Vulnerable Hospitals and Cancer Surgery Readmissions: Insights Into the Unintended Consequences of the Affordable Care Act

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Affordable Care Act and Readmissions

- Reducing readmissions is a clinical and policy priority.
- Affordable Care Act 2010
  - Hospital Readmission Reduction Program (HRRP) will penalize hospitals by withholding up to 3% of Medicare payments.
- Expansion of financial penalties to orthopedic procedures and potentially other surgical procedures.

Fontanarosa PB. JAMA. 2013

Weber SM. Surgery. 2014

Vulnerable Hospitals and Readmissions

- Under-resourced, highly utilized hospitals that serve minorities, multi-morbid, Medicaid beneficiaries, and the uninsured.
- Operate on very narrow financial margins and depend on diminishing federal funding.
- To date, little is known about readmission patterns in vulnerable hospitals after major cancer surgery.

Hawn, M.T. Ann Surg 2015
Gilman, M. Health Aff 2014

Hypothesis and Objectives

- Hypothesis
  - Vulnerable hospitals are associated with higher 30-day, 90-day, and repeated readmissions compared to the non-vulnerable hospitals after major cancer surgery.

- Primary Aim
  - Quantify the impact of vulnerable hospital status on readmissions after major cancer surgery

- Secondary Aim
  - Identify sources of variation in readmission rates among vulnerable vs. non-vulnerable hospitals

Data Source and Cohort

- Use of 2 complimentary Data sources:
  - 2004 – 2011 State Inpatient Database of California:
    - Large and racially diverse population

    Linked to

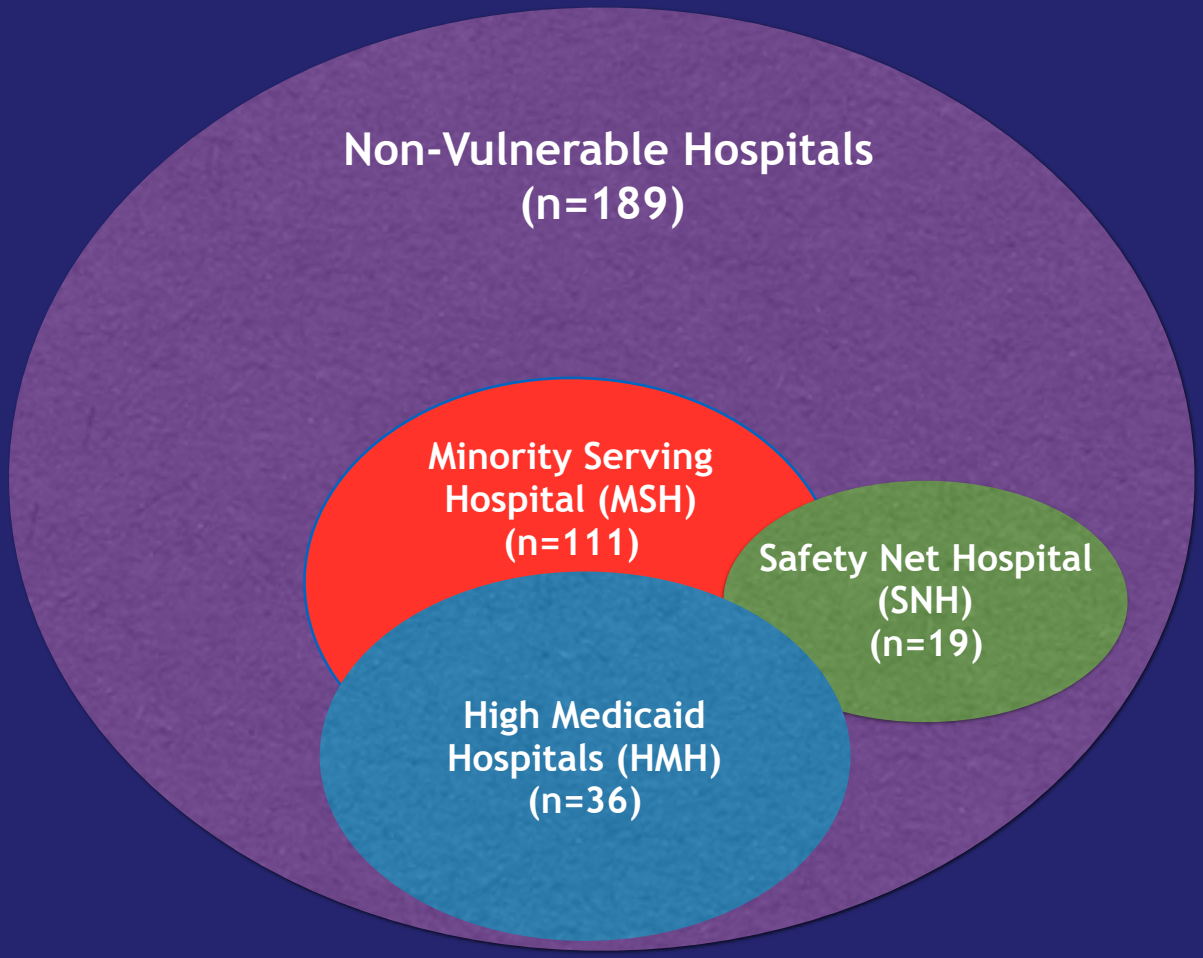
  - Annual Survey Database of American Hospital Association:
    - Rich in hospital factors
- Patient selection:
  - 110,857 patients in 491 hospitals in California
- Operative procedures:
  - Resections of lung, esophageal, gastric, pancreatic, hepatobiliary, rectal, and kidney cancers.

Hospital Vulnerability Definitions

- High Medicaid Hospitals (HMH)
  - Top decile in proportion of Medicaid patients served

- Safety Net Hospitals (SNH)
  - Members of the California Association of Public Hospitals and Health Systems

Vulnerable Hospitals in California Performing Major Cancer Surgery (n=355)



Minority Serving Hospital (Top 25%)

High Medicaid Hospital (Top 10%)

Safety Net Hospital (California Association of Public Hospital and Health System)

Statistical Methods

- Covariates:
  - HRRP variables
    - Age, Sex, Comorbidity Index (Charlson Index)
  - Patient Factors:
    - Race/Ethnicity, ZIP-level median income, Emergency admission
  - Hospital Factors:
    - Bed Size, Commission on Cancer (CoC) designation, Annual Case Volume, teaching status

Statistical Methods

- Outcome (Dependent) Variables
  - 30-day readmissions (Affordable Care Act priority)
  - 90-day and repeated readmissions (clinical relevance)
- Multivariable Analyses:
  - HMH/SNH and readmission patterns (Multivariable Hierarchical Logistic Regression Model with adjustment for case mix)
  - Stepwise logistic model, measured % change in OR from the HRRP model after adding patient or hospital factors
  - Repeated sensitivity analyses using different HMH proportions (top quartile or decile)

Results

Vulnerable Hospitals performed higher case mix procedures…

Cancer Surgery Type	Non-Vulnerable (N=99,963) H=189	Safety Net Hospital (N=8,267) H=19	High Medicaid Hospital (N=2106) H=36	P-value
Esophageal	2.1	2.9	0.1	<0.001
Gastric	10.3	9.2	25.6	
Liver	2.1	2.6	1.0	
Pancreatic	8.0	13.9	3.9	
Rectal	19.4	12.0	21.3	
Lung	23.1	16.4	13.8	
Kidney	35.0	43.0	34.3	

Vulnerable Hospitals Patients are Younger and Multi-morbid..

	Non-Vulnerable (N=99,963) H=189	Safety Net Hospital (N=8,267) H=19	High Medicaid Hospital (N=2106) H=36	P-value
Age Group (yrs)				
18-49	17.5	28.6	19.6	<0.001
50-64	31.5	42.1	28.6	
Charlson Index				
1	26.5	23.6	29.9	<0.001
2	15.1	10.7	17.0	

Variation in Hospital Attributes

	Non-Vulnerable (N=99,963) H=189	Safety Net Hospital (N=8,267) H=19	High Medicaid Hospital (N=2106) H=36	P-value
Emergency Admission	8.5	10.8	26.3	< 0.001
400+ Beds	31.1	63.1	31.8	< 0.001
Teaching Hospital	44.2	97.9	47.1	<0.001
Designated Cancer Program	56.8	85.4	47.2	<0.001
Case Volume Low	32.4%	24.5%	80.3%	<0.001

HMH and SNH have Higher Readmissions after Major Cancer Surgery

		Model 1: HRRP OR (95% CI)
Safety Net Hospitals (SNH)	30-day	1.32 (1.18,1.47)
	90-day	1.28 (1.18,1.38)
	Repeated	1.33 (1.18,1.49)
High Medicaid Hospitals (HMH)	30-day	1.10 (0.97,1.25)
	90-day	1.28 (1.16,1.42)
	Repeated	1.24 (1.01,1.54)

Paradoxical Drivers of Readmission at SNH vs. HMH

		Model 1: HRRP	Model 2: + Patient Factors	
		OR (95% CI)	OR (95% CI)	% Change
Safety Net Hospitals (SNH)	30-day	1.32 (1.18,1.47)	1.24 (1.09,1.41)	24%
	90-day	1.28 (1.18,1.38)	1.17 (1.04,1.30)	39%
	Repeated	1.33 (1.18,1.49)	1.20 (1.01,1.42)	39%
High Medicaid Hospitals (HMH)	30-day	1.10 (0.97,1.25)	0.98 (0.86,1.13)	115%
	90-day	1.28 (1.16,1.42)	1.11 (1.00,1.24)	60%
	Repeated	1.24 (1.01,1.54)	1.04 (0.85,1.29)	82%

Paradoxical Drivers of Readmission at SNH vs. HMH

		Model 1: HRRP	Model 2: + Patient Factors		Model 3: + Hospital Factors	
		OR (95% CI)	OR (95% CI)	% Change	OR (95% CI)	% Change
Safety Net Hospitals (SNH)	30-day	1.32 (1.18,1.47)	1.24 (1.09,1.41)	24%	1.13 (0.98,1.30)	60%
	90-day	1.28 (1.18,1.38)	1.17 (1.04,1.30)	39%	1.09 (0.96,1.25)	66%
	Repeated	1.33 (1.18,1.49)	1.20 (1.01,1.42)	39%	1.02 (0.87,1.20)	93%
High Medicaid Hospitals (HMH)	30-day	1.10 (0.97,1.25)	0.98 (0.86,1.13)	115%	1.09 (0.96,1.23)	15%
	90-day	1.28 (1.16,1.42)	1.11 (1.00,1.24)	60%	1.26 (1.13,1.39)	10%
	Repeated	1.24 (1.01,1.54)	1.04 (0.85,1.29)	82%	1.22 (0.97,1.55)	9%

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Sensitivity Analysis of Alternate Pattern of Block Regression with Similar Results

Limitations and Strengths

- **Limitations**
  - Administrative data are prone to variations in coding diagnosis (ICD)
  - Lack of cancer staging/treatments
    - Advanced stage may have higher readmissions
  - Lack of clear consensus on definition of Safety Net Hospitals
    - Alternate hospital inclusion criteria
- **Strengths**
  - Large and racially diverse cohort
  - Identified paradoxical drivers of readmission for vulnerable hospitals
  - Results generalizable to other US states

Implications and Significance

- Reinforces the call to account for social determinants to the current ACA readmission penalty formulae
- Points toward potential quality improvement initiatives at Safety Net Hospitals
- MedStar Surgical Readmission Risk Score (SR2) with link to Electronic Medical Record (EMR) decision support tool.

Conclusions

- Vulnerable hospitals consistently demonstrate higher readmissions after major cancer surgery.
- Primary drivers of readmission are:
  - Patient factors at High Medicaid Hospitals
  - Hospital factors at Safety Net Hospitals
- Findings highlight the unintended consequences of the ACA readmission penalties on vulnerable hospitals
- Support amendments to HRRP penalty formulae

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Thank You!

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