

## Effect of Regulatory Readmission Penalties on Transitional Care

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### ABSTRACT

The Affordable Care Act (ACA) announced in 2010 introduced the Hospital Readmissions Reduction Program (HRRP) which penalizes hospitals if their 30-day readmission rates for Acute Myocardial Infarction (AMI), Heart Failure (HF), or Pneumonia (PN) are higher than expected, relative to a comparable hospital. This study is an extension of a recent study, which examines positive intra-ailment and spillover effects of the ACA regulation on transitional care, a particular type of continuity of care which refers to the discharge of a patient from intensive hospital-based care to another type of recovery facility. Transitional continuity of care is a critical part of the healthcare delivery process. Using econometric methods and patient-level data for 2004-2014 from the state of California we extend the study and find that transitional continuity of care improved for each of the three targeted ailments as well as for their clinical verticals.

**Keywords:** Quality regulation; Affordable care act; Hospital readmissions reduction program; Transitional care; Spillovers

## INTRODUCTION

### Transitional continuity of care

Care coordination in the fragmented landscape of the American health care system is an arduous task for patients discharged from Intensive Care Units (ICU) and Critical Care Units (CCU). It requires transitional care in the form of post-intensive care in hospital-based step-down or recovery units, or in other facilities such as Skilled Nursing Facilities (SNFs), Inpatient Rehabilitation Facilities (IRFs), Long-Term Care Hospitals (LTCHs), and Home Health Agencies (HHAs). Transitional continuity of care is defined as “a broad range of time-limited services designed to ensure health care continuity, avoid preventable poor outcomes among at-risk populations, and promote the safe and timely transfer of patients from one level of care to another or from one type of setting to another” [1]. Higher levels of transitional care can prevent future adverse outcomes, and assuage demands on hospital capacity [1,2]. Smooth discharge to transitional care facilities can improve overall patient wellbeing as well as health care value in terms of patient health outcomes achieved per dollar spent [3,4].

### Healthcare regulation as a determinant of care outcomes

Although transitional care is a valuable element in maintaining continuity of care in the health care delivery process, research examining the antecedents of transitional care is limited. Regulations such as the Hospital Readmissions Reduction Program (HRRP), which was introduced in 2010 under the Affordable Care Act (ACA), can be an important determinant of continuity of care outcomes [5,6]. By reducing reimbursement rates by up to 3%, the HRRP imposed a penalty on hospitals whose risk-adjusted readmissions for three targeted ailments—Acute Myocardial Infarction (AMI), Heart Failure (HF), or Pneumonia (PN) were greater than an expected level. The hospital level measure of excess 30 day readmission rates for the targeted ailments was constructed by the Centers for Medicare and Medicaid Services (CMS) using a predictive regression model that used patient demographics, hospital size, location, and other factors. Robust evidence indicates that the HRRP reduced readmissions, but nascent research examines the system-wide effects of programs such as the HRRP [7-9]. A recent study provides evidence that the ACA regulation had positive effects on

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transitional care of ailments targeted by regulation as well as non-targeted but related ailments in the same clinical vertical as the targeted ailment [10]. Labeled as intra-ailment and spillover effects, respectively, the authors of this study also examine the mechanisms that drive such improvements. This commentary reviews and extends this recent study by looking at the intra-ailment and spillover effects for each individual ailment and its clinical vertical.

## LITERATURE REVIEW

### Intra-ailment effects

While the HRRP penalties under the ACA focused only on readmissions of three ailments, it could influence other health care outcomes of the targeted ailments which were not the focus of the regulation. Such intra-ailment effects arise from sharing of knowledge and resources; investments to improve the targeted outcome of an ailment (readmissions) with an intention to avoid penalties permeates through the system and positively affects another outcome (transitional continuity of care) of the same ailment. Using a cohort of unrelated ailments which were not the target of regulation from within the same clinical vertical as the targeted ailment, and a difference-in-difference specification, findings indicate positive intra-ailment effects of the ACA regulation [10]. The magnitude of this effect is estimated at 4.6%. Although the ACA regulation targeted only Medicare patients, intra-ailments effects are also significant in a subsample of non-Medicare patients [10].

### Drivers of intra-ailment effects

Organizational processual and structural characteristics moderate the observed positive intra-ailment effects. Emergency departments in hospitals have highly specialized routines and are known to plan for transitional care [11,12]. Accordingly, hospitals that have a relatively high proportion of emergency department admits in the targeted ailments (and are hence likely to have better routines) have higher intra-ailment effects following the ACA regulation [10]. Discharging patients to continuity of care facilities benefits readmissions as well as capacity management by freeing up beds in ICUs [13]. However, to reduce the risk of readmissions, hospitals may choose to have targeted patients stay longer in hospital beds. Length of stay is therefore a conscious decision made by health care providers which can be used to lower readmissions and acts as a substitute to improving transitional continuity of care. Hospitals which chose to have patients with targeted ailments stay longer in their beds have lower intra-ailment effects following the ACA regulation [10]. Hospitals can often belong to a system which, while providing reputational and resource sharing benefits, are also susceptible to entrenched routines, resistance to change, and longer lead times to implement process improvements [14,15]. Such large system hospitals have lower intra-ailment effects following the ACA regulation [10]. However, intra-ailment effects are enhanced in large system hospitals that had invested in continuity of care facilities in the pre-ACA era relative to large system hospitals that had no such investments [10].

### Spillover effects

Spillover effects refer to the impact of the HRRP penalties introduced under the ACA regulation on non-targeted outcomes (transitional continuity of care) of non-targeted ailments which share complementarities with the targeted ailments. Complementarity theory suggests that inputs to improve an outcome of one ailment increases the marginal productivity of inputs to improve outcomes of non-targeted, given that the ailments are complementary [16]. The organization of ailments into clinical verticals (e.g., cardiovascular diseases, respiratory diseases, digestive diseases, etc.) allows health care researchers to parse out such complementarities. Using such verticals and a difference-in-difference specification, findings indicate improvements in transitional continuity of care in a cohort of non-targeted but related ailments that share complementarities with the targeted ailments relative to a cohort of unrelated ailments (also within the same vertical) which were not the target of regulation and share little to no complementarities with the targeted ailments [10]. The magnitude of such positive spillover effects is estimated to be 4.4%.

### Drivers of spillover effects

Spillover effects are second order effects and exist in the presence of complementarities between non-targeted but related ailments and targeted ailments. Accordingly, verticals with a relatively higher magnitude of intra-ailment effects following the ACA regulation are seen to have a significantly higher magnitude of spillover effects [10]. This underscores complementarities across ailments as a driver of spillover effects.

## EXTENSIONS

In this study we extend the recent study by looking at intra-ailment and spillover effects of the ACA regulation on each of the three targeted ailments (i.e., AMI, HF, and PN) and their respective clinical verticals (i.e., cardiovascular and respiratory) separately. Construction of variables, treatment and control cohorts, econometric design and specifications, and data used follow the published study [10]. Table 1 provides pre- and post-ACA means for transitional continuity of care for each of the three Targeted Ailments (TS), Non-Targeted but Related Ailments (NTRS), and Unrelated Ailments (URS) in the respective clinical verticals (Table 1).

Acute Myocardial Infraction (AMI)	Pre-ACA	Post-ACA
TS	0.4723 (0.2331)	0.4784 (0.2428)
NTRS	0.2922 (0.1773)	0.3041 (0.1772)
URS	0.1968 (0.1707)	0.1887 (0.1662)
Heart Failure (HF)	Pre-ACA	Post-ACA
TS	0.3514 (0.1698)	0.3956 (0.1783)

NTRS	0.2922 (0.1773)	0.3041 (0.1772)
URS	0.1968 (0.1707)	0.1887 (0.1662)
<b>Pneumonia (PN)</b>	<b>Pre-ACA</b>	<b>Post-ACA</b>
TS	0.3487 (0.1764)	0.3641 (0.1833)
NTRS	0.3389 (0.1822)	0.3764 (0.1911)
URS	0.2895 (0.1810)	0.3004 (0.1917)

**Table 1:** Means (Standard Deviations) of Transitional Care in Patient Cohorts for Different Targeted Ailments and their Clinical Verticals in Pre- and Post-ACA Periods.

To examine intra-ailment effects, we estimate equation 6 as in the published study using the TS cohort as the treatment group and the URS cohort as the control group. The coefficient of Treatment X PostACA captures the intra-ailment effects of the ACA regulation on TS relative to URS for each of the three targeted ailments and their respective control cohorts. Results in Columns 1,2 and 3 of Table 2 indicate positive and significant intra-ailment effects for all three ailments-AMI, HF, and PN. The magnitude of this effect for AMI is 0.0271 percentage points which translates to a 5.7% (0.0271/0.4723) improvement in the post-ACA period. For HF the effect is 0.0214 percentage points which translates to a 6.1% (0.0214/0.3514) improvement in the post-ACA period (Table 2).

Treatment Control	Targeted ailments (TS), Unrelated Ailments (URS)		
	Acute myocardial infarction	Heart Failure (HF)	Pneumonia (PN)
Treatment X PostACA	0.0271*** (0.0077)	0.0214*** (0.0072)	0.0087** (0.0038)
Observations	7,473	7,790	8,012
R-squared	0.6937	0.6562	0.7848
Sample Period	2004-2014	2004-2014	2004-2014
Hospital, Ailment, Year FE	Yes	Yes	Yes
Clustered	Yes	Yes	Yes

**Note:** Robust standard errors in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

**Table 2:** Intra-Ailment Effects of HRRP Penalties Under the ACA Regulation by Ailment.

For PN the effect is 0.0087 percentage points which translates to a 2.5% (0.0087/0.3487) improvement in the post-ACA period. Intra-ailment effects of readmission penalties under the ACA

regulation were higher in AMI and HF relative to PN (p-value of difference <0.10) [17]. To examine spillover effects, we estimate equation 6 as in the published study using the NTRS cohort as the treatment group and the URS cohort as the control group. The coefficient on Treatment X PostACA captures the spillover effects of the ACA regulation on NTRS relative to URS in each of the clinical verticals which housed the targeted ailments (Table 3).

Treatment Control	Non-targeted but related ailments (NTRS), Unrelated ailments (URS)	
	Cardiovascular	Respiratory
Treatment X PostACA	0.0176*** (0.0051)	0.0170*** (0.0044)
Observations	7,832	8,016
R-squared	0.6612	0.7594
Sample Period	2004-2014	2004-2014
Hospital, Ailment, Year FE	Yes	Yes
Clustered	Yes	Yes

**Note:** Robust standard errors in parentheses. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

**Table 3:** Spillover Effects of HRRP Penalties Under the ACA Regulation by Clinical Verticals.

Results in Columns 1 and 2 of Table 3 indicate positive and significant spillover effects for both cardiovascular and respiratory verticals. The magnitude of this effect in the cardiovascular vertical is 0.0176 percentage points which translates to a 6.0% (0.0176/0.2922) improvement in the post-ACA period. For the respiratory vertical, the magnitude of this effect is 0.0170 percentage points which translates to a 5.0% (0.0170/0.389) improvement in the post-ACA period. Spillovers effects of readmission penalties under the ACA were of similar magnitude in cardiovascular and respiratory verticals (p-value of difference >0.10) [18,19].

## CONCLUSION

Quality regulation is prevalent in the world of health care. The ACA represents a recent regulation which has garnered the interest of health care researchers. Announced in 2010, the ACA introduced the HRRP-a program which penalized hospitals for below average readmissions performance in three targeted ailments. Studies examining the impact of the HRRP have shown it to have positive effects on readmissions of the targeted ailments. However, quality regulations such as the ACA are often designed to have impacts that go beyond the scope of the regulation. In line with this, recent studies have found regulation to have positive impacts throughout the healthcare delivery chain. Most prominently, evidence exists that the ACA regulation led to improvements in transitional continuity of care

of targeted ailments as well as non-targeted but related ailments. We extend this recent study and show how these improvements manifest in each of the three targeted ailments and their respective clinical verticals. Research has underscored the importance of transitional care in improving readmissions, patient wellbeing, and patient quality of life. Therefore, studying antecedents to transitional care is critical to understanding and improving the complicated web of health care delivery.

## DECLARATION

None

## AVAILABILITY OF DATA AND MATERIAL

The data were obtained from HCAI after signing a confidentiality disclosure form. Data are stored in university computers.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## FUNDING

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## AUTHORS' CONTRIBUTIONS

The study was jointly conceived, AD performed statistical analysis, all authors wrote the manuscript, and revised it to ensure intellectual content and exposition.

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