent with the hypothesis that hospitals under this rule may be more willing to admit unprofitable patients from the ED even if transfers are difficult, perhaps because they can transfer these patients even after admission.

Hospitals with specialized capabilities were concerned that the Sixth Circuit rule extending EMTALA obligations would lead to other hospitals transferring their unprofitable inpatients despite the original hospital having the ability to stabilize these patients. (83) (H2) Although we do find that the Sixth Circuit rule is associated with an increase in inpatient transfers, this increase was not statistically significant. Furthermore, the effect size is not large – the point estimate suggests that there is a 0.4% non-significant increase in inpatient transfers

under the Sixth Circuit rule (95% CI -2.1% to 3.0%), after adjusting for temporal and geographic differences. Thus, these findings are neither statistically significant nor clinically significant.

Limitations

In addition to the caveats described above, this study has several limitations. First, the measures we use in this study are only proxies for unstable discharge, patient dumping, and reluctance to admit behavior. For instance, 30-day readmission rates may also reflect community characteristics, such as access to primary care physicians (136), although our sensitivity analysis showed similar results for 7-day readmissions, suggesting these findings are robust. Moreover, although the outcomes do not correspond perfectly with unstable discharge, inpatient patient dumping, and reluctance to admit behavior, these proxies should be correlated with these behaviors given the DDD study design. Finally, we previously found in key informant interviews (Chapter Two) that there were no state-wide programs to enhance patient safety that were implemented during the study period that might violate the parallel slopes assumption for the DDD method.

Second, some of the variables may be subject to measurement error. In addition to the early discharge measures, which may not be very robust (described above), we use a definition for transfers that may incorrectly classify some same-day revisits or readmissions as transfers. (see methods) We could not conduct sensitivity analyses using alternate definitions for transfers because disposition and point of origin codes indicating transfers are often missing. Specifically, 49% of records with a same day visit and 80% of records with a next day visit do not have any transfer flags. Requiring that same-day visits include a disposition or point of origin code

indicating a transfer results in implausibly low transfer rates (0.7% for ED transfers, 1.2% for inpatient transfers).

Third, risk adjustment may not fully adjust for patients' conditions, particularly because we could not control for race since not all data sources collected this information. In addition, illness burden may be inadequately accounted for despite our controlling for comorbidities and diagnoses. For instance, the increase in early discharges may indicate a lower illness burden (137), although the DDD design helps mitigate some of this concern, and we do not anticipate any bias stemming from inadequate risk adjustment, as it seems unlikely that patient populations would have systematically changed from the pre period due to the *Moses* case.

Fourth, there may be an issue of external validity. The study states are all within a CMS region with a particularly high rate of EMTALA complaints. Although this region accounts for approximately 20% of the population (138), 41% of all EMTALA complaints in 2007 originated from this region (14). Thus, hospital care within this CMS region may not be generalizable to hospitals elsewhere.

Policy Implications

After the Sixth Circuit ruled in *Moses* that EMTALA obligations continued until a patient is stabilized, regardless of whether she or he is admitted, the case was appealed to the United States Supreme Court. The Supreme Court declined to hear the case, likely in part because the government stated that CMS would reconsider the CMS regulations in light of the *Moses* case. (139) Although CMS requested comments about the two rules, (93) in 2012, the agency declined to revise the CMS regulations because it lacked evidence that the Sixth Circuit rule affected patient safety. (83) The agency had received comments primarily from hospital

respondents, who argued for a "bright line policy" that indicated when their EMTALA obligations ended. (140) Although this request implies that hospitals may treat patients differently without the protection of EMTALA, CMS explained its reasoning based on its previous contention that malpractice liability and conditions of participation (including discharge planning requirements) were sufficient to prevent inpatients from being discharged unstably. (83)

This study suggests that the Sixth Circuit rule may change hospital behavior by improving patient safety for unprofitable patients. Specifically, our results are consistent with the hypotheses that the Sixth Circuit rule may encourage hospitals to fully stabilize unprofitable admitted ED patients (seen by lower readmission rates) and to admit unprofitable patients if they are in markets where transfers are difficult. While the first should be interpreted cautiously given the mixed results regarding early discharge, this study does suggest that the Sixth Circuit rule influences hospital behavior in a way that protects unprofitable patients.

We note that although CMS was primarily concerned with unstable discharge of inpatients and inpatient dumping (for which we did not find significant evidence), this study also suggests another way that extending EMTALA to inpatients can improve patient safety. Key informant interviews we previously conducted suggested that hospitals under the CMS regulations in markets where transfers are difficult may be reluctant to admit unprofitable patients, since once a patient is admitted, it is increasingly difficult for a hospital to transfer the patient. (Chapter Two) This study suggests that in these markets, the Sixth Circuit rule may encourage hospitals to admit unprofitable patients, since the rule preserves the possibility of a later inpatient transfer.

In light of these study results, CMS may wish to reconsider the CMS regulations, and perhaps explicitly request comments about our findings regarding hospital reluctance to admit patients in markets where transfers are difficult.

Furthermore, a change in the rule by CMS might have an even larger effect on patient safety than the judicial rule. Key informant interviews suggested that hospitals are particularly nervous about being terminated from Medicare, even though this is an extremely rare penalty: they are "acutely aware" of EMTALA and want to "stay out of EMTALA jail." (Chapter Two) Thus, a policy change by the agency, with the threatened penalty of termination from Medicare, might have an even larger effect on hospitals than *Moses* did.

Table 3-1. Summary table of hypotheses, samples, outcomes, expected direction of DDD, and policy effect.

	Hypothesis	Sample	Outcomes	Expected direction on DDD	Adjusted Policy Effect
	As compared to hospitals under the CMS regulations, hospitals under the Sixth Circuit rule will…				
H1	Discharge fewer unstable inpatients with Medicaid or no insurance who were admitted from the ED	All hospitals	Early discharge	⇓	Discharge within two days: 8.0%** Dx-specific: -0.4% Non-dx specific: -0.7%
		All hospitals	Readmissions of inpatients admitted from ED	⇓	Surg/gyn: -8.9% Cardiorespiratory: -1.1% Cardiovascular: -8.1% Neurology: -19.5%** General Medicine: -4.4%*
H2	Transfer more uninsured and Medicaid inpatients who were admitted from the ED.	Excludes hospitals with specialized capabilities	Inpatient transfer	⇑	0.4%
H3	Admit more uninsured and Medicaid ED patients if transfers are difficult.	In HRRs where hospitals with specialized capabilities have higher inpatient occupancy Exclude hospitals with specialized capabilities	Admission	⇑	3.9%**

Significance levels: * p < 0.10, ** p<0.05, *** p<0.01

Table 3-2. Predictor variables and definitions.

Variable	Definition	Notes
DDD and main effects		
Post	Whether visit began before or after the *Moses* case	The *Moses* decision was issued April 6, 2009. Visits in April 2009 were excluded from the sample Reference group = pre
Sixth	Whether in jurisdiction of Sixth Circuit (KY, TN) or non-Sixth Circuit (NC, SC)	Reference group = non-Sixth Circuit
Medicaid-uninsured	Commercial insurance v. Medicaid/no insurance	Excludes dually-eligible Medicare-Medicaid patients, since these patients may be sicker, and patients with both commercial and Medicaid listed as payers. Patients are considered to be uninsured if they had a payer listed as self, indigent, or no charge, and do not have any additional payer that is listed as private or Medicare or other government. Reference group = Medicaid/uninsured
Patient-level risk adjustment		
Sex	Female	Reference group = male
Age	Age (categorized)	Age is categorized in data for confidentiality reasons; we use the same age categories for all data for consistency. (<1, 1-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64) 65+ are excluded from the sample in order to avoid miscategorization as Medicare patients are excluded Reference group = < 1

Comorbidities	Elixhauser comorbidities	Adapted for use for ED data (needed for admissions and ED transfer) (126, 127)
Diagnoses	Level 2 CCS categories	Based on primary diagnosis.
Hospital characteristics		
Profit Status	Profit, not-for-profit, or public hospital	Reference group = not-for-profit
Bed Size	Licensed bed size	We impute from prior / subsequent years from AHA data and supplement with web searches if this information is missing.
Urbanicity	Rural-urban continuum code	We group the continuum code into a three categorical variable: metropolitan urban, non-metropolitan urban, and rural area. Reference group = metropolitan urban
Safety net status	One standard deviation above the mean inpatient Medicaid/uninsured caseload in the HRR	

Table 3-3. Descriptive statistics – hospital characteristics in 2008, by Sixth Circuit and non-Sixth Circuit

	Sixth Circuit	Non-Sixth Circuit
Number of hospitals	210	171
Financial Status*		
Profit	27.3%	14.0%
Nonprofit	55.6%	55.6%
Public	17.1%	30.4%
Mean bed size (SD)	171.9 (203.1)	205.0 (218.8)
Mean occupancy (SD)	0.4 (0.2)	0.5 (0.2)
% Hospitals with specialized capabilities	36.7%	37.4%
Urbanicity		
% Metropolitan urban	44.4%	52.1%
% Non-metropolitan urban	45.8%	43.3%
% Rural	9.7%	4.7%
% safety net	22.2%	20.5%

Notes. *p=0.001. Safety net status is determined based on having one standard deviation above the mean inpatient Medicaid/uninsured caseload in the HRR.

Table 3-4. Descriptive statistics – characteristics during pre period of inpatients admitted from ED

	Sixth Circuit			Non-Sixth Circuit		
	Overall	Medicaid/ uninsured	Commercial	Overall	Medicaid/ Uninsured	Commercial
Number of inpatients admitted from ED*	349,663	196,136	163,407	416,877	230,621	186,256
Female*	52.6%	55.0%	49.8%	52.0%	52.5%	51.3%
Age*						
<1	3.7%	5.3%	1.8%	2.8%	4.0%	1.3%
1-4	3.6%	4.8%	2.1%	3.0%	3.9%	1.9%
5-9	1.9%	2.2%	1.5%	1.8%	1.9%	1.7%
10-14	1.8%	1.9%	1.7%	1.9%	1.9%	2.0%
15-19	4.5%	5.2%	3.6%	4.8%	5.5%	4.0%
20-24	6.4%	8.1%	4.3%	6.9%	9.2%	4.1%
25-29	6.9%	8.4%	5.1%	7.2%	8.7%	5.2%
30-34	6.9%	7.4%	6.2%	7.0%	7.7%	6.1%
35-39	8.0%	8.2%	7.8%	8.2%	8.6%	7.8%
40-44	9.6%	9.5%	9.6%	9.7%	9.9%	9.5%
45-49	11.7%	11.1%	12.4%	11.7%	11.6%	11.8%
50-54	12.7%	11.2%	14.4%	12.3%	11.0%	14.0%
55-59	11.5%	8.7%	14.9%	11.7%	8.9%	15.1%
60-64	10.9%	8.0%	14.5%	11.1%	7.4%	15.5%
Mean # of comorbidities (SD)*	1.9 (1.8)	2.0 (1.9)	1.8 (1.7)	1.8 (1.6)	1.8 (1.6)	1.7 (1.5)

Note. *Differences between patients in the Sixth Circuit and non-Sixth Circuit are statistically significant ($p<0.001$).

Table 3-5. Unadjusted DDD Analyses

a) H1: Early Discharge

			H1: Early Discharge		
			Diagnosis-specific 25th percentile	Non-diagnosis specific 25th percentile	Discharge within two days
Sixth Circuit	Medicaid & uninsured	Pre	26.2%	30.7%	29.2%
		Post	27.0%	31.5%	31.6%
		(Post-Pre)	0.8%	0.8%	2.4%
	Commercial	Pre	22.9%	28.0%	27.5%
		Post	23.9%	28.9%	28.1%
		(Post-Pre)	1.0%	0.9%	0.6%
		DD	-0.1%	-0.2%	1.9%
Non-Sixth Circuit	Medicaid & uninsured	Pre	26.7%	31.7%	23.4%
		Post	27.4%	32.6%	23.4%
		(Post-Pre)	0.7%	1.0%	0.0%
	Commercial	Pre	27.0%	33.1%	23.8%
		Post	27.9%	34.0%	24.8%
		(Post-Pre)	0.9%	0.9%	1.0%
		DD	-0.2%	0.1%	-1.0%
		DDD	0.1%	-0.2%	2.9%
		Policy Effect of DDD	0.2%	-0.7%	9.8%

b) H1: Readmissions

			H1: readmissions				
			Surgical / gynecological	Cardio-respiratory	Cardio-vascular	Neurology	General Medicine
Sixth Circuit	Medicaid & uninsured	Pre	7.3%	14.8%	10.3%	10.6%	13.5%
		Post	7.0%	15.1%	10.1%	8.7%	12.9%
		(Post-Pre)	-0.3%	0.3%	-0.1%	-1.9%	-0.6%
	Commercial	Pre	6.9%	8.8%	5.0%	7.3%	9.4%
		Post	7.1%	8.9%	4.9%	7.5%	9.5%
		(Post-Pre)	0.1%	0.1%	-0.1%	0.1%	0.1%
		DD	-0.4%	0.2%	0.0%	-2.1%	-0.7%
Non-Sixth Circuit	Medicaid & uninsured	Pre	5.0%	11.0%	7.5%	7.5%	11.4%
		Post	5.4%	11.3%	8.4%	7.9%	11.6%
		(Post-Pre)	0.4%	0.4%	0.9%	0.4%	0.2%
	Commercial	Pre	5.0%	9.1%	4.3%	6.2%	8.1%
		Post	5.0%	9.0%	4.5%	6.3%	8.7%
		(Post-Pre)	0.0%	-0.1%	0.2%	0.1%	0.5%
		DD	0.4%	0.5%	0.7%	0.3%	-0.3%
		DDD	-0.8%	-0.3%	-0.7%	-2.4%	-0.4%
		Policy effect of DDD	-11.2%	-1.8%	-6.7%	-22.6%	-2.8%

c) H2: Inpatient transfer; H3: Admissions and ED transfers; H3: Admissions in high occupancy markets

			H2: Inpatient transfer	H3: Admissions in high occupancy markets
Sixth Circuit	Medicaid & uninsured	Pre	4.9%	4.0%
		Post	4.5%	3.9%
		(Post-Pre)	-0.4%	-0.1%
	Commercial	Pre	5.1%	6.1%
		Post	4.6%	6.6%
		(Post-Pre)	-0.5%	0.5%
		DD	0.1%	-0.6%
Non-Sixth Circuit	Medicaid & uninsured	Pre	6.8%	5.1%
		Post	6.2%	4.2%
		(Post-Pre)	-0.6%	-0.9%
	Commercial	Pre	6.7%	7.1%
		Post	6.7%	6.9%
		(Post-Pre)	0.0%	-0.1%
		DD	-0.6%	-0.8%
		DDD	0.7%	0.2%
		Policy effect of DDD	13.7%	3.7%

Table 3-6. Adjusted analyses

		N	DDD	SE	p-value	Policy Effect
H1	**Early Discharge**					
	Diagnosis-specific	1,378,822	-0.0010	0.0030	0.744	-0.4%
	Non-diagnosis specific	1,102,416	-0.0019	0.0035	0.577	-0.7%
	Within two days	216,042	0.0244	0.0078	0.002	8.0%
H1	**Readmissions**					
	Surgical/gynecological	238,190	-0.0064	0.0039	0.101	-8.9%
	Cardiorespiratory	160,763	-0.0017	0.0066	0.8	-1.1%
	Cardiovascular	117,642	-0.0082	0.0059	0.163	-8.1%
	Neurology	65,713	-0.0207	0.0086	0.016	-19.5%
	General Medicine	578,069	-0.0060	0.0033	0.072	-4.4%
H2	**Inpatient transfers**	445,621	0.0002	0.0006	0.998	0.4%
H3	**Admission in high occupancy markets**	3,693,700	0.0007	0.0003	0.007	3.9%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. (see Table 3-2) The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The policy effect is the DDD divided by the unadjusted baseline rate for Medicaid/uninsured patients in the Sixth Circuit (see Table 3-4).

Table 3-7. Adjusted analyses for early discharge excluding inpatient transfers

		N	DDD	SE	p-value	Baseline rate	Policy Effect
H1	**Early Discharge**						
	Diagnosis-specific	1,336,647	-0.0013	0.0030	0.661	26.2%	-0.5%
	Non-diagnosis specific	1,061,518	-0.0032	0.0035	0.365	29.9%	-1.1%
	Within two days	201,139	0.0220	0.0081	0.007	28.7%	7.7%

Note. The samples for these models exclude inpatient transfers, but are otherwise the same as the models described in Table 3-6. The DDD is the interaction of post * sixth * Medicaid/uninsured. (see Table 3-2) The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted baseline rate for Medicaid/uninsured patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Chapter 4. Predictors of Ambulance Diversions: Do Hospitals Strategically Divert to Avoid Medicaid and Uninsured Patients?

A. Introduction

This study explores whether hospitals temporarily close their emergency departments (EDs) to strategically avoid treating uninsured or Medicaid patients. Although hospitals cannot deny specific patients care because of insurance status without running afoul of the Emergency Medical Treatment and Labor Act (EMTALA), a condition of participation under Medicare, (10) EMTALA only protects a patient who "comes to" the ED. The law does not apply to a patient who does not arrive at a hospital, including a patient who does not arrive because the hospital has closed its ED to all ambulance patients by declaring an ambulance diversion. (48-50) Thus hospitals may be able to circumvent EMTALA by strategically choosing when to declare a diversion. For example, a hospital may divert when it suspects it is more likely than usual to receive ambulances containing relatively unprofitable patients such as those with Medicaid or no insurance. Thus, hospitals may be more likely to declare a diversion if a nearby safety net hospital is itself on diversion.

Although strategic diversions may make economic sense to a hospital, (141) it may harm patients. It reduces or delays access to emergency services to indigent patients. In addition, because strategic diversions are based on perceived insurance status instead of ED crowding, hospitals engaged in strategic diversions effectively withhold usable hospital capacity from all patients in need, regardless of insurance status. This unnecessary delay in care may increase mortality, (142) particularly in patients with time-sensitive conditions like acute myocardial infarction (AMI). (143) In fact, AMI patients admitted on days with longer diversions had a 22%

increase in the overall mortality rate, (144) those admitted on days when multiple hospitals are on diversion had a 14% increase in mortality, (143) and AMI patients whose nearest hospitals were frequently on diversion were more likely to be admitted to hospitals without cardiac technology, and had a 9.8% increase in mortality. (145)

To our knowledge, our study is the first to examine strategic diversions empirically. More specifically, we ask two sets of questions. First, are hospitals engaging in strategic diversion? We do this by examining whether a hospital's decisions to divert and when to end its diversion are related to whether a nearby hospital that diverts is a safety net or non-safety net hospital (matched to the safety net hospital by distance and size). Second, what are the characteristics of hospitals that strategically divert? Hospitals that are more focused on profit and less on the services needed by their surrounding communities may be more likely to strategically divert. We proxy this using two measures: for-profit status and whether a hospital offers few relatively unprofitable services that are disproportionately needed by underserved patients, as compared to other hospitals within the same region.

We find evidence that hospitals engage in strategic diversion when they declare a diversion. Specifically, after a nearby hospital declares a diversion, a hospital is more likely to declare a diversion if the nearby hospital is a safety net hospital than if the nearby hospital is a non-safety net hospital. In addition, hospitals that divert when a nearby safety net hospital diverts have slightly lower ED occupancy than hospitals that divert when a non-safety hospital diverts. Furthermore, we theorize that, like musical chairs, hospitals do not want to be the last one with an open ED after a nearby safety net hospital declares a diversion. Consistent with this theory, the third hospital in a market to declare a diversion does so sooner when the first hospital

declaring a diversion is a safety net hospital than when the first hospital declaring a diversion is a non-safety net hospital.

We also find evidence that hospitals ending diversions time them differently depending on whether the nearby diverting hospital is a safety net or non-safety net hospital. Specifically, when hospitals declare a diversion after a nearby hospital diverts, they wait longer after going off diversion if the nearby diverting hospital is a safety net hospital instead of a non-safety net hospital. This delay in going off diversion is measured in two ways: (i) a longer duration and (ii) timing (e.g., more time passes between when the nearby diverting hospital and the hospital of interest end their respective diversions). It is unclear why this is the case. It could be that the second diverting hospital is slow to go off diversion because it wants to be sure the nearby safety net hospital stays open. On the other hand, the relatively slow decision to reopen after a nearby safety net hospital reopens may also indicate that the second hospital is not responding to the safety net hospital's diversion status to go off diversion.

Our results are consistent with our hypothesis that for-profit hospitals may be more likely to strategically divert. While not statistically significant, we find that when multiple hospitals in a market divert, the third hospital in a market to declare a diversion is more likely to do so sooner if a safety net hospital is the first to divert than if a non-safety net hospital is the first, and that this behavior is more pronounced in for-profit than nonprofit hospitals. We are not able to conduct additional analyses because of the relatively few for-profit hospitals in our sample.

We find mixed evidence about whether hospitals that choose not to offer services that may be needed by their surrounding communities strategically divert. Specifically, hospitals that offer few relatively unprofitable services compared to other hospitals in their region are less likely than hospitals that offer more of these services to declare a diversion when the nearby

diverting hospital is a safety net hospital than when the nearby diverting hospital is not a safety net hospital. Moreover, when these hospitals do divert, they have a slightly higher ED occupancy. However, compared to hospitals that offer more relatively unprofitable services, hospitals that offer few of these services go off diversions sooner after the nearby hospital ends its diversion when the nearby diverting hospital is a safety net hospital than after a nearby non-safety net hospital ends its diversion. These results are opposite those of the main analysis, suggesting perhaps that what we term strategic diversion consists of two decisions, one related to being sensitive to when a safety net hospital declares a diversion, and the other to being sensitive when it goes off diversion. In other words, hospitals that offer few relatively unprofitable services compared to other hospitals in their region may be less likely to strategically decide to declare a diversion, but if they are already on diversion, they may wait until the safety net hospital goes off diversion before themselves going off diversion.

B. Background

Strategic Diversions. As described in the previous chapters, hospitals have a strong financial incentive to avoid providing emergency care to uninsured and Medicaid patients. The margins for patients with Medicaid or no insurance are substantially lower than for patients with private insurance or Medicare (-35.9% and -54.4% for Medicaid and uninsured, compared to 39.6% and -15.6% for privately insured and Medicare patients for ED care), (84) and adjusted mean payments are 50% lower for uninsured patients than for commercially insured patients. (94) Thus, hospitals trying to maximize reimbursement may wish to selectively avoid uninsured and Medicaid patients.

Although Congress passed EMTALA in 1986 to counteract the incentive to selectively avoid uninsured and Medicaid patient and ensure that all patients receive access to emergency care, hospitals continue to violate the Act. (12, 28, 32) The same financial motivations that lead hospitals to violate EMTALA may lead them to try to avoid indigent patients before they even arrive at the hospital. For instance, hospital networks are more likely to close EDs in low-income areas, (146) raising critiques that hospital networks select locations to screen out indigent patients and reserve capacity for affluent patients. (147, 148)

In addition to permanently closing EDs that are likely to attract uninsured and poorly-insured patients, hospitals may also temporarily close an emergency room to the same effect. (141, 149) Specifically, hospitals may declare an ambulance diversion when nearby safety net hospitals go on diversion, a time when they are more likely to receive Medicaid and uninsured patients than otherwise. Furthermore, declaring a strategic diversion may be lower risk than violating EMTALA because under current federal regulations, EMTALA does not apply if the hospital has declared an ambulance diversion. Because no federal law restricts strategic diversions, they would go unreported.

Thus, hospitals have the incentive to declare a strategic diversion and are not restrained by an EMTALA prohibition. They also have the ability and opportunity to declare strategic diversions.

First, hospitals within a market often rely on a shared computerized system to declare a diversion, and these systems may permit hospitals to observe the diversion status of one another. For instance, many hospitals in California use a single system (ReddiNet) to declare a diversion, and those on the system can observe the diversion status of other hospitals as well. Thus, a hospital can respond to a safety net being on diversion if it desires.

Second, hospitals have flexibility in when and how they declare a diversion. Some hospitals choose to create formal processes for deciding when to divert, but others choose informal processes. For instance, a qualitative study found that a single hospital administrator/staff member often had the discretion to unilaterally decide when to declare a diversion. (150) Even if a hospital had a formal policy requiring diversion decisions to be made jointly, usually only one administrator/staff member initiated the request and the second merely approved or disapproved. (150) The only external constraints for hospitals declaring a diversion are rules from local agencies. (151, 152) However, these rules are often vague, requiring only that ED resources be "fully committed" (153) or that the ED has an "overload of patients requiring immediate attention," (154) but leaving the interpretation of what this means to the hospitals' discretion.

This study examines whether hospitals exploit the lack of a federal EMTALA prohibition and these vague rules by LEMSAs by engaging in strategic diversions. Specifically, we focus on whether a hospital's decision to divert differs when a nearby safety net hospital diverts than when a nearby non-safety net hospital diverts, when two nearby hospitals are of similar size and distance. In addition, we explore factors that may be associated with strategic diversion, focusing on whether hospitals that are more focused on profit and less on the services needed by their surrounding communities are more likely to strategically divert.

Conceptual Model. Our study focuses on whether hospitals respond differently to diversions from a nearby hospital depending on whether that hospital is a safety net or non-safety net hospital. When a nearby hospital is on diversion, a hospital may itself declare a diversion

either because its ED is crowded (a capacity-driven diversion) or because of the perceived insurance status of patients being diverted to its hospital (a strategic diversion). (Figure 4-1)

Capacity-driven diversions occur if the ED of the hospital of interest is crowded beyond the hospital's capabilities. Other scholars have suggested conceptual models for understanding ED crowding, including the input-throughput-output model from Asplin et al (2003). (155) This model is useful for understanding capacity-driven diversions. Indeed, one study even suggests using ambulance diversion as a measure for ED crowding under the input-throughout-output model, (156) assuming that the only reason hospitals divert is for capacity-driven reasons.

Our model differs from the input-throughput-output model because we focus specifically on whether hospitals' decisions to divert depends on whether a nearby hospital on diversion is a safety net or non-safety net hospital. In other words, because the purpose of our model is to distinguish between a capacity-driven and strategic diversion, we focus on factors that may influence whether a hospital declares a diversion when another hospital has already declared a diversion.

Two pathways explain how a capacity-driven diversion at the hospital of interest may occur if a nearby hospital is on diversion. First, the hospital's ED may become crowded if there is diversion at the nearby hospital. For instance, patients may be diverted from the nearby hospital if the two hospitals are geographically close, if there are other nearby EDs, or the nearby hospital is on diversion for a long time. Second, an external event that increases demand (such as influenza (157) or an accident) can cause a nearby hospital to divert, and it may also overwhelm the ED resources at the hospital of interest.

ED crowding at the hospital of interest may be exacerbated by internal factors at the hospital (e.g. throughput), such as the number of ED staff on shift, having a high ED occupancy

rate (the number of patients in the ED over the total number of ED treatment bays (156)), and the boarding practices of the hospital (boarding is when a patient remains in the ED even after admission, because s/he is waiting for an inpatient bed (158)).

A hospital engaged in a strategic diversion attempts to withhold ED capacity for a more favorable mix of patients. Thus, its ED is not fully crowded, but the hospital declares a diversion because it fears that unprofitable patients will be diverted from a nearby hospital. Under this pathway, a primary determinant for declaring a diversion is if the nearby hospital on diversion is a safety net hospital or whether it is a non-safety net hospital. Because the decision to strategically divert occurs at the margin, the decision to declare a strategic diversion is moderated by the extent to which ED resources are committed.

A hospital may be more likely to strategically divert if it emphasizes profit and de-emphasizes services that may be needed by their surrounding communities.

Hypotheses. We test a total of six hypotheses related to strategic diversions. (Table 4-1) The first aim, captured by H1 to H4, is whether hospitals respond differently when a nearby hospital on diversion is a safety net hospital than when that nearby hospital is a non-safety net hospital. Specifically, H1, H2, and H3 focus on whether hospitals declare a diversion differently, while H4 focuses on whether hospitals end a diversion differently depending on the safety net status of a nearby diverting hospital. The second aim, captured by H5 and H6, examines whether profit status or offering few relatively unprofitable services may be associated with strategic diversions.

H1. Hospitals are more likely to declare a diversion if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts.

A hospital engages in strategic diversion if it declares a diversion because of the perceived insurance mix of patients that will be diverted to its ED, as opposed to because the ED is crowded. Thus, a hospital likely engages in a strategic diversion if it is more likely to declare a diversion when a nearby safety-net hospital diverts than if a nearby non-safety net hospital. (H1) We predict therefore that the coefficient associated with the nearby hospital being a safety net hospital will be positive.

H2. A hospitals is more likely to declare a diversion with a lower ED occupancy if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts

We theorize that hospitals engaging in strategic diversions likely balance the risks of flagrantly violating the LEMSA rules and the possibility of diverting financially profitable patients to another hospital against the financial benefits of avoiding unprofitable patients. Thus, we surmise, strategic diversions likely occur "at the margin," i.e. when the ED is nearing capacity and somewhat crowded, but not entirely full. In other words, we hypothesize that in a strategic diversion, a hospital is more likely to declare a diversion with lower ED occupancy if the nearby diverting hospital is a safety net hospital than a non-safety net hospital. (H2) We predict therefore that the coefficient associated with the interaction term of the ED occupancy and the nearby hospital being a safety net hospital will be negative.

H3. When a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-safety net hospital declares a diversion.

Safety net hospitals are more likely to declare a diversion than non-safety net hospitals. (159) Thus, hospitals may not strategically divert every time a safety net hospital diverts. Doing so would make it obvious that they were engaging in strategic diversion, and it would not always be necessary as long as other hospitals in the area were also open and accepting unprofitable patients. Instead, hospitals may treat strategic diversion like a game of musical chairs – they do not want to be the last hospital accepting unprofitable patients when neighboring hospitals are on diversion. Under this theory, after a safety net hospital goes on diversion, hospitals may not engage in a strategic diversion until other hospitals in their market declare a diversion. In other words, once one hospital has declared a diversion, others quickly follow. Thus, we hypothesize that when a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-safety net hospital declares a diversion. (H3) Specifically, if multiple hospitals in a market declare a diversion, the third hospital to declare a diversion does so sooner if the first diverting hospital is a safety net hospital than if the first diverting hospital is a non-safety net hospital. We predict therefore that the coefficient associated with the first hospital declaring a diversion being a safety net hospital will be negative.

H4. When a hospital and a nearby hospital are both on diversion, the hospital will go off diversion sooner if the nearby hospital is a safety net rather than a non-safety net hospital.

A hospital that is strategically diverting will respond differently in when it goes off diversion if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. Specifically, we hypothesize that a hospital will go off diversion sooner if the nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. (H4) This is because we assume that being on diversion is costly to a hospital — being on diversion is associated with lower inpatient revenue and gross margins, (160, 161) perhaps because ambulance patients tend to be more critically ill (162) and are therefore more likely to be admitted. (161) In other words, a hospital that is strategically diverting may be doing so to deliberately avoid unprofitable patients but, because diversion is a blunt instrument, they may also lose the opportunity to treat profitable patients because it still has capacity to accept additional ED patients. Thus, we surmise that hospitals may balance the desire to avoid Medicaid/uninsured patients with the lower revenues and gross margins that may occur if they fail to treat profitable patients by going off diversion sooner when the diversion is strategic. Thus, hospitals may have a shorter diversion or end their diversions sooner after the nearby hospital ends its diversion if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. In other words, we predict that the coefficient associated with a nearby hospital being a safety net hospital would be negative.

H5. A hospital is more likely to strategically divert if it is a for-profit hospital.

A hospital may be more likely to strategically divert if it emphasizes profit. Thus, we hypothesize that for-profit hospitals may be more likely to strategically divert. (H5) Accordingly, we expect the coefficients associated with the interaction of whether the hospital is

a for-profit hospital and each of the main predictor variables for H1-H4 (described above) to have the same directions as predicted above. (Table 4-1)

H6. A hospital is more likely to strategically divert if it provides few relatively unprofitable services.

A hospital may also be more likely to strategically divert if it chooses not to offer services that may be needed by its surrounding community. One way to measure this is examining the extent to which hospitals offer relatively unprofitable services compared to others in their region. We hypothesize that those that offer few relatively unprofitable services in their region may be more likely to strategically divert. (H6) Accordingly, we expect the coefficients associated with the interaction of whether the hospital offered few relatively unprofitable services and the main predictor variable for H1-H4 described above to have the same directions as described above. (Table 4-1).

C. Methods

Empirical Strategy. To distinguish between strategic diversions and capacity-driven diversions, we match hospitals by size and distance, and use multivariate linear regression with hospital random effects to examine diversion characteristics after nearby safety net and matched non-safety net hospitals divert. Diversion characteristics includes whether the hospital of interest diverts, the duration of the diversion, and the timing of when the diversion starts or stops. In the first aim, the main predictor variables are whether the nearby diverting hospital is a safety net hospital and this variable interacted with ED occupancy. In the second aim, which looks at characteristics associated with strategic diversion, we further interact these main predictor

variables with whether the hospital is for-profit or offers few relatively unprofitable services. Because variables for ED occupancy are by day, and diversion data is by minute, we use instrumental variables to address concerns about reverse causality, using daily inpatient discharges as the instrument.

Identification Strategy. The first hypothesis is that a hospital is more likely to declare a diversion if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. The outcome variable is whether a hospital diverts and the main predictor variable is whether the nearby diverting hospital is a safety net hospital.

The second hypothesis is that a hospital is more likely to declare a diversion with a lower ED occupancy if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. The outcome variable is whether a hospital diverts, asnd the main predictor variable is ED occupancy interacted with whether the nearby diverting hospital is a safety net hospital.

The third hypothesis is the "musical chairs" analogy described above. Namely, hospitals do not want to be the only ones with an open ED if the safety net hospital is on diversion. Thus, if multiple hospitals in a market declare a diversion, the third hospital to declare a diversion does so sooner if the first diverting hospital is a safety net hospital than if the first diverting hospital is a non-safety net hospital. We focus on when three or more hospitals in a market divert. The outcome is the time elapsed between when the second and the third hospital in the market divert. The main predictor variable is whether the first hospital to divert is a safety net hospital.

The fourth hypothesis is that a hospital will go off diversion sooner if the nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. We proxy a hospital going off diversion sooner using two measures: first, the duration of the diversion, and second, the time that elapses from when the nearby hospital ends its diversion and the hospital ends its own

diversion. The main predictor variable for both of these are whether the nearby diverting hospital is a safety net hospital.

To examine the fifth and sixth hypotheses, which examine the characteristics of hospitals that may be more likely to strategically divert, we replicate the analyses used to test the first four hypotheses but add an additional interaction for the specific characteristic we are testing. This lets us examime whether hospitals with that characteristics are more likely to declare a diversion than hospitals without those characteristics. The fifth hypothesis is that a hospital is more likely to strategically divert if it is a for-profit hospital. Thus, the main predictor variable is whether the hospital is a for-profit hospital interacted with whether the nearby diverting hospital is a safety net hospital.

The sixth hypothesis is that a hospital is more likely to strategically divert if it provides few relatively unprofitable services among other hospitals in its market. We define offering few relatively unprofitable services as whether it provides a low (25^{th} percentile) percent of relatively unprofitable services among other hospitals in the LEMSA. We determine the percent of relatively unprofitable services that a hospital offers based on classifications from previous literature. Horwitz (2005) (163) classifies hospital services (found within the AHA Annual Survey) into services which are, generally speaking, relatively profitable, relatively unprofitable, or variably profitable based on peer-reviewed medical and social science literature, and verified using trade publications, business magazines, and newspaper reports. Horwitz and Nichols (2009) (164) update this list for the 2005 AHA Annual Survey, and classify five additional services as relatively unprofitable. For instance, alcohol/drug abuse outpatient services and psychiatric emergency services are services that are relatively unprofitable.[9]

[9] Services considered relatively unprofitable were: having alcohol/chemical dependency beds; offering alcohol/drug abuse outpatient services; having burn care beds; being a certified trauma center; offering child psychiatric services;

Data and Sample. The primary data consist of 2007 ambulance diversion logs for California, which lists for each diversion: the hospital, the starting time, and the end time. The logs were previously collected from local emergency medical services agencies (LEMSAs), which have mostly county-based jurisdictions, and exclude LEMSAs that did not allow ambulance diversions or that did not collect data at that level of detail. (159) Diversions from the same hospital that begin five minutes or less after the prior one ends are treated as if it is one diversion. We exclude three LEMSAs that did not have three or more hospitals with diversions. We use 2007 diversion logs because Los Angeles county provides only aggregated data after that year.

We combine the diversion logs with data aggregated from restricted inpatient and emergency department discharge data from the State of California Office of Statewide Health Planning and Development (OSHPD). Nine hospitals from the diversion logs that do not appear in the OSHPD data are excluded from the study (1.49% of diversions), including seven federal hospitals. We also exclude five hospitals in our sample that participated in a project that began September 2007 to reduce diversion hours. (151)

The combined diversion data-OSHPD discharge data is merged by hospital with data on financial characteristics from OSHPD and hospital characteristics from the American Hospital Association (AHA) Annual Survey.

We begin by identifying safety net hospitals. Scholars disagree about how to define a safety net hospital. (165) For instance, safety net hospitals could be public hospitals, hospitals

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having an emergency department; offering HIV-AIDS services; offering psychiatric consultation/liaison services; offering psychiatric education services; offering psychiatric emergency services; having psychiatric inpatient beds; offering psychiatric outpatient services; offering psychiatric partial hospitalization program; offering a geriatric adult day care program; hospice; having a patient education center; having social work services; and having a volunteer services department (not present in 2007 AHA data).

that serve a high proportion of Medicaid and uninsured patients, or hospitals which are members of America's Essential Hospitals. In the main analysis, we use public hospitals because this is a definition which is apparent to all physicians and staff of neighboring hospitals. In additional analyses, we evaluate the robustness of our results by using the other two definitions described, as well as hospitals that meet any of the safety net criteria or all. (see "additional analyses" section below) We match each safety net hospital to up to three non-safety net hospitals based on mean driving distance (which we obtain using Google Maps Geocoding API), the number of annual ED visits, and the licensed bed size. Each hospital pair thus represents hospitals that may divert to one another. Non-safety net hospitals are those that do not meet any of the safety net definitions described above. Because we are interested in how hospitals respond to a safety net hospital diverting, we exclude from our sample safety net hospitals that had fewer than 15 diversions during the year. In order to avoid bias, however, we did not use the same exclusion for the non-safety net hospitals.

We then create two different datasets. Dataset A compares diversion characteristics (e.g. probability, duration, timing for ending a diversion) for matched hospitals when the nearby hospital has declared a diversion. It contains information about diversions only at matched hospitals, and is unique by diversion for a nearby hospital and the next-occurring diversion at a matched hospital. We use dataset A to examine H1, H2, and H4 (Table 4-1).

Dataset B examines the timing of diversions among hospitals in a market when a nearby safety net hospital has declared a diversion, compared to the timing when a nearby non-safety net hospital has declared a diversion. In the main analysis, we define the hospital market to be the closest five hospitals. Sun et al. (2006) used the closest five hospitals to define a market in order to determine the effect of hospital closure on diversion. (166) We use dataset B to examine H3.

The samples vary by outcome. (Table 4-1) For H1 and H2, which look at the probability of diversion, the sample consists of all matched hospitals. For H3, which examines timing for declaring diversions, the sample is the closest five hospitals that are non-safety net hospitals when at least three hospitals declares a diversion. H4 looks at the length of the hospital's diversion and the timing of ending diversions. For the outcome examining length of the hospital's diversion, the sample consists of matched hospitals when the hospital of interest declares a diversion. For the outcome examining timing of ending diversions, the sample consists of matched hospitals where the diversion at the hospital of interest ends after the diversion at the nearby hospital. H5 and H6, which examine the influence of ownership (for-profit) and offer few relatively unprofitable services, each use the same outcomes and samples as H1-H4.

We exclude observations with extreme values of the outcome variable (above the 95th percentile) in order to avoid outliers with high leverage from influencing the results.

Analyses. In adjusted analyses, we use linear regression with random effects for the hospital of interest. In the first aim, our main predictors of interest are whether the nearby diverting hospital is a safety net hospital or a non-safety net hospital, and, for H2, the interaction of ED occupancy with whether the nearby diverting hospital is a safety net or non-safety net hospital. We adjust for ED staffing, external events that may increase demand, and the influence of the nearby hospital's diversion on the hospital of interest. (Table 4-2) In other words:

Y = f(SN x ED occupancy, SN x ED staffing, SN, ED occupancy, ED staffing, external events, influence of nearby hospital's diversion)

OSHPD data provides discharge data by day, so our measure for ED occupancy is by day. Because the diversion data is by minute, we control for reverse causality by using

instrumental variables. The instrument we use is the number of inpatient discharges for the hospital for the day; inpatient discharges is a major predictor of ED crowding. (167, 168)

Other than daily ED occupancy, we use three variables to proxy for ED crowding: the number of physicians on shift, whether the diversion occurs on a weekend, and general physician staffing. To proxy for the number of physicians on shift, we use the hour that the diversion is declared to create a three-category variable. McCarthy et al. (2008) suggests that there are fewest ED physicians on shift from 4 – 6 AM, and the most physicians on shift from 10 AM to 7 PM. (156) To proxy general physician staffing, we use the ratio of the average number of ED patients to emergency medicine physicians with privileges. We obtain the number of emergency medicine physicians with privileges from the AHA Annual Survey, which ask hospitals about this information beginning 2010. We assume that this number is relatively constant from 2007 to 2010. Rather than imputing missing values, since this may be missing not at random (e.g. hospitals with few ED physicians may not respond to this question), we categorize this variable into five: each of the quartiles and missing. The categories are: for each emergency medicine physician with privileges, <2.9 patients/day, 2.9-4.2 patients/day; >4.2-5.6 patients/day; and >5.6 patients/day.

To operationalize external events that may increase demand (i.e. input in Asplin's model), we use two variables: season, which may introduce spikes in ED use (151), and whether the ED occupancy rate for EDs within the LEMSA is abnormally high for the day, which we define as a day where the ED occupancy was above the 66^{th} percentile.

To operationalize the influence of the nearby hospital's diversion on the hospital of interest, we use three variables: the ratio of the distance between the hospitals over the average distance of the closest five EDs; the length of time that the nearby hospital is on diversion; and

the overlap of patient zip codes between the hospitals. In calculating this overlap, we modify the approach of Brooks and Jones (1997), by calculating a "competitor market presence" (CMP) for the hospital of interest based on the number of ED visits from a particular zip code to the hospital of interest multiplied by ED visits from the same zip code to the nearby hospital. This number is divided by the total number of ED visits at the hospital of interest and summed across all zip codes from which the hospital of interest has ED patients. (169) Thus, the higher the CMP, the more overlap there is in patient zip codes between the two hospitals, and the more that patients from these zip codes make up the hospital's patient population.

As described above, for H5 and H6, we account for organizational characteristics by interacting the main predictor of interest with whether the hospital of interest is a for-profit or nonprofit (H5) or whether it provides a low (25^{th} percentile) percent of relatively unprofitable services among other hospitals in the LEMSA (H6). See Table 4-3 for the means, standard deviations, range, and cut-offs for relatively unprofitable services. If services are missing for the study year, we impute based on prior or subsequent years' data. One hospital does not provide any information about services provided from 2004-2011, and is excluded from this analysis.

Additional analyses. We conduct several additional analyses as robustness checks. First, because safety net status is a key predictor variable, we use four additional definitions for safety net status: (i) hospitals that serve a high proportion of Medicaid and uninsured patients; (ii) members of America's Essential Hospitals; (iii) any of the three definitions (public, high proportion Medicaid/uninsured, America's Essential Hospitals); and (iv) all of the three definitions. We consider a hospital to serve a high proportion of Medicaid/uninsured patients if it serves more Medicaid and uninsured patients than one standard deviation above the mean in the LEMSA. Previous literature used this definition but relied on inpatient discharges and state.

(128, 129) A patient is considered to have Medicaid or no insurance if their expected payer is Medi-Cal (California's Medicaid program), Title V, county indigent programs, other indigent, or self-pay. We examine the CDC definition of safety net (131) but do not use it because it was over-inclusive: 46% of hospitals within the LEMSAs meet the CDC definition for a safety net hospital.

Second, because hospital random effects may not be appropriate if the hospital effects are correlated with the explanatory variables, (170) we use clustered standard errors at the LEMSA level. We use clustered standard errors at the LEMSA level, which accounts not only for arbitrary clustering at the lower levels (i.e. hospital) but also at the higher level such as may occur if there are issues with matching. Third, because LEMSAs have different rules for diversions, potentially leading to clustering at the LEMSA level, we include fixed effects for LEMSAs.

In addition, for H3, we explore the robustness of the results using different definitions of market. We hypothesize in H3 that the third hospital in a market to declare a diversion will declare one sooner if the first hospital to divert is a safety net hospitals instead of a non-safety net hospital. In the main analysis, we use the closest five hospitals to define a market. (166) In additional analyses, we explore different definitions of hospital market, including hospitals within 12 miles (171) and within 30 minute drive, (172) which prior research identifies as the distance and driving time that the majority of Californians had access to EDs. We do not use LEMSA for market because the geographic boundaries are quite large – e.g. all hospitals in Los Angeles are part of the same LEMSA. Similarly, we do not use hospital referral regions (HRR) from the Dartmouth Atlas, because these generally overlap with the LEMSA definition – only one LEMSA has more than one HRR, and only one HRR has more than one LEMSA.

Finally, for H3, in the main analysis we focus on non-safety net hospitals that are the closest five hospitals. In additional analyses, we examine all hospitals, including safety net hospitals. In order to account for differences in whether safety net and non-safety net hospitals might strategically divert, we add additional covariates controlling for the safety net status of the hospital of interest.

D. Results

Descriptive Statistics. Our sample consists of 17 safety net hospitals in 7 LEMSAs, which we matched to 25 non-safety net hospitals. (Table 4-4) Safety net hospitals are farther away from their closest five hospitals than the non-safety net hospitals (9.6 miles versus 6.8 miles). The safety net hospitals are 7.5 miles away from the matched non-safety net hospitals, compared to non-safety net hospitals being 7.1 miles away from one another in markets in which more than one non-safety net hospital is matched. These values do not differ significantly. Although safety net hospitals are on diversion more times during the year (mean of 1021) compared to safety net hospitals (mean of 660), this difference is not statistically significant because of large differences in the number of diversions between hospitals and LEMSAs. Safety net and non-safety net hospitals also do not differ in the competitor market presence.

Compared to the matched non-safety net hospitals, safety net hospitals are more likely to be public hospitals ($p<0.001$); have fewer female ED ($p=0.0010$) and inpatients ($p=0.0046$); Native American / Alaskan Native ($p=0.0198$) ED patients; have more Native American / Alaskan Native ($p=0.0193$) and Hispanic ($p=0.0273$) inpatients; and treat about twice as many Medicaid/uninsured ED patients ($p<0.0001$) and 2.8 times as many Medicaid/uninsured inpatient

($p<0.0001$). (Table 4-5) Safety net hospitals also treated fewer ED patients per year (mean of 52K vs. 41K patients per year, $p=0.0433$) than matched non-safety net hospitals do.

Table 4-6 examines differences in the control variables based on whether the nearby diverting hospital is a safety net or non-safety net hospital. Hospitals diverting after a safety net hospital diverts are more likely to divert when there are the fewest number of emergency physicians on shift ($p<0.001$), on days when the daily ED occupancy for the LEMSA is in the 25^{th} percentile ($p=0.004$), and in different months ($p<0.001$) than if they divert after a non-safety net hospital diverts. In addition, the relative distance between the hospital and nearby diverting hospital is closer if the nearby hospital is a safety net than non-safety net hospital ($p=0.0178$).

Unadjusted and Adjusted Analyses

H1-H4. Whether hospitals engage in strategic diversions. The first set of hypotheses are focused on the question whether hospitals engage in strategic diversions.

We hypothesize that hospitals are more likely to divert if the nearby diverting hospital is a safety net hospital than if that nearby hospital is a non-safety net hospital. (H1) In addition, we hypothesize that hospitals that divert when a nearby safety net hospital diverts have a slightly lower ED occupancy than hospitals that divert when a nearby non-safety net hospital diverts. (H2)

In unadjusted analyses, matched hospitals are less likely to divert if the nearby diverting hospital is a safety net hospital than if that nearby hospital is a non-safety net hospital. ($p<0.001$) (Table 4-7) Furthermore, hospitals that divert when a nearby safety net hospital diverts average 6 more ED patients than hospitals that divert when a nearby non-safety net hospital diverts. ($p<0.001$) However, hospitals that do not divert are more full (by an average of 10 more ED

patients) on days that a safety net hospital divert, compared to days that a non-safety net hospital divert ($p<0.001$).

In adjusted analyses, once we control for ED occupancy and whether hospitals divert at different occupancies if the nearby diverting hospital is a safety net hospital, hospitals are more likely to divert when a safety net hospital diverts than when a non-safety net hospital diverts. In other words, matched hospitals are more likely to divert (i.e. the sign went from negative to positive) if the nearby diverting hospital is a safety net hospital than if the nearby diverting hospital is a non-safety net hospital. This finding persists in our final model, which controls for other factors (such as external events that increase demand, whether patients from the nearby hospital are likely diverted to the hospital of interest, and ED staffing, see Table 4-2), account for reverse causality in ED occupancy using instrumental variables, and include hospital random effects.

Thus, in the adjusted model, consistent with our hypothesis, hospitals are 1.27 times more likely to divert if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts ($p<0.001$). (Table 4-8) As we would expect, hospitals are more likely to divert if their ED occupancy is higher. However, hospitals that divert when a nearby safety net hospital diverts have lower ED occupancy than those that divert when a nearby non-safety net hospital diverts (-0.255, $p<0.001$). Results from the additional analyses are similar, (Appendix 4-A) suggesting that the results are fairly robust. However, we note that the coefficient for ED occupancy in additional analyses is negative if the definition of safety net is a hospital that meets all three criteria.

The third hypothesis is when a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-

safety net hospital declares a diversion. Specifically, we expect that when multiple hospitals in a market are on diversion, and the time between when the second and third hospitals in the market divert should be shorter when a safety net hospital is the first to go on diversion than when a non-safety net hospital is first. In unadjusted analyses, this duration is shorter if the first hospital in the market to declare a diversion is a safety net hospital compared to a non-safety net hospital (27.7 vs 29.3 minutes) but this difference is not statistically significant. (Table 4-7) However, in adjusted analyses, when multiple hospitals in a market are on diversion, the third hospital declares a diversion 92.1 minutes sooner after the second hospital declares its diversion if the first hospital is a safety net hospital, compared to a non-safety net hospital ($p=0.014$). The majority of the additional analyses have negative coefficients and fairly similar point estimates to these findings, except that defining a market as a twelve-mile drive changes the coefficients to positive, although these are not statistically significant. (Appendix 4-A)

Our fourth hypothesis is that a hospital will go off diversion sooner if the nearby safety net hospital diverts than if a nearby non-safety net hospital diverts. (H4) This is because we assume that being on diversion is costly to a hospital, so hospitals want to minimize the amount of time that they are on diversion if they are strategically diverting. We use two measures for this behavior, the duration of the diversion and the time between when the hospital and nearby hospital end their respective diversions. In unadjusted analyses, there is no statistically significant difference in when hospitals go off diversion if the nearby safety net hospital diverts than if the nearby non-safety net hospital diverts. (Table 4-7) In adjusted analyses, we find a difference in when hospitals go off diversion if the nearby safety net hospital diverts than if the nearby non-safety net hospital diverts, but the difference is opposite what we expect. The adjusted analyses suggest that the hospital is on diversion for 84.5 minutes longer when a nearby

safety net hospital is on diversion, than when a nearby non-safety net hospital is on diversion ($p<0.001$). In addition, the hospital goes off diversion 34.1 minutes after the nearby hospital ends its diversion when the nearby hospital is a safety net as compared to a non-safety net hospital, a difference which is marginally significant ($p=0.076$).

H5. Whether for-profit hospitals are more likely to strategically divert. Our fifth hypothesis is that for-profit hospitals would be more likely to engage in strategic diversions. We originally planned on examining the same five models as above, but interacting whether the hospital is a for-profit or nonprofit hospital with the main predictor variables described above. (By definition, the hospitals of interest in the main analysis are never public hospitals.) However, only two for-profit hospitals are in the sample for the models that measure differences in behavior in matched non-safety net hospitals (i.e. those that rely on dataset A (H1, H2, and H4)). Between zero and five for-profit hospitals are in the sample for these models if we change the definition of safety net hospital (Appendix 4-A). Given the relatively few hospitals, we do not run the models that measure differences in behavior in matched non-safety net hospitals, but instead focus on the market-based model, which we label H5-3 for clarity. In this model, 31 hospitals are for-profit hospitals.

In the H5-3 model, we hypothesize that because for-profit hospitals would be more likely to engage in strategic diversions, they would be even more likely to not want to be the last hospital with an open ED if the first hospital in a market to divert is a safety net hospital compared to a non-safety net hospital. Specifically, we surmise that the third hospital in the market to declare a diversion would do so sooner if the first hospital to divert is a safety net hospital than if the first hospital to divert is a non-safety net hospital, and that for-profit hospitals would do so even sooner than nonprofit hospitals. (H5-3) Consistent with our hypothesis, the

third hospital in the market to declare a diversion does so 135 minutes sooner if the first hospital is a safety net hospital, compared to a non-safety net hospital (p=0.011), and for-profit hospitals do so even sooner, although these results are not statistically significant (-255 minutes, p=0.735). (Table 4-8)

H6. Our sixth hypothesis is that hospitals that offer few relatively unprofitable services would be more likely to engage in strategic diversions. Thus, we repeat the models that correspond to H1-H4 but we add a new variable, the interaction of whether the hospital offers few relatively unprofitable services for the LEMSA with the main predictor variables described above. For clarity, we name these models H6-1 to H6-4.

We hypothesize that, compared to hospitals offering more relatively unprofitable services, hospitals offering few of these services would be more likely to divert when the nearby diverting hospital is a safety net hospital rather than a non-safety net hospital (H6-1), and that these hospitals that do divert do so at a lower ED occupancy if the nearby diverting hospital is a safety net hospital rather than a non-safety net hospital. (H6-2) Although hospitals that offer few relatively unprofitable services are 0.43%[10] more likely to divert when the nearby safety net hospital diverts compared to when the nearby non-safety net hospital diverts, they are less likely to do so compared to hospitals offering more relatively unprofitable services (-1.04, p<0.001). (Table 4-8) Hospitals that offer few relatively profitable services that divert after the nearby safety net hospital diverts compared to when the nearby non-safety net hospital diverts do so at a

[10] The difference between the coefficients from whether the nearby diverting hospital is a safety net hospital (1.47) and whether the hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital (-1.04)

lower ED occupancy (-0.075)[11], but have a higher ED occupancy compared to other hospitals (0.221, $p<0.001$).

We hypothesize that when a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-safety net hospital declares a diversion, and that this difference is more pronounced for hospitals offering few relatively unprofitable services (H6-3). Thus, we expect that the time between when the second and third hospital in a market declare a diversion is shorter if the first hospital to declare a diversion is a safety net hospital rather than a non-safety net hospital, and that this time is even shorter if the third hospital is a hospital that offers few relatively unprofitable services in the market. (H6-3) The results are consistent with this hypothesis; when multiple hospitals in a market are on diversion, the third hospital in the market to declare a diversion does so 64.4 minutes sooner after the second hospital in the market declares a diversion if the first hospital is a safety net, compared to a non-safety net hospital ($p=0.096$). If the third hospital offers few relatively unprofitable services, it declares this diversion 38.4 minutes sooner than if the third hospital offers more relatively unprofitable services, but this difference is not statistically significant ($p=0.630$).

We hypothesize that hospitals go off diversion sooner if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts, and that hospitals offering few relatively unprofitable services are more likely to do this than other hospitals. (H6-4) We use two measures for this, duration of the diversion and the time elapsed between when the nearby hospital ends its diversion and the hospital ends its diversion. Hospitals are generally on

[11] The difference between the coefficients from whether the nearby diverting hospital is a safety net hospital x daily ED occupancy, log (-0.296) and whether hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital x daily ED occupancy, log (0.221)

diversion 134 minutes longer if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts (p=0.005), but hospitals offering few relatively unprofitable services end their diversions 253 minutes sooner than other hospitals if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts (p=0.001). Similarly, although hospitals ending diversions after the nearby hospital ends its diversion does so 27.4 minutes later if the nearby hospital is a safety net compared to a non-safety net hospital (p=0.601), hospitals offering few relatively unprofitable services does so 33.7 minutes sooner than hospitals offering more of these services (p=0.682); neither of these were statistically significant.

E. Conclusion

Our study suggests that hospitals respond differently when a nearby safety net hospital declares a diversion as compared to a non-safety net hospital of similar size and distance, even after controlling for daily ED occupancy, ED staffing, external events that increase demand (e.g. season), the influence of the nearby hospital's diversion (e.g. the overlap in patient zip codes between hospitals), and hospital size, and adjusting for hospital random effects. Thus, our results suggest that hospitals may be engaging in strategic diversions.

For instance, hospitals are more likely to declare a diversion when a nearby safety net hospital diverts than when a nearby non-safety net hospital diverts. (H1) Furthermore, hospitals that do divert have a lower ED occupancy when the nearby hospital is a safety net hospital rather than a non-safety net hospital. (H2) In addition, we hypothesize that hospitals do not want to be the last hospital open when a safety net hospital is on diversion. As we predict, hospitals declare a diversion sooner when two other hospitals in the market have already diverted, and the first hospital to divert is a safety net hospital rather than a non-safety net hospital. (H3)

Hospitals also end their diversion differently when the nearby hospital on diversion is a safety net hospital than when it is a non-safety net hospital. We hypothesize that hospitals go off diversion sooner if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts, because we assume that being on diversion is costly to hospitals. However, our results are opposite of our hypothesized direction. Specifically, hospitals are on diversion for less time and end them sooner after the nearby hospital end its diversion if the nearby hospital is a safety net hospital than a non-safety net hospital.

Our results may indicate that we do not fully understand strategic diversions. For instance, our assumption that being on diversion is costly to hospitals may be incorrect. Instead of re-opening faster in order to increase profitability, hospitals that are strategically diverting may be slower to re-open if the nearby diverting hospital is a safety net hospital instead of a non-safety net hospital because they want to wait to be certain that the nearby safety net hospital stays open.

When we explore factors that may lead hospitals to strategically divert, focusing specifically on whether hospitals that are more focused on profit and less on the services needed by their surrounding communities, our results are also mixed, although they are the opposite of the main result. In other words, we find that hospitals offering few relatively unprofitable services are less likely to divert compared to hospitals offering more of these services if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts, (H6-1) and those that do divert have a higher ED occupancy than other hospitals offering more of these services if the nearby diverting hospital is a safety net rather than a non-safety net hospital (H6-2). However, they have shorter diversions and end their diversions sooner after the nearby hospital end its own diversion, although these are not statistically significant (H6-4). This may be because hospitals

offering few relatively unprofitable services may be less likely to receive unprofitable patients because they are less likely to offer services needed by these patients.

We do not find any significant relationship between the timing of diversions and whether a hospital is a for-profit hospital, although our results are consistent with the hypothesis that for-profit hospitals are more likely to strategically divert. (H5-3) The lack of significant results may be because non-profit hospitals may less charitable in California than in other states. (173)

Our study suggests that hospitals decide to divert differently when nearby safety net hospitals divert than when nearby non-safety net hospitals divert. Strategic diversions may be composed of two decisions — one related to being sensitive to when a safety net hospital declares a diversion, and the other to being sensitive when it goes off diversion. The fact that the results related to declaring a diversion (H1, H2, H3) are in the same direction as we hypothesize, while the results related to going off diversion (H4) are in the opposite direction, and vice versa for hospitals offering few relatively unprofitable services, supports this contention. Furthermore, it suggests that hospitals may disagree about what the optimal strategy is to strategically divert.

Although more study needs to be conducted to determine whether there are indeed two different decisions, we contend that differential behavior following a diversion by a safety net and non-safety net hospital indicate that strategic diversion may be occurring. Given the effect that strategic diversions have on limiting access to emergency services, this finding is troubling and warrants both further study and possible policy action.

Limitations

Our study has several limitations. First, the study may have measurement error. For instance, we did not directly measure how crowded an ED is. An ideal measure might involve

the number of patients in the ED, the acuity of the patients, the number of physicians and staff, and the number of ED boarders, (174, 175) all at the precise moment that a hospital declare a diversion. The data did not provide this information, so we use several proxies for ED crowding, including ED occupancy and variables measuring ED staffing. Nonetheless, while this may cause measurement error, we do not think that this should bias our results since our study compares diversion characteristics following a diversion at a nearby safety net hospital with those following a diversion at a non-safety net hospital matched by size and distance. For there to be bias, there would need to be measurement error (not controlled by other variables) that systematically differ depending on whether the nearby hospital is a safety net or non-safety net hospital. Indeed, when we examine alternate definitions of safety net, two models find a negative statistically significant relationship between the predicted daily ED occupancy and probability of diversion (i.e. suggesting that hospitals are more likely to divert if ED occupancy is lower, which may indicate measurement error), while two find a positive relationship (i.e. suggesting that hospitals are more likely to divert if ED occupancy is higher, which is consistent with what we would expect). (Appendix 4-A)

Second, ED occupancy is a variable that is measured by day; we use instrumental variables to account for reverse causality, but the instrument may not fully address the reverse causality. Unfortunately, we are not able to measure the strength of the instrument since it is just-identified. However, even if this is the case, our other outcomes suggesting differential behavior after a safety net hospital diverts still suggest that strategic diversion occurs.

Third, some LEMSAs have changed their diversion policies since 2007. (151) Unfortunately, we are limited by the data to 2007 because the LEMSA that has the largest number of hospitals in the state (Los Angeles, which has 77 hospitals with emergency services

and accounts for 22% of all hospitals within the state with emergency services) stopped collecting by-minute diversion information in 2008.

Fourth, our findings may not be generalizable. Our data comes from California, which may be different from other markets, and our hospitals are all in metropolitan or urban hospitals. Furthermore, our study design relies on matching non-safety net hospitals by size and distance to safety net hospitals. This helps improve the comparability of diversions at a hospital of interest. However, this design also restricts our sample, which may lead to our results not being generalizable. More study needs to be done to see if hospitals of varying size and in different states engage in similar behavior.

Policy Implications

EMTALA only applies to a patient who "comes to" the ED. (10) If a patient does not arrive at a specific hospital because the hospital has declared an ambulance diversion, s/he is not considered to have come to the ED, and thus is not covered by EMTALA. (48-50) This rule applies even if the patient is in a hospital-owned ambulance. (49)

Our study suggests that hospitals may be engaging in strategic diversions. However, it is difficult to imagine how the federal government could re-interpret EMTALA in such a way to prevent strategic diversions.

The most straight-forward solution is to make strategic diversions an exception to the general rule (i.e. if a hospital engages in a strategic diversion, the patient is considered to have come to the ED). Unfortunately, this solution likely would not have an effect. Determining whether a hospital engaged in a strategic diversion, whether a specific patient was affected by

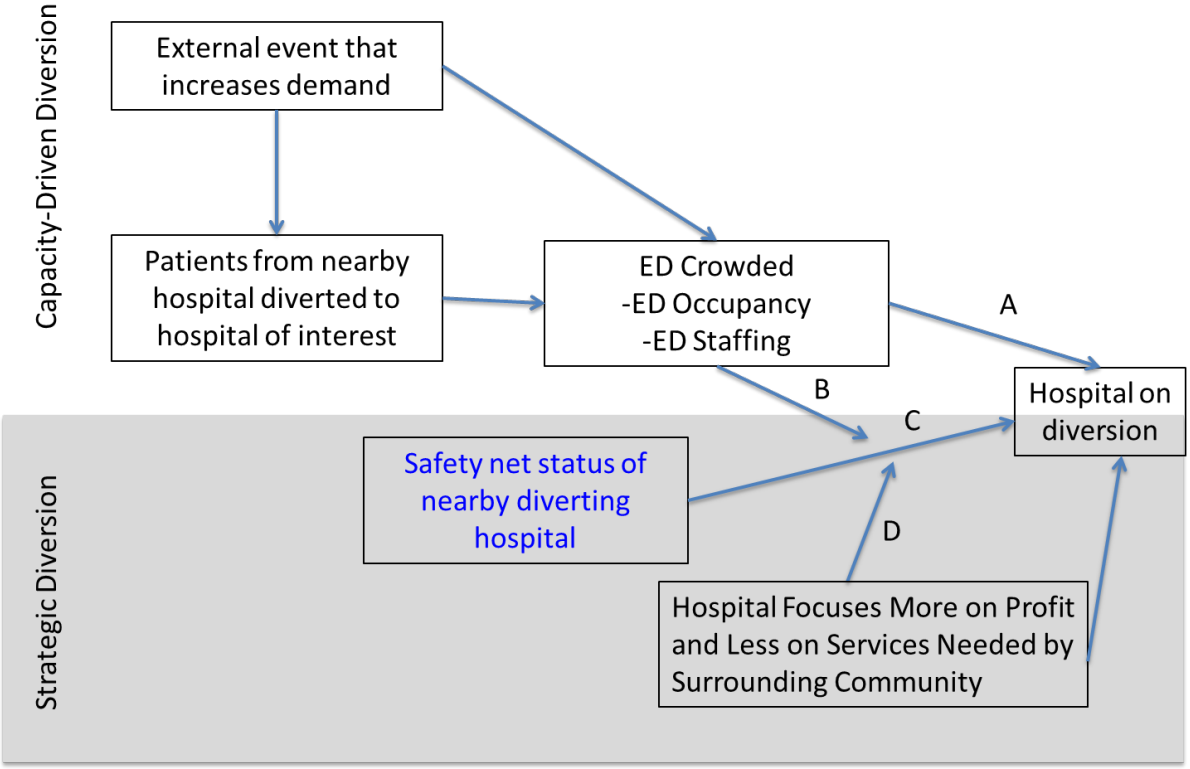
that strategic diversion, and whether the ambulance would have brought that patient to the hospital engaging in a strategic diversion (as opposed to another hospital) would likely be overwhelming to establish, either by CMS (in an investigation for an EMTALA violation) or by a plaintiff (in a civil suit). Furthermore, in civil suits, it would be difficult for plaintiffs to establish causality for an injury that arose due to a strategic diversion.

A second solution might be for CMS to re-interpret EMTALA so that a patient is considered to have come to a hospital if s/he is in a hospital-owned ambulance, regardless of whether the hospital has declared a diversion. However, this seems too blunt an instrument. Not only does this equally penalize hospitals that engage in capacity-driven diversions with those that engage in strategic diversions, but the rule change would affect a minority of hospitals. Very few hospitals own ambulance services, and this number is falling – in 2007, approximately 12% of Medicare-participating hospitals provided ambulance trips, but by 2011, only approximately 8% were. (176)

Instead, the most effective actor in preventing strategic diversions may be state or municipal governments. One solution could be to forbid hospitals from engaging in diversions at all. Massachusetts instituted such a ban in 2009, and despite concerns, (177) key process measures (e.g. ED length of stay, ambulance turnaround time, ED volume, elopements) did not change before and after the ban, (178, 179) and hospitals generally supported the ban after its implementation. (177) Another solution could be to require more information from hospitals before they declare a diversion. Indeed, some jurisdictions already do this; Alameda County requires that hospitals self-report information such as patient census, bed availability, number of patients who are waiting in the ED, and number of patients who are being boarded. (153) However, in order for this to effectively deter hospitals from strategically diverting, LEMSAs

may need to audit such information. More study would need to be done to see if this is an effective strategy in deterring strategic diversions.

Figure 4-1. Conceptual framework distinguishing between capacity-driven diversions and strategic diversions



A represents the pathway for a capacity-driven diversion, with no strategic diversions occurring
B and C represent the pathway explored by H1-H5
C and D represent the pathway explored by H6-H7

Table 4-1. Summary table of hypotheses, samples, outcomes

a) H1-H5: Whether hospitals strategically divert

	Hypothesis	Dataset	Sample	Outcome	Main predictor variable	Expected Direction	Coefficient for main predictor variable
H1	A hospital is more likely to declare a diversion if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts.	A	All matched hospitals	Whether hospital diverts after a nearby hospital diverts	Whether nearby diverting hospital is a safety net	⇑	1.27***
H2	A hospital is more likely to declare a diversion with a lower ED occupancy if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts	A	All matched hospitals	Whether hospital diverts after a nearby hospital diverts	Whether nearby diverting hospital is a safety net x ED occupancy	⇓	-0.255***
H3	When a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-safety net hospital declares a diversion.	B	The closest 5 hospitals (all non-safety net hospitals) when at least three hospitals declared a diversion	Time elapsed between when the second and third hospital in the market divert	Whether first diverting hospital is a safety net	⇓	-92.1*
H4	A hospital go off diversion sooner if a nearby safety net hospital diverts than if a nearby non-safety net hospital diverts.	A	Matched hospitals where the hospital of interest declared a diversion	Duration of the diversion	Whether nearby diverting hospital is a safety net	⇓	84.5***
		A	Matched hospitals where the hospital of interest declared a diversion	Time elapsed from when the nearby hospital ends its diversion and the hospital ends its diversion	Whether nearby diverting hospital is a safety net	⇓	34.1

b) H5: A hospital is more likely to strategically divert if it is a for-profit hospital.

	Outcome	Dataset	Sample	Main predictor variable	Expected direction	Coefficients
H6-5	Time between when the second and third hospital in the market divert	B	The closest 5 hospitals (all non-safety net hospitals) when at least three hospitals declared a diversion	Whether the hospital is a for-profit hospital x whether the nearby diverting hospital is a safety net hospital	⇓	-255

c) **H6: A hospital is more likely to strategically divert if it provides few relatively unprofitable services among other hospitals in its market.**

	Outcome	Dataset	Sample	Main predictor variable	Expected direction if strategic diversion	Coefficients
H6-1	Whether hospital diverts after a nearby hospital diverts	A	All matched hospitals	Whether the hospital offers few relatively unprofitable services x whether the nearby diverting hospital is a safety net	⇑	-1.04***
H6-2	Whether hospital diverts after a nearby hospital diverts	A	All matched hospitals	Whether the hospital offers abnormally few relatively unprofitable services x ED occupancy, log x whether the nearby diverting hospital is a safety net	⇓	0.221***
H6-3	Time elapsed between when the second and third hospital in the market divert	B	The closest 5 hospitals (all non-safety net hospitals) when at least three hospitals declared a diversion	Whether the hospital offers few relatively unprofitable services x whether the nearby diverting hospital is a safety net hospital	⇓	-38.4
H6-4	Duration of the diversion	A	Matched hospitals where the hospital of interest declared a diversion	Whether the hospital offers few relatively unprofitable services x whether the nearby diverting hospital is a safety net hospital	⇓	-253**
	Time elapsed from when the nearby hospital ends its diversion and the hospital ends its diversion	A	Matched hospitals where the hospital of interest declared a diversion that ended after the nearby hospital ended its diversion	Whether the hospital offers few relatively unprofitable services x whether the nearby diverting hospital is a safety net hospital	⇓	-33.7

Notes. Safety net is defined as a public hospital. All regressions are linear regression with hospital random effects, * p<0.10, ** p<0.05, *** p<0.01.

Table 4-2. Predictor variables and definitions.

	Definition	Notes
Main predictor variables		
Safety net status of nearby diverting hospital	Public hospital	Other definitions of safety net evaluated in additional analyses
ED Occupancy	Daily # of ED visits (predicted)	Daily ED visits predicted using instrumental variables, using daily inpatient discharges as the instrument to account for possible reverse causality. We use daily inpatient discharges because inpatient bed availability is a major source of ED crowding. (167, 168)
Ownership	For-profit hospital	Whether the hospital of interest is a for-profit hospital. Reference is not-for-profit hospital. (Hospitals of interest are non-safety net hospitals, so are not public hospitals)
Few relatively unprofitable services among other hospitals in its market	25th percentile of relatively unprofitable services offered by hospital, compared to other hospitals within LEMSA	See Table 4-3 for cut-offs by LEMSA Relatively unprofitable services classified relying on previous literature. (163, 164)
Control Variables		
ED Staffing	Physicians on shift	Categorical variable indicating the approximate number of physicians on shift, based on the hour that the diversion was declared. These categories were based on findings from McCarthy et al. (2008), which suggests that there are fewest physicians on shift from 4 – 6 AM, and the most physicians on shift from 10 AM to 7 PM. (156) Reference is having a moderate number of physicians on shift.
	Weekend	Dichotomous variable indicating whether the diversion began on a weekend or weekday
	Staffing Ratio	Categorical variables for the ratio of # average ED visits per day / number of emergency medicine physicians with privileges, by quartile or whether missing Reference is 1st quartile
External events that may increase demand	Season	Month Reference is January
	Daily ED occupancy rate for all hospitals within LEMSA is abnormally high	Whether daily ED occupancy rate for all hospitals within the LEMSA is 66th percentile.
Influence of nearby hospital's diversion on hospital of interest	Ratio of distance / average distance of closest 5 EDs	Distance between hospitals divided by the average distance of the closest 5 EDs to the nearby hospital

	Length of time nearby hospital is on diversion	The duration of the nearby hospital's diversion in minutes
	Overlap in patient zip codes between hospitals	Relying on previous literature, (169) calculated as the number of ED visits from a particular zip code to the hospital of interest multiplied by ED visits from the same zip code to the nearby hospital. This number was divided by the total number of ED visits at the hospital of interest and summed across all zip codes from which the hospital of interest has ED patients
Other control variables	Size	Number of licensed inpatient beds, log-transformed

Table 4-3. Relatively unprofitable services offered

LEMSA	Mean % of Relatively Unprofitable Services Offered	SD of Relatively Unprofitable Services Offered	Range in % of Relatively Unprofitable Services Offered	Cut-off for Offering Few Relatively Unprofitable Service
Alameda	34.8%	22.5%	64.7%	20.6%
Inland Counties Emergency Medical Agency (ICEMA)	21.1%	20.4%	64.7%	5.9%
Los Angeles	32.2%	20.5%	76.5%	17.6%
Mountain Valley	21.6%	3.4%	5.9%	17.6%
Sacramento	41.8%	21.1%	52.9%	29.4%
San Diego	48.6%	21.3%	64.7%	23.5%
San Francisco	43.5%	16.7%	52.9%	35.3%
San Joaquin	18.5%	11.0%	29.4%	11.8%
San Mateo	41.2%	18.2%	52.9%	35.3%
Santa Clara	45.3%	25.1%	64.7%	17.6%

Notes. Hospitals were classified as offering few relatively unprofitable services if they offered the 25th percentile or below of relatively unprofitable services compared to other hospitals within LEMSA**.** Relatively unprofitable services were classified relying on previous literature. (163, 164) See footnote 9 for a list of relatively unprofitable services.

Table 4-4. Descriptive statistics – comparability of matched hospitals

	Safety Net	Matched non-safety net	p-value
Number of safety net hospitals	17	27	
Mean (SD) driving distance (miles) of closest 5 hospitals	9.6 (7.5)	6.8 (3.3)	0.1352
Mean (SD) driving distance (miles) between non-safety net hospital and:	7.5 (6.1)	7.1 (4.3)	0.8021
Mean (SD) Number of Diversions	1021 (1284)	660 (859)	0.2687

Notes. Safety net hospitals are public hospitals. The matched non-safety net hospitals are matched on driving distance, ED volume, and bed size. None of the differences between safety net and matched non-safety net hospitals are statistically significant.

Table 4-5. Hospital characteristics for safety net and matched hospitals

	Safety Net Hospitals	Matched Hospitals	p-value
Ownership			
Public	17 (100.0%)	0 (0.0%)	<0.001
Nonprofit	0 (0.0%)	25 (92.6%)	
Profit	0 (0.0%)	2 (7.4%)	
Characteristics of ED patients			
Mean (SD) % of ED patients who are female	40.3 (4.9)	53.8 (3.6)	0.0010
Mean (SD) % ED patients with a race of:			
White	52.1 (24.5)	56.4 (21.1)	0.5676
Black / African American	18.3 (14.2)	16.2 (13.2)	0.6491
Asian / Pacific Islander	6.4 (4.5)	6.9 (3.4)	0.7127
Native American / Alaskan Native	0.9 (1.2)	0.3 (0.5)	0.0514
Other	18.8 (16.1)	13.2 (10.1)	0.1965
Missing	3.5 (9.5)	7.3 (17.5)	0.4529
Mean (SD) % of ED patients who were Hispanic	34.5 (24.2)	24.4 (17.5)	0.1174
Mean (SD) % of ED patients who had Medicaid/no insurance	59.3 (23.7)	29.6 (13.7)	<0.0001
Characteristics of inpatients			
Mean (SD) % of inpatients who are female	53.5 (6.4)	58.7 (5.1)	0.0046
Mean (SD) % inpatients with a race of:			
White	56.6 (24.6)	64.3 (17.8)	0.2795
Black / African American	15.0 (13.9)	12.5 (10.1)	0.5159
Asian / Pacific Islander	7.5 (4.2)	9.4 (4.3)	0.2044
Native American / Alaskan Native	0.9 (1.0)	0.3 (0.4)	0.0193
Other	18.9 (16.5)	12.2 (11.1)	0.1490
Missing	1.0 (1.0)	1.4 (1.4)	0.3761

Mean (SD) % of inpatients who were Hispanic	39.3 (22.4)	26.3 (15.3)	0.0273
Mean (SD) % of inpatients who had Medicaid/no insurance	50.6 (25.8)	18.3 (14.9)	<0.0001
Mean (SD) Number of ED Patients per year	5.22×10^4 (2.26×10^4)	4.07×10^4 (1.41×10^4)	0.0433

Notes. Safety net in this table is defined as a public hospital. The matched hospitals are non-safety net hospitals that were matched on driving distance, ED volume, and bed size. In the table above describing the race of hospital patients, we excluded twelve hospitals that described more than 50% of their patients' races as "other" or more than 5% of their patients' race were missing.

Table 4-6. Descriptive statistics based on whether nearby diverting hospital is safety net and matched hospitals

	Safety Net Hospitals	Matched Hospitals	p-value
Percent diversions occurring when there are:			
Fewest physicians on shift	2.8%	1.6%	
More physicians on shift	39.8%	34.7%	
Most physicians on shift	57.4%	63.8%	<0.001
Percent diversions occurring on a weekend, by whether the nearby diverting hospital is a safety net or non-safety net hospital	14.9%	14.6%	0.675
Mean number of ED visits per day / number of emergency physicians with privileges	4.10 (1.79)	4.28 (1.55)	0.7965
Percent diversions occurring by month			
January	15.0%	13.3%	
February	12.1%	8.8%	
March	10.7%	8.0%	
April	9.1%	7.7%	
May	8.3%	7.3%	
June	3.1%	3.8%	
July	7.0%	7.4%	
August	8.4%	7.9%	
September	6.1%	9.3%	
October	6.5%	8.7%	
November	7.5%	8.3%	
December	6.3%	9.6%	<0.001
Percent of diversions occurring on days where daily ED occupancy for LEMSA is in the 25th percentile	48.1%	45.5%	0.004
Mean ratio of distance between the hospital and nearby diverting hospital over the average distance of the closest five EDs to the nearby diverting hospital	0.838 (0.415)	1.26 (0.184)	0.0178

Mean (SD) duration of the nearby hospital's diversion (in minutes)	91.6 (176)	93.4 (141.3)	0.5485
Mean (SD) competitor market presence between hospital and nearby diverting hospital	0.060 (0.109)	0.033 (0.028)	0.2956
Mean (SD) bed size of hospital	341 (151)	355 (170)	0.7735

Notes. Safety net in this table is defined a public hospital. The matched hospitals are non-safety net hospitals that were matched on driving distance, ED volume, and bed size. The competitor market presence is defined in previous literature (169) as the number of ED visits from a particular zip code to the hospital of interest multiplied by ED visits from the same zip code to the nearby hospital. This number is divided by the total number of ED visits at the hospital of interest and summed across all zip codes from which the hospital of interest has ED patients. Thus, a higher competitor market index indicates that the hospitals draw patients from similar zip codes, and that the zip codes are important to the hospital. To proxy for the number of physicians on shift, we use the hour that the diversion was declared to create a three-category variable. McCarthy et al. (2008) suggested that there are fewest ED physicians on shift from 4 – 6 AM, and the most physicians on shift from 10 AM to 7 PM. (156)

Table 4-7. Unadjusted results – diversion characteristics of a matched non-safety net hospital when the nearby diverting hospital is a safety net or non-safety net hospital.

		Safety Net	Non-Safety Net
H1	Percent of matched non-safety net hospitals that divert when nearby diverting hospital is either a safety net or non-safety net hospital	18.1%***	22.2%***
H2	Mean (SD) number of ED patients at matched non-safety net hospital if hospital diverts when nearby diverting hospital is either a safety net or non-safety net hospital	143 (38.8)***	137 (37.4)***
	Mean (SD) number of ED patients at matched non-safety net hospital if hospital does not divert when nearby diverting hospital is either a safety net or non-safety net hospital	131 (35.5)***	121 (37.0)***
	Percent of time that at least two (non-safety net) hospitals also divert if the initial diverting hospital is a safety net or non-safety net hospital	4.9 (21.6)***	5.8 (23.5)***
H3	Time in minutes (SD) between when the 2nd and 3rd hospital in the market divert if the initial diverting hospital is a safety net or non-safety net hospital	27.7 (28.6)	29.3 (31.3)
H4	Mean (SD) duration of diversion (in minutes)	84.8 (92.7)	86.5 (105.6)
	Mean (SD) time between when nearby diverting hospital and matched hospital end their respective diversions, if nearby hospital ends diversion first	45.4 (76.7)	46.9 (88.3)

Notes. A safety net hospital is defined as a public hospital. The matched hospitals are non-safety net hospitals that were matched on driving distance, ED volume, and bed size. *** $p<0.001$

Table 4-8. Adjusted results

a) H1-H4. Whether hospitals strategically divert

Outcome		Predictor variable	b	SE	p-value
Whether hospital diverts after a nearby hospital diverts		Daily ED occupancy, log (predicted)	0.152	(0.018)	<0.001
	H1	Whether nearby diverting hospital is a safety net hospital	1.27	(0.081)	<0.001
	H2	Daily ED occupancy, log x whether nearby diverting hospital is a safety net hospital	-0.255	(0.016)	<0.001
Time between when the 2nd and 3rd hospitals in a market declare a diversion	H3	Whether first hospital in market to divert is a safety net hospital	-92.1	(37.6)	0.014
Duration of diversion	H4	Whether nearby diverting hospital is a safety net hospital	84.5	(18.7)	<0.001
Time between when hospital and nearby hospital end their respective diversions	H4	Whether nearby diverting hospital is a safety net hospital	34.1	(19.3)	0.076

b) H5. Whether hospital is for-profit

Outcome		Predictor variable	b	SE	p-value
Time elapsed between when the 2nd and 3rd hospitals in a market declare a diversion		Whether hospital is for-profit	108	(635)	0.864
		Whether the first hospital to divert is a safety net hospital	-135	(53.4)	0.011
	H5-3	Whether hospital is for-profit x whether the first hospital to divert is a safety net hospital	-255	(755)	0.735

c) H6. Whether hospital offers few relatively unprofitable services

Outcome		Predictor variable	B	SE	p-value
Whether hospital diverts after a nearby hospital diverts		Daily ED occupancy, log (predicted)	0.085	(0.051)	0.099
		Whether nearby diverting hospital is a safety net hospital	1.47	(0.231)	<0.001
		Whether nearby diverting hospital is a safety net hospital x daily ED occupancy, log	-0.296	(0.048)	<0.001
		Whether hospital offers few relatively unprofitable services	-0.473	(0.255)	0.063
		Whether hospital offers few relatively unprofitable services x daily ED occupancy, log	0.086	(0.052)	0.096
	H6-1	Whether hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital	-1.04	(0.286)	<0.001
	H6-2	Whether hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital x daily ED occupancy, log	0.221	(0.058)	<0.001

Time elapsed between when the 2nd and 3rd hospitals in a market declare a diversion		Whether hospital offers few relatively unprofitable services	36.7	(56.2)	0.513
		Whether first hospital in market to divert is a safety net hospital	-64.4	(38.7)	0.096
	H6-3	Whether hospital offers few relatively unprofitable services x whether first hospital in market to divert is a safety net hospital	-38.4	(79.7)	0.630
Duration of diversion		Whether hospital offers few relatively unprofitable services	13.47	(91.6)	0.883
		Whether nearby diverting hospital is a safety net hospital	134	(47.8)	0.005
	H6-4	Whether hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital	-253	(77.8)	0.001
Time between when hospital and nearby hospital end their respective diversions		Whether hospital offers few relatively unprofitable services	-108	(95.8)	0.259
		Whether nearby diverting hospital is a safety net hospital	27.4	(52.5)	0.601
	H6-4	Whether hospital offers few relatively unprofitable services x whether nearby diverting hospital is a safety net hospital	-33.7	(82.4)	0.682

Notes. Safety net is defined as a public hospital. Regressions are linear regression with hospital random effects, controlling for ED staffing (the approximate number of physicians on shift, whether the diversion was on a weekend, and staffing ratio), safety net of nearby hospital x ED staffing, external events that may increase demand (season, whether ED occupancy for LEMSA is abnormally high), the influence of the nearby hospital's diversion on the hospital (the ratio of the distance between the hospitals to the distance of the closest 5 hospitals, the duration of the nearby hospital's diversion, the overlap in patient zip codes), and hospital size. ED occupancy and safety net status of nearby hospital x ED occupancy are predicted using instrumental variables, where the instrument is number of inpatient discharges for that day and safety net status of nearby hospital x inpatient discharges.

Chapter 5. Conclusion

We began this dissertation by asking the question whether hospitals have internalized the goals of the Emergency Medical Treatment and Labor Act (EMTALA), such that EMTALA violations stem from a few "bad apples", or instead whether hospitals continue to be guided by the law, such that the Act encourages hospitals to provide care to unprofitable patients that they might not in the Act's absence. This dissertation suggests that the answer to this question is complicated.

Our results generally support the contention that EMTALA continues to play a key role in protecting patient safety, although some of our key informants in Chapter Two claimed that hospitals have internalized the Act. For instance, other respondents gave examples of suspicious transfers that continue, and suggested that EMTALA changes hospital behavior. One respondent even said that without EMTALA, hospitals would "literally put in a credit card swipe on the front door." Our results in Chapter Four support this contention, as it suggests that hospitals may act contrary to the goals of EMTALA by strategically declaring ambulance diversions in order to avoid Medicaid and uninsured patients.

However, the dissertation also suggests that EMTALA may help shift norms of behavior toward unprofitable patients. For instance, Chapter Three found that expanding the scope of EMTALA obligations to include inpatients might encourage hospitals to stabilize patients admitted from the emergency department (ED) before discharging them. Requiring stabilization of admitted patients is a step removed from the original problem of patient dumping that Congress was concerned about when it enacted EMTALA. In a sense, it moves EMTALA closer to a law ensuring quality of care instead of providing access. Our results suggest that hospitals

generally want to comply with EMTALA even when the care required goes beyond the original goals of the legislation – if this had not been the case, we would not have observed any change in hospital behavior.

Notably, the change in behavior occurred despite the fact that the penalties for not stabilizing an admitted ED patient were not very great. According to our interviews in Chapter Two, hospitals are primarily worried about being decertified from Medicare if they violate EMTALA. However, this penalty would not apply to hospitals which failed to stabilize admitted ED patients. Specifically, the Federal Court of Appeals for the Sixth Circuit was the actor behind expanding the scope of EMTALA obligations, while CMS declined to revise the 2003 CMS regulations. Thus, the most stringent penalty a hospital is subject to under the *Moses* rule is financial liability in a civil suit (which is restricted by the EMTALA statute to the amounts recoverable under state tort law).

Another way of thinking about this is to ask why hospitals comply with EMTALA at all. So few confirmed EMTALA violations result in civil fines – only about 8% of violations even trigger a fine – and decertification from Medicare is so seldom used that the last time that a hospital was penalized this way was in 2007. (13) In comparison, the cost to hospitals for providing emergency care to unprofitable patients is extremely high. Positive margins and payments are substantially lower for uninsured and Medicaid ED patients than commercially-insured patients. (84, 94) Furthermore, because EMTALA requires hospitals to provide stabilizing care if an ED patient has an emergency medical condition, the law increases the cost of treatment and makes unprofitable patients even more undesirable.

In passing EMTALA, Congress focused on alleviating the plight of uninsured and Medicaid patients who were being unstably dumped to public hospitals. However, these

examples, while possibly widespread, (8) do not tell the full story. (180) Even prior to EMTALA's enactment, physicians and hospitals provided uncompensated emergency care. In a letter to the Judiciary Committee when EMTALA was being considered, the American College of Emergency Physicians stated that they agreed with the objective of the legislation,[12] and pointed out that emergency physicians every year provided an average of $25,000 in uncompensated care, (1) which is equivalent to $60,055 in 2016 dollars. (181) These support the contention that there may be a long-established norm of providing emergency care to unprofitable patients – a norm which, because it precedes EMTALA, does not necessarily overlap the Act's legal requirements.

In other words, one way to understand EMTALA is that the Act supports and expands the established practice of providing uncompensated care. As one of our key informants stated, emergency physicians may use EMTALA as a lever to convince other physicians to provide necessary care. (Chapter Two) EMTALA may thus shift the perceived obligations of hospitals and its physicians. This finding is consistent with institutional theory suggesting that laws influence organizational behavior as organizations shift their business practices and organizational forms in order to comply. (182) Laws that are ambiguous or that, like EMTALA, may be enforced differently depending on whether an action arises through an administrative investigation or through litigation, may particularly influence behavior, as the conflict increases visibility of the law. (183, 184)

However, the reach of EMTALA may be limited by providers' perception of the law. In other areas of research, physicians are more likely to violate a law that they consider to be a "bad law." (185) EMTALA has been accused being an unfunded mandate (because it requires

[12] Although the association objected to a draft provision (later removed) imposing criminal penalties on physicians for inappropriate transfers.

hospitals to provide uncompensated care to unprofitable ED patients), (13, 47) (Chapter Two) and has been blamed for Medicaid and uninsured patients using the ED for primary care (186) and closing EDs. (47) With this negative perception of EMTALA, it is unsurprising that hospitals may try to avoid uninsured and Medicaid patients by declaring strategic diversions.

Relieving the financial strain for hospitals to treat unprofitable patients is often touted as the main way to improve EMTALA compliance. However, in Chapter Two, we found that financial pressure is only one possible reason hospitals may fail to comply with EMTALA. This suggests that improving the financial pressure on hospitals may not solve the entire problem. Furthermore, increasing financing may not be tenable in the current political and fiscal climate.

Increasing enforcement of EMTALA or increasing financial penalties (187) may also not improve compliance. In fact, this may have a chilling effect on reporting. As we discussed in Chapter Two, hospitals are reluctant to report their transfer partners – they do not want to get one another in trouble. Increasing penalties may therefore actually discourage hospitals from reporting one another.

An alternate strategy to improve EMTALA compliance may be to focus both on expanding hospital norms to further encourage treatment of unprofitable patients and on improving providers' perception of EMTALA. We proposed in Chapter Two that one way to do this would be to permit informal mediation sessions between hospitals to discuss suspicious transfers. Similarly, to reduce strategic diversions, CMS could encourage discussion and collaborations among hospitals to reduce diversions. Similar collaborations on capacity-driven diversions have been shown to reduce diversions. (188)

Another benefit of focusing on hospital norms is that this strategy may have a broader reach than focusing on enforcement, as the latter may focus only on violations that hospitals have

historically engaged in. However, hospitals may change their focus as more Americans become insured under the Patient Protection and Affordable Care Act (ACA). Specifically, differences in reimbursement by ACA-established exchanges may lead hospitals and physicians to discriminate against enrollees who purchase insurance on the exchanges if providers receive lower reimbursements for these patients than others. The source of these lower reimbursements may stem from several sources. Most plans purchased on the exchanges established by the ACA are health maintenance organizations or narrow network, (189) excluding providers — including emergency physicians and certain hospitals (190) — in order to lower costs. Providers providing EMTALA-mandated care to out-of-network patients may therefore be required to accept in-network rates from insurers, even though high deductibles from these plans may make it unlikely that they will recoup the difference from patients directly. Furthermore, in some cases, providers may not receive any payment at all, such as if the plan deems EMTALA-mandated services to be non-emergent (191) or if the patient is a subsidized exchange plan enrollee who has lapsed on his or her premium payment.[13]

This dissertation suggests that although the goals of EMTALA may generally be internalized, the Act still plays a role in shaping hospital behavior toward unprofitable patients. Yet the findings also indicate that, contrary to conventional wisdom, increasing the penalties to improve EMTALA compliance may not be as effective as hoped. Instead, changing providers' perception of the law may be as influential as increasing the penalties in influencing organizational behavior.

[13] Specifically, exchange plans must grant subsidized non-paying enrollees a ninety-day grace period before they can cancel their plans. Although insurers are responsible for claims made during the first month of the grace period, they are not responsible for paying claims made in the second and third months by enrollees who ultimately terminate their plans. (192) Although not many enrollees may fall under this exception, providers are wary of this rule. (193) In fact, the state of Texas requires enrollees of exchange plans to display "QHP" (for qualified health plan) on their insurance cards indicating that they belong to exchange plans. (194)

Appendix 2. Qualitative Interview Guide

NOTE: the following interview guide was used as a rough guide in the interviews. Wording and questions varied based on the respondent's responses and time.

We are interested in how hospitals respond to the Emergency Medical Treatment and Labor Act, or EMTALA, which requires that hospitals that receive Medicare funding provide certain emergency services to their patients.

We're interested in your perspective, as a [hospital system / hospital association / patient safety organization] in [state].

The interview is going to take about 30 minutes, and I'll be asking you about 20 questions.

I'd like to start by getting some context about EMTALA.

Context

1. What are the biggest challenges facing hospitals in your region with regards to EMTALA compliance?
2. The major provisions of EMTALA include screening for an emergency condition, stabilizing an emergency condition, certain requirements that must be met before a patient is transferred, and, for hospitals with specialized capabilities, recipient hospital responsibilities.
    a. How familiar are **emergency physicians** in your region with specific provisions of EMTALA?
    b. What about **emergency staff?**
    c. How familiar are **non-emergency physicians** in your region with specific provisions of EMTALA?
    d. What about **non-emergency medical staff**?

3. How do physicians and staff in your region become aware of EMTALA? [Prompt: hospital association trainings, each hospital / hospital network; other professional organization; rely on training]

Empirical Study Design

The issue about whether EMTALA obligations cover inpatients is being debated among hospitals.

4. What do hospitals in your region generally think is the rule now regarding whether EMTALA obligations extend to inpatients?
    a. To what extent do you think **non-**emergency medicine physicians are aware of the debate about EMTALA extending to inpatients?
    b. What about non-emergency medical staff?

An important court case in the Sixth Circuit, *Moses v. Providence Hospital,* was decided in 2009. This case suggests that, at least within [your state / neighboring states], EMTALA obligations may survive beyond admission.

5. How aware are hospitals in your region of this case?
6. Do you think that hospitals' understanding about when EMTALA obligations apply changed after this case? Please think back to between 2003 and 2009.
7. Our study is focused on 2008-2010. Do you know of any state-specific initiatives or programs that may have influenced patient safety during this time period?

Interpretation of (Empirical) Results

EMTALA obligations overlap with medical malpractice liability and other patient safety considerations. I'd like to know more about what you think are the concerns about each.

8. There are several ways that patient safety is protected in hospitals. I'm going to read you a list, and I'd like for you to indicate how important **emergency department physicians and staff** perceive each item to be in protecting patient safety: not important, important, or extremely important. Please let me know if your rating is different for ED physicians than it is for ED staff.

(i) Professional or ethical duties

(ii) Any type of hospital accreditation, such as JCAHO

(iii) Discharge requirements under the Medicare conditions of participation

(iv) Malpractice liability

(v) EMTALA

[If indicate more than one is "extremely important"]: You indicated that [LIST] are all extremely important. Which do you think is most important?

9. I'm now interested how **non-emergency department physicians and medical staff** perceive these same patient safety protections. I'm going to repeat the list, and I'd like for you to indicate whether **non-ED physicians and medical staff** perceive each item to be each is not important, important, or extremely important to protecting patient safety**.** Please let me know if your rating is different for non-ED physicians than it is for non-ED medical staff.

(i) Professional or ethical duties

(vi) Any type of hospital accreditation, such as JCAHO

(ii) Discharge requirements under the Medicare conditions of participation

(iii) Malpractice liability

(iv) EMTALA

[If indicate more than one is "extremely important"]: You indicated that [LIST] are all extremely important. Which do you think is most important?

10. How important do you think concerns about EMTALA are in changing hospital behavior, as compared to concerns about malpractice?

Investigations

Thank you for your time so far. We have another [5-10] minutes. I'd like to focus now on how hospitals respond to investigations of EMTALA violations.

11. When a hospital is investigated by CMS for an EMTALA violation, how aware are other hospitals of the investigation? [If respondent indicates that very aware, ask how they become aware & how widely spread information is]
12. Do you think that hospitals are more concerned about EMTALA after they've been investigated, even if the investigation doesn't find a violation? [If yes, then ask: can you give some examples?]
13. CMS Region 4 (which covers your state) has a relatively high rate of hospital investigations for EMTALA. Do you have thoughts on why this might be?
14. Communication among hospitals is very important in understanding how hospitals respond to EMTALA. How much do hospitals communicate with one another

regarding concerns about EMTALA? **[Prompt:** for instance, if they are not clear about how a provision of EMTALA is interpreted] Is this based on specific counties or a specific region, or across the whole state?

Closing

15. Do you think hospitals' responses to EMTALA have changed as a result of the Affordable Care Act?

16. I really appreciate you sharing your perspective. We'll be conducting some empirical analyses as well, and it's helpful for us to hear how hospitals view and respond to EMTALA in order to avoid misinterpreting the data. To that end, I'd like to ask if there are any stories or concerns about EMTALA that you'd like to share with me, either now or through e-mail.

Appendix 3-A. Demographic and Hospital Characteristics in Intervention and Control States

Appendix Table 3A-1. Demographic Characteristics in 2008

Rule	State	Population Size[195]	% White[1]	% in Poverty[196]	% Uninsured[197]	% Medicaid[3]	Median Household Income[198]	Health Spending per capita[199]
Sixth Circuit Rule	TN	6,214,888	80	15	14.5	18.2	$39,702	$6,254
	KY	4,269,245	90	17.1	15.7	16	$41,148	$6,341
CMS Regulations	NC	9,222,414	74	13.9	15.1	14.4	$42,930	$6,204
	SC	4,479,800	69	14	15.5	13	$42,155	$6,157

Appendix Table 3A-2. Hospital Characteristics in 2010

Rule	State	Total Hospitals[200]		State or Local Hospitals[6]		Not-for Profit Hospitals[6]		For-Profit Hospitals[6]		ED visits/ 1K pop[6]	Inpatient Days per 1K pop[6]	Academic Medical Centers[6]
		#	Admissions per 1K pop	%	Admissions per 1K pop	%	Admissions per 1K pop	%	Admissions per 1K pop			
Sixth Circuit Rule	TN	134	126	14.9	20	41.8	69	43.3	37	492	720	9
	KY	106	137	10.4	14	70.8	107	18.8	17	549	723	2
CMS Regulations	NC	117	107	27.4	31	62.4	72	10.2	4	446	312	6
	SC	67	109	25.4	30	35.8	51	38.8	28	314	648	4

Appendix 3-B. Samples by Outcome

For outcomes involving early discharge (H1), of the inpatients admitted from the ED during the study period (1.1 million with a non-diagnosis–specific length of stay below the 75th percentile, 1.4 million with a diagnosis-specific length of stay below the 75th percentile, and 222K with a diagnosis-specific median length of stay of at least 4 days), we exclude 1.14-2.52% of patients who died and 0.18-0.28% patients who had primary diagnoses that do not show any variability in outcome.

For readmissions (H1), 1.16 million records associated with inpatients admitted from the ED (excluding Kentucky, which did not provide patient identifiers) qualify as index admissions, of which 238K are surgical/gynecology patients, 161K are cardiorespiratory, 118K are cardiovascular, 66K are neurology patients, and 578K are general medicine. We exclude 2,448 of records in hospitals that do not have admissions (all of which hospitals with fewer than 100 licensed bed).

For inpatient transfers (H2), 1.47 million inpatients are admitted from the ED during the study period excluding patients in Kentucky. The vast majority of them are in hospitals with specialized capabilities; 453K are in hospitals that do not have these capabilities. We exclude 5,258 records where patients died in the hospital and 3,649 records where the transfer is within the same hospital (i.e. from one unit to another).

For admissions in markets where transfers are relatively difficult (H3), 8.56 million patients are seen in the ED in hospitals in high occupancy markets. We exclude 4.87 million records in hospitals with specialized capabilities.

Appendix 3-C. Additional Analyses

Uninsured vs Commercially-Insured Patients. In the main analysis, we combine uninsured and Medicaid patients. Providers generally consider EMTALA as requiring them to provide emergency care to unprofitable patients, including both Medicaid and uninsured patients. Furthermore, if we were to focus solely on care provided to uninsured patients compared to privately-insured patients, we may have a biased sample if patients who have been admitted may be more likely to apply for Medicaid coverage. As a sensitivity analysis, we investigate whether the patterns of admission and ED transfer are comparable for uninsured and Medicaid patients.

6.8% of Medicaid patients are admitted from the ED, compared to 5.5% of uninsured patients ($p<0.001$), and 2.33% of Medicaid patients are transferred from the ED, compared to 2.45% of uninsured patients ($p<0.001$). Because the rates of admissions and ED transfers differ for Medicaid and uninsured patients, we look at whether the DDD for the outcomes differ if we restrict the sample to just uninsured patients compared to commercially-insured patients.

After restricting analyses to uninsured patients versus commercially-insured patients, we find that our results are fairly similar to those in the main analysis. (Appendix Table C1) Differences are in early discharge (which show non-significant increases in early discharge for diagnosis-specific and non-diagnosis specific 25^{th} percentile length of stay, versus non-significant decreases), a non-significant increase in readmissions (versus a marginally significant decrease) and a much lower increase in admission rate in high occupancy markets (effect size 0.3% versus 3.85%)

Seven-Day Readmissions. The main analysis examines 30-day readmissions. This 30-day time frame relies on the methodology from Medicare, and has been thoroughly validated. It examines long-term consequences of a hospital's decision to release a patient early. However,

although Dharmarajan et al. (2013) (201) suggest that patterns of readmission diagnoses are roughly similar irrespective of different time frames, a 30-day follow-up period may be more likely to detect differences in patients' primary care than differences in hospital care. Thus, as a sensitivity analysis, we examine 7-day readmission rates ("bounce-back" readmissions). (202)

Similar to the main analysis, the DDD in adjusted analyses for readmission is negative for each cohort, indicating that unprofitable patients are less likely to be readmitted at seven days under the Sixth Circuit rule versus the CMS regulations. (Appendix Table C2) Cardiovascular readmissions is 1 percentage point lower under the Sixth Circuit rule (p=0.005), which corresponds to a -26.7% policy effect, and general medicine readmissions is 0.4 percentage points lowerunder the Sixth Circuit rule (p=0.068), which corresponds to a -8.1% policy effect. The effect size of the decreases is the same for surgical/gynecological patients for 7-day readmissions and 30-day readmissions (see Table 6). The decrease in readmissions is larger for cardiorespiratory (-6% versus -1.1% in the main analysis), cardiovascular (-26.7% versus -8.1%), and general medicine (-8.1% versus -4.4% in the main analysis) for a 7-day time frame as compared to a 30-day, but the decrease is smaller for neurology (-11.6% versus -19.5%).

Early Discharge for Diagnoses with High Variability in Length of Stay. In the main analysis, we include all inpatients from the ED in examining length of stay because of concerns about coding creep. However, using all inpatients may reduce the ability of the analysis to detect effects, so as a sensitivity analysis, we use as an outcome the diagnosis-specific 25th percentile for only those patients with CCS diagnoses empirically associated with high variability in lengths of stay. (Appendix Table 3) CCS diagnoses with high variability in lengths of stay are those where the interquartile region of the length of stay is longer than the 75th percentile.

Diagnoses are considered having a high variability in length of stay if the interquartile region of the length of stay is 7 days or more. When we restrict the sample to include only inpatients admitted from the ED with diagnoses that have a high variability length of stay, the adjusted analyses finds a larger effect size (policy effect -6% versus -0.4%) in the same direction, but it is still non-significant.

Excluding Records Before August 2008. There may have been uncertainty about whether EMTALA obligations for hospitals with specialized capabilities were also satisfied upon inpatient admission. In August 2008, CMS decided that they were – i.e. that hospitals with specialized capabilities were not required to accept transfers of admitted EMTALA patients. (132) However, in draft recommendations published four month earlier, they had proposed the opposite. (203) Therefore, hospitals with specialized capabilities may have been uncertain about their obligations during this time. We adjust for the effect of this uncertainty in an additional sensitivity analysis that restricts the "pre" period to visits after August 2008.

In adjusted results, the DDD for inpatient transfers is positive (but not statistically significant), indicating that under the Sixth Circuit rule, more unprofitable inpatients admitted from the ED are transferred, even after adjusting for temporal and geographic trends. The policy effect is similar to the effect found in the main analysis (0.3% versus 0.4%).

Alternate Definition of Market. In the main analysis, we define the hospital market based on HRR. In sensitivity analyses, we define the market based on county, which researchers have used as the hospital market area in studies examining institutional influences. (204)

In adjusted analyses, the DDD is negative. This is opposite of the direction expected and the direction of the measure in the main analysis, but the result is not statistically significant.

Alternate Definition of Safety Net. A key control variable in the adjusted analyses is whether a hospital is a safety net hospital. In sensitivity analyses, we use an alternate definitions of safety net, the CDC definition which relies on the patients served in the ED: having at least 30% Medicaid or uninsured patients, or at least 40% of both Medicaid and uninsured patients in the ED.

The adjusted results using the CDC definition for a safety net results in almost exactly the same results as the main analysis.

Early discharge excluding patients with primary psychiatric disease and inpatient transfers. Diagnoses vary for the different measures of early discharge, with a primary diagnosis of a primary psychiatric disease making up about half of the discharges associated with a two-day length of stay (when the diagnosis-specific median length of stay is five days or longer), as compared to under 6.0% for the other two measures. In an additional analysis, we exclude discharges associated with a primary diagnosis of a primary psychiatric disease in order to see whether the findings in the main analysis re being driven by differential treatment of these patients.

The adjusted results after excluding these observations yields results similar to the main analysis, although the point estimates change. While the policy effect is larger for the diagnosis-specific and non-diagnosis specific measures of early discharge, they are still not statistically significant. The policy effect is smaller for the "within 2 days" measure of early discharge and is marginally significant (p=0.111).

Appendix Table 3-C1. Adjusted analyses comparing uninsured patients versus commercially insured patients

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Early Discharge						
Diagnosis-specific 25th percentile	930,624	0.0038	0.0039	0.325	26.2%	1.5%
Non-diagnosis specific 25th percentile	741,903	0.0011	0.0046	0.817	36.5%	0.3%
Within 2 days	133,196	0.0371	0.0100	<0.001	38.5%	9.6%
Readmissions						
Surgical/gynecological	161,498	-0.0045	0.0052	0.39	7.2%	-6.3%
Cardiorespiratory	93,866	-0.0029	0.0082	0.722	12.0%	-2.4%
Cardiovascular	95,978	-0.0100	0.0065	0.127	8.3%	-12.0%
Neurology	46,663	-0.0175	0.0101	0.084	7.7%	-22.8%
General Medicine	397,079	0.0034	0.0039	0.367	9.7%	3.6%
Inpatient transfers	311,967	0.0009	0.0008	0.267	4.8%	1.8%
Admission in high occupancy market	2,272,432	0.0001	0.0003	0.697	4.7%	0.3%

Note. The DDD is the interaction of post * sixth * uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C2. Adjusted analyses for 7-day readmissions, by condition

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Surgical/gynecological	238,190	-0.0026	0.0026	0.318	2.9%	-8.9%
Cardiorespiratory	160,763	-0.0028	0.0040	0.478	4.7%	-6.0%
Cardiovascular	117,642	-0.0103	0.0037	0.005	3.9%	-26.7%
Neurology	65,713	-0.0044	0.0055	0.419	3.8%	-11.6%
General Medicine	65,713	-0.0039	0.0021	0.068	4.8%	-8.1%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C3. Early discharge for diagnosis-specific 25th percentile length of stay, including only diagnoses with a high variability in length of stay

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Diagnosis-specific	55,248	-0.0169	0.0152	0.265	28.0%	-6.0%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured and Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C4. Inpatient transfers excluding visits prior to August 2008

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Inpatient transfers	333,157	0.0002	0.0009	0.865	4.7%	0.3%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured/Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C5. Adjusted results using counties to define a high occupancy market

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Admission in high occupancy market	2,086,923	-0.0002	0.0003	0.437	6.2%	-0.3%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured/Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C6. Adjusted results using the CDC definition for safety net

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Early Discharge						
Diagnosis-specific 25th percentile	1,378,822	-0.0010	0.0030	0.746	26.2%	-0.4%
Non-diagnosis specific 25th percentile	1,102,416	-0.0019	0.0035	0.578	30.7%	-0.6%
Within 2 days	216,042	0.0244	0.0078	0.002	29.2%	8.4%
Readmissions	445,621	0.0002	0.0006	0.749	4.9%	0.4%
Surgical/gynecological	238,190	-0.0065	0.0039	0.100	7.3%	-8.9%
Cardiorespiratory	160,763	-0.0017	0.0066	0.801	14.8%	-1.1%
Cardiovascular	117,642	-0.0084	0.0059	0.158	10.3%	-8.2%
Neurology	65,713	-0.0206	0.0086	0.016	10.6%	-19.4%
General Medicine	578,069	-0.0060	0.0033	0.071	13.5%	-4.4%
Inpatient transfers	445,621	0.0002	0.0006	0.749	4.9%	0.4%
Admission in high occupancy market	3,693,700	0.0008	0.0003	0.004	4.0%	1.9%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured/Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix Table 3-C7. Adjusted results excluding inpatient transfers and patients with primary psychiatric disease

	N	DDD	SE	p-value	Baseline rate	Policy Effect
Early Discharge						
Diagnosis-specific 25th percentile	1,262,723	-0.0037	0.0031	0.226	26.0%	-1.4%
Non-diagnosis specific 25th percentile	1,027,960	-0.0043	0.0036	0.238	30.0%	-1.4%
Within 2 days	106,054	0.0177	0.0111	0.111	32.1%	5.5%

Note. The DDD is the interaction of post * sixth * Medicaid/uninsured. The model also controls for the main effect of the DDD, patient-level risk adjustment variables (sex, age, comorbidities, diagnoses), hospital characteristics (profit status, bed size, urbanicity, and safety net status), and hospital random effects. The baseline rate is the unadjusted pre rate for uninsured/Medicaid patients in the Sixth Circuit, and the policy effect is the DDD divided by the baseline rate.

Appendix 3-D. Unadjusted Analyses

Medicaid and uninsured patients in the Sixth Circuit are more likely to experience an early discharge in the post period for all three measures (diagnosis- and non-diagnosis-specific 25th percentile length of stay and discharge within two days for diagnoses with at least a median length of stay of 4 days). (Table 5a) For two of the three measures, this increase is less than the corresponding increase for commercially insured patients, but more than the difference observed for Medicaid and uninsured patients (compared with commercially-insured patients) in hospitals governed by the CMS regulations. In other words, the DDD is positive for two of the measures and negative for the third. The percent difference varies substantially for the measures, from a decrease in policy effect (the DDD / baseline rate of Medicaid/uninsured patients in the Sixth Circuit) of 0.65% to an increase in policy effect of 9.75%.

In hospitals outside the Sixth Circuit, readmissions for all conditions except cardiorespiratory declines in the post period for Medicaid and uninsured patients admitted from the ED. (Table 5b) In contrast, readmissions increases for all conditions except cardiovascular in the post period for commercially-insured patients in intervention hospitals. In control hospitals, readmissions increases for both unprofitable and commercially-insured patients during the post period, except for commercially-insured general medicine patients. After accounting for trends in commercially-insured patients, readmissions for patients in hospitals under the Sixth Circuit rule compared to the CMS regulations declines from 0.27% to 2.4%, resulting in a policy effect that ranged from -1.82% to -22.64%.

Hospitals transferred fewer inpatients, regardless of insurance, during the post period in hospitals in both intervention and control states. However, the decrease in inpatient transfers for Medicaid and uninsured patients is less than the decrease in inpatient transfers for commercially-

insured patients in the Sixth Circuit, the opposite of what happened in patients outside of the Sixth Circuit. Thus, the overall DDD is positive, indicating that after accounting for trends in commercially-insured patients, hospitals under the Sixth Circuit rule transfers 0.67% more Medicaid and uninsured inpatients, a policy difference of 13.65%.

Hospitals are less likely to admit Medicaid and uninsured patients but less likely to transfer them from the ED under the Sixth Circuit rule. (Table 5c) However, after accounting for differences in trends for commercially-insured patients, and the differences between the same groups that visited hospitals under the CMS regulations, Medicaid and uninsured patients under the Sixth Circuit rule compared to the CMS regulations re 0.38% less likely to be admitted (a policy difference of -5.94%) and 0.06% more likely to be transferred from the ED (a policy difference of 2.32%).

Hospitals in the Sixth Circuit without specialized capabilities that are located in markets where transfers are relatively difficult (i.e. high occupancy markets) are also less likely to admit Medicaid and uninsured patients in the post period. (Table 5c) However, this difference is less than the difference for these same types of hospitals outside of the Sixth Circuit. After accounting for these differences, and differences in trends for commercially-insured patients under both rules, Medicaid and uninsured patients under the Sixth Circuit rule compared to the CMS regulations are 0.15% more likely to be admitted, a policy difference of 3.74%.

Appendix 4-A. Additional Analyses

Appendix Table 4-1. Additional analyses.

a) H1: After a diversion at a nearby safety net hospital, compared to a non-safety net hospital, hospitals are more likely to declare a diversion. The outcome variable is whether the hospital of interest diverts while the nearby hospital is on diversion, and the main predictor variable is whether the nearby diverting hospital is a safety net hospital.

	Any SN Definition		Public		Mean + SD		Essential Hospital		All SN Definitions	
	b	SE	B	SE	b	SE	b	SE	b	SE
Alternative definitions of safety net	0.201	(0.137)	N/A – main analysis		0.444	(1.33)	1.20***	(0.100)	0.719***	(0.159)
Robust clustered SEs instead of hospital random effects	0.625***	(0.15)	1.269***	(0.338)	0.551*	(0.287)	1.204**	(0.599)	0.719	(0.473)
LEMSA fixed effects	0.207	(0.159)	1.326***	(0.084)	0.677***	(0.084)	1.350***	(0.106)	0.452**	(0.177)

b) H2: After a diversion at a nearby safety net hospital, compared to a non-safety net hospital, hospitals are more likely to declare a diversion even with a lower ED occupancy. The outcome variable is whether the hospital of interest diverts while the nearby hospital is on diversion, and the main predictor variable is the interaction between whether the nearby diverting hospital is a safety net hospital and ED occupancy (log).

	Any SN Definition		Public		Mean + SD		Essential Hospital		All SN Definitions	
	B	SE	B	SE	b	SE	b	SE	b	SE
Alternative definition of safety net	-0.034	(0.028)	N/A – main analysis		0.022	(0.803)	-0.252***	(0.02)	-0.144***	(0.033)
Robust clustered SEs instead of hospital random effects	-0.126***	(0.028)	-0.255***	(0.064)	-0.115**	(0.056)	-0.252**	(0.117)	-0.144	(0.091)
LEMSA fixed effects	-0.035	(0.032)	-0.264***	(0.017)	-0.143***	(0.017)	-0.278***	(0.021)	-0.086**	(0.037)

c) H3: When a safety net hospital declares a diversion, other hospitals in the market are more likely to not want to be the last hospital with an open ED than when a non-safety net hospital declares a diversion. The outcome variable is the amount of time that elapses between when the second and third hospital in a market declare a diversion, and the main predictor variable is whether the first hospital to divert is a safety net hospital.

	Any SN Definition		Public		Mean + SD		Essential Hospital		All SN Definitions	
	b	SE	b	SE	b	SE	b	SE	b	SE
Alternate definition of safety net	4.34	(31.2)	N/A – main analysis		7.31	(35.2)	-74.6*	(35.6)	-76.2*	(37.9)
Market defined as within 12 miles	4.714	(10.638)	14.658	(19.431)	8.168	(12.266)	5.873	(12.761)	3.974	(14.523)
Market defined as 30-minute drive	-8.288	(6.345)	-9.539	(7.312)	1.833	(8.268)	-8.334	(6.758)	-0.488	(7.253)
Hospital of interest can be safety net	-17.146	(15.314)	-30.466	(20.138)	-0.426	(21.895)	-60.348	(62.467)	-40.95	(36.266)
Robust SEs instead of random effects	-1.865	(34.691)	-92.080***	(24.72)	-1.095	(37.366)	-74.564**	(26.414)	-76.203**	(24.41)
LEMSA fixed effects	7.212	(27.243)	-72.326*	(36.274)	9.817	(27.831)	-63.231	(34.067)	-63.223	(36.534)

d) H4: When a hospital and a nearby hospital are both on diversion, the hospital will go off diversion sooner if the nearby hospital is a safety net rather than a non-safety net hospital. The main predictor varaible is whether the nearby diverting hospital is a safety net hospital. The outcome variable is either the duration of the diversion or the amount of time that elapses between when the nearby hospital ends a diversion and when the hospital ends its own diversion, as indicated

	Any SN Definition		Public		Mean + SD		Essential Hospital		All SN Definitions	
	b	SE	b	SE	b	SE	b	SE	b	SE
Duration of diversion										
Alternate definition of safety net	-25.3	(44.7)	N/A – main analysis		38.4**	(13.4)	46.2*	(22.2)	375***	(54.2)
Robust clustered SEs instead of hospital random effects	51.2	(37.8)	84.5	(61.1)	38.4	(39.8)	46.2	(41.7)	374.571*	(174)
LEMSA fixed effects	25.8	(20.7)	-3.457	(16.4)	19.9	(11.1)	16.2	(18.5)	108.2*	(45.4)

Time that elapses between when the nearby hospital ends a diversion and when the hospital ends its own diversion										
Alternate definition of safety net	4.34	(31.2)	N/A – main analysis		7.31	(35.2)	-74.6*	(35.6)	-76.2*	(37.9)
Robust clustered SEs instead of hospital random effects	26.1	(15.9)	34.1	(18.6)	35.8*	(15.4)	12.39	(11.6)	242**	(83.0)
LEMSA fixed effects	18.5	(9.79)	17.2	(18.9)	37.8**	(12.3)	7.16	(23.6)	173**	(63.5)

e) H5: Hospitals are more likely to strategically divert if it is a for-profit hospital. The main predictor variable is whether the first diverting hospital is a safety net x whether the third diverting hospital is a for-profit hospital.

	Any SN Definition		Public		High proportion Medicaid/uninsured		Essential Hospital		All SN Definitions	
Model	b	SE	b	SE	b	SE	b	SE	b	SE
Time elapsed between when the 2nd and 3rd hospitals in a market declare a diversion										
Alternative definitions of safety net	-228	(1.09×10^3)	N/A – main analysis		-43.3	(860)	-43.1	(611)	43.3	(645)
Market defined as within 12 miles	-38.2	(107)	-34.8	(123)	-6.461	(180)	46.8	(173)	-254	(694)
Market defined as 30-minute drive	48.7	(42.6)	99.1*	(50.2)	61.755	(50.6)	107	(55.2)	117	(63.8)
Hospital of interest can be safety net	122	(107)	-610	(1.09×10^4)	1.105×10^4	(1.85×10^6)	-242	(552)	-243	(545)
Robust clustered SEs instead of random effects	-228	(190)	-256**	(95.6)	-43.325	(47.8)	-43.1	(35.3)	43.3	(52.0)
LEMSA fixed effects	-256	(1.04×10^4)	-160	(721)	-11.965	(822)	67.3	(583)	212	(621)

f) H6: Hospitals are more likely to strategically divert if it provides few relatively unprofitable services. Unless otherwise indicated, the main predictor variable is whether the nearby diverting hospital is a safety net x whether the hospital of interest offers few relatively unprofitable services.

		Any SN Definition		Public		High proportion Medicaid/uninsured		Essential Hospital		All SN Definitions	
	Model	b	SE	b	SE	b	SE	b	SE	B	SE
H6-1	Whether hospital of interest diverts										
	Alternate definition of safety net	-0.451**	(0.165)	N/A – main analysis		-0.575***	(0.138)	-0.843**	(0.259)	-2.023***	(0.324)
	Robust clustered SEs instead of random effects	-0.984***	(0.273)	-1.042*	(0.506)	-0.575*	(0.253)	-0.843	(0.592)	-2.023	(1.038)
	LEMSA fixed effects	-1.209***	(0.13)	-1.338***	(0.299)	-0.565***	(0.142)	-1.426***	(0.295)	-1.726***	(0.407)
H6-2	Whether hospital of interest diverts – outcome variable is whether nearby hospital is safety net x ED occupancy, log x whether the hospital of interest offers few relatively unprofitable services.										
	Alternate definition of safety net	0.090**	(0.034)	N/A – main analysis		0.097***	(0.029)	0.153**	(0.052)	0.393***	(0.065)
	Robust clustered SEs instead of random effects	0.216***	(0.059)	0.221*	(0.104)	0.097	(0.05)	0.153	(0.121)	0.393	(0.206)
	LEMSA fixed effects	0.263***	(0.027)	0.288***	(0.06)	0.098***	(0.029)	0.287***	(0.06)	0.367***	(0.079)
H6-3	Time elapsed between when the 2nd and 3rd hospitals in a market declare a diversion										
	Alternate definition of safety net	-42.6	(75.7)	N/A – main analysis		-20.6	(79.9)	39.6	(90.6)	22.5	(94.0)
	Market defined as within 12 miles	1.22	(18.1)	10.5	(20.9)	-17.8	(27.0)	3.09	(24.4)	44.5	(54.3)

	Market defined as 30-minute drive	15.6	(10.7)	23.7	(12.3)	12.5	(12.6)	15.5	(13.1)	17.4	(14.7)
	Hospital of interest can be safety net	-60.6	(42.2)	-139*	(65.5)	-53.2	(52.9)	-441	(298)	-350***	(61.0)
	Robust clustered SEs instead of random effects	-42.6	(92.4)	-38.4	(125)	-20.6	(71.0)	39.6	(174)	22.5	(144)
	LEMSA fixed effects	-52.7	(73.8)	-70.5	(76.6)	-53.9	(77.5)	-42.6	(89.2)	-83.9	(92.9)
H6-4	Duration of diversion by hospital of interest										
	Alternate definition of safety net	69.2	(101)	N/A – main analysis		-10.8	(25.9)	-277***	(75.9)	-681***	(105)
	Robust clustered SEs instead of random effects	-94.3	(68.7)	-253	(174)	-10.8	(48.4)	-277**	(87.7)	-681***	(191)
	LEMSA fixed effects	-5.82	(16.7)	-16.3	(46.3)	19.4	(17.2)	-63.2	(53.7)	-84.3	(69.5)
H6-4	Time elapsed between when nearby hospital ends its diversion and hospital of interest ends its diversion										
	Alternate definition of safety net	-69.7***	(21.1)	N/A – main analysis		-87.0***	(24.0)	-128	(70.2)	-399***	(114)
	Robust clustered SEs instead of random effects	-69.7*	(29.5)	-33.7	(66.9)	-87.0***	(21.9)	-128*	(57.5)	-399*	(160)
	LEMSA fixed effects	-61.0**	(20.7)	-0.551	(80.2)	-90.2***	(23.5)	-70.6	(69.7)	-306**	(115)

Notes. Safety net is defined as: any of the safety net definitions; a public hospital; a hospital serving a high proportion of Medicaid or uninsured patients (1 standard deviation above the mean in the LEMSA); a member of America's Essential Hospitals; or a hospital that meets all of the safety net definitions. All regressions except for the one labeled "robust SEs instead of random effects" are linear regression with hospital random effects, controlling for ED staffing (the approximate number of physicians on shift, whether the diversion was on a weekend, and staffing ratio), safety net of nearby hospital x ED staffing, external events that may increase demand (season, whether ED occupancy for LEMSA is abnormally high), the influence of the nearby hospital's diversion on the hospital (the ratio of the distance between the hospitals to the distance of the closest 5 hospitals, the duration of the nearby hospital's diversion, the overlap in patient zip codes), and hospital size. In addition, the regression labeled "LEMSA fixed effects" include fixed effects for the LEMSA. ED occupancy and safety net status of nearby hospital x ED occupancy are predicted using instrumental variables, where the instrument is number of inpatient discharges for that day and safety net status of nearby hospital x inpatient discharges. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Appendix 4-B. For-Profit and Hospitals Offering Few Relatively Unprofitable Services

Appendix Table 4-2. Number of for-profit hospitals by dataset

a) For Dataset A

Definition of Safety Net	Number (%) of Matched Non-Safety Net Hospitals that are For-Profit
Any	5 (11.1%)
Public	2 (7.69%)
High proportion Medicaid/uninsured	4 (11.1%)
America's Essential Hospitals	0
All 3 definitions	0

b) For Dataset B

Definition of Safety Net	Number (%) of Non-Safety Net Hospitals that are in the Closest 5 Hospitals that are For-Profit
Any	51 (13.8%)
Public	31 (13.7%)
High proportion Medicaid/uninsured	47 (15.11%)
America's Essential Hospitals	26 (13.3%)
All 3 definitions	24 (15.3%)

Appendix Table 4-3. Number of hospitals offering few relatively unprofitable services, by dataset

c) For Dataset A

Definition of Safety Net	Number (%) of Matched Non-Safety Net Hospitals that offer few relatively unprofitable services
Any	18 (39.1%)
Public	11 (42.3%)
High proportion Medicaid/uninsured	12 (32.4%)
America's Essential Hospitals	9 (37.5%)
All 3 definitions	6 (31.6%)

d) For Dataset B

Definition of Safety Net	Number (%) of Non-Safety Net Hospitals that are in the Closest 5 Hospitals that offer few relatively unprofitable services
Any	98 (26.8%)
Public	61 (27.2%)
High proportion Medicaid/uninsured	81 (26.4%)
America's Essential Hospitals	60 (30.9%)
All 3 definitions	46 (30.0%)

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