Racial Disparities in Hospital-Acquired Infection Rates

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Research Question

Is patient race associated with rates of hospital-acquired infection within hospitals, controlling for treatment differences and other patient traits?

What are Hospital-Acquired Infections?

These are "infections acquired during hospital care which are not present or incubating at admission," according to the World Health Organization. Some contributing factors include:

- Having an impaired immune system
- Undergoing invasive examinations and treatments
- Being treated in certain hospital environments that facilitate the transmission of microorganisms among patients

Motivation

Hospital-acquired infections (HAI) are a preventable threat to patient safety. They increase lengths of stay, complication rates, and overall morbidity and mortality. In addition, estimates suggest that $9.8 billion is spent each year treating HAIs. Because disparities exist in healthcare quality and health status among racial and ethnic minority groups, it is important to study differences in HAI by race.

Specific Types of HAI

This study looked at specific conditions that CMS penalizes hospitals for under the Hospital Acquired Condition Reduction Program. This program requires the Department of Health and Human Services to adjust payments to the worst-performing hospitals in regards to these conditions. These hospitals will be subject to a 1% payment reduction in FY 2018. This study examined the following infections:

Clostridium Difficile Infection (CDI): CDI accounts for 12.1% of HAIs, and caused a half million infections in the US in 2011. 29,000 patients died within 30 days of initial diagnosis.

Catheter Associated Urinary Tract Infections (CAUTI): CMS considers this a "never event," which is an error in medical care that is clearly identifiable and preventable.

Central Line Associated Bloodstream Infections (CLABSI), which are infections due to use of a device.

Data and Methods

This study used Virginia Health Information (VHI) patient level data from 2012 through 2015. Hospital-acquired infections (HAIs) were identified by ICD-9-CM diagnosis codes for specific infections, plus information that the diagnosis was not "present on admission."

Five samples were used, each based on acute care hospital stays for patients aged 65+ who were treated for 1) AMI, 2) Heart Failure, 3) Pneumonia, 4) Major Surgeries, 5) Cancer-related Major Surgeries. This allowed for comparison of infection rates between white and black patients treated for the same condition.

Patient race was indicated on the discharge record. To proxy for patient socioeconomic status (SES), county-level American Community Survey data were used to measure the share of households in poverty, median household income, the share receiving food stamps, the labor force participation rate, and the unemployment rate.

Weighted least squares regression models were used to estimate the association between the share of patients with an HAI at a given hospital (h) and in a given race group (g), in a given year (t), and a dummy variable for African American race of the group.

$$RateHAI_{hgt} = \alpha_0 + \beta_1 AA\ Race_{hgt} + \beta_2 X_{hgt} + \beta_3 charl_{hgt} + \beta_4 treat_{hgt} + \gamma_h + \lambda_t + \varepsilon_{hgt}$$

AA Race: Indicator variable for African-American race
X: Patient group means for age, sex, payer, hospital traits, and SES proxies
charl: The Charlson Index, a measure of comorbid conditions
treat: Anesthesiology charges, operating room charges, length of stay, special care
γ_h: Hospital fixed effects
λ_t: Year indicators

Percent of HAIs Among Each Condition

	Clostridium Difficile Infection	Catheter Associated Urinary Tract Infections	Central Line Associated Bloodstream Infections
AMI/Heart Failure	2.1%	0.7%	0.2%
Pneumonia	2.5%	0.7%	0.3%
Major Surgery (not cancer)	1.4%	0.5%	0.2%
Major Surgery (cancer)	1.5%	0.5%	0.2%

Association between AA Race and HAI rates

	Clostridium Difficile Infection	Catheter Associated Urinary Tract Infections	Central Line Associated Bloodstream Infections
AMI/Heart Failure	0.22219 (1.24)	-0.03717 (3.28)**	0.00950 (0.91)
AMI	-0.18237 (1.29)	-0.04299 (1.36)	0.08606 (1.28)
Heart Failure	0.23004 (1.23)	-0.04405 (3.41**)	-0.00014 (0.02)
Pneumonia	-0.31104 (1.60)	-0.02257 (2.15)*	0.02987 (0.80)
Surgery-not cancer	0.78230 (1.37)	-0.03026 (2.12)*	-0.02791 (1.73)
Surgery-cancer	0.81232 (1.36)	-0.02909 (2.07)*	-0.01808 (0.99)

Association between LOS and HAI rates

	CDI	CAUTI	CLABSI
AMI/Heart Failure	0.00157 (8.76)**	0.00024 (3.65)**	0.00025 (4.40)**
Pneumonia	0.00161 (5.96)**	.000011 (2.26)*	0.00027 (4.26)**
Surgery-not cancer	0.00173 (8.68)**	0.00012 (2.79)**	0.00020 (1.74)
Surgery-cancer	0.00178 (9.32)**	0.00013 (2.85)**	0.00023 (2.04)*

Summary

1. CDI, CAUTI, and CLABSI are rare occurrences in Virginia acute care hospitals.
2. Among AMI, heart failure, pneumonia, major surgery, and cancer related surgery patients age 65+, African American patients had significantly lower rates of CAUTI than white patients treated at the same hospital for the same conditions.
3. Among AMI/HF and non-cancer surgery groups, patients in for-profit hospitals were significantly less likely to acquire CDI.

Conclusions

Various U.S. studies show that racial minorities often receive lower quality healthcare compared to whites. However, the findings of this study suggest that African American patients are less likely to develop a catheter associated urinary tract infection than white patients treated at the same hospital. Thus, policymakers should focus on efforts outside of HAIs to decrease the unequal treatment of healthcare delivery. Results from this study indicate that CDI, CAUTI, and CLABSI are rare occurrences in Virginia acute care hospitals; however, Virginia still has room to diminish HAIs. Although there does not seem to be a harmful racial disparity in the occurrence of HAIs within Virginia acute care hospitals, HAIs remain an important topic because they are can result in extended lengths of stay, permanent harm, and even death.