



BeiGene

How the Centers for Medicare & Medicaid Services Use Real World Big Data to Do “Hospital Compare” in the U.S.

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Disclaimer

- Views expressed in this presentation are based on the author's personal views and experience, not present any organization or authority.
- All data in this slides were acquired from the published reports or papers or website <https://www.medicare.gov/>, <https://www.qualitynet.org/>.

Rationale & Agenda of this talk

- A concrete example of how real world big data are being used in the U.S.
 - National wide claims data, registry data, electronic health records, etc.
 - In the scope of healthcare policy and clinical decision making
- The first-hand observation and understanding of:
 - the status of application of healthcare big data in the U.S.
 - the opportunities of data scientists with statistics background in the U.S.

Introduction

CMS: Centers for Medicare & Medicaid Services

Hospital Compare: has information about the quality of care at over 4,000 Medicare-certified hospitals. People can use Hospital Compare to find hospitals and compare the quality of their care.

The screenshot shows the Medicare.gov Hospital Compare website. At the top, there are links for 'Español', 'A A A', 'Print', 'About Us', 'Glossary', 'CMS.gov', 'Medicare.gov', and 'MyMedicare.gov Log'. Below this is the 'Medicare.gov | Hospital Compare' header, with the tagline 'The Official U.S. Government Site for Medicare'. A navigation bar contains five buttons: 'Hospital Compare Home', 'About Hospital Compare', 'About the data', 'Resources', and 'Help'. Below the navigation bar is a search bar with the text 'Home' and a 'Shar' button. A yellow banner below the search bar states: 'You can now view Department of Defense hospital performance data using our [interactive datasets](#) and [downloadable databases](#).' Below the banner is a section titled 'Find a hospital'. This section contains a form with the following fields: 'Location' (with a note 'A field with an asterisk (*) is required.' and an example '45802 or Lima, OH or Ohio'), 'ZIP code or City, State or State', 'Hospital name (optional)', and 'Full or Partial Hospital Name'. To the right of the form is a photograph of a healthcare professional in green scrubs talking to an elderly patient in a hospital bed.

Hospital Compare

- **Hospital Compare overall rating:** Summarizes up to 57 quality measures shown on Hospital Compare into a single star rating, making it easier to compare hospitals side by side.
- **General information:** Name, address, telephone number, type of hospital, and other general information about the hospital.
- **Survey of patients' experiences:** How patients recently discharged from the hospital responded to a survey about their hospital experience. The survey asked questions such as how well a hospital's doctors and nurses communicated with the patient.
- **Timely & effective care:** How often a hospital gives recommended treatments for certain conditions, such as heart attack, influenza, cancer, and blood clots; how quickly recommended treatments are administered; and how often a hospital follows best practices to prevent surgical complications.
- **Complications & deaths:** How likely it is that patients will have complications while in the hospital or after certain inpatient surgical procedures, and how often patients died within 30 days of being in the hospital for a specific condition.
- **Unplanned hospital visits:** Whether patients return to a hospital after an initial hospital stay or outpatient procedure, and how much time they spend back in the hospital.
- **Use of medical imaging:** How a hospital uses outpatient medical imaging tests (like CT scans and MRIs).
- **Payment & value of care:** How payments made for patients treated at a particular hospital compare to all hospitals nationally, and the value of care provided by individual hospitals.

VALUE-BASED PROGRAMS

	2008	2010	2012	2014	2015	2018	2019
LEGISLATION PASSED	MIPPA	ACA		PAMA	MACRA		
PROGRAM IMPLEMENTED			ESRD-QIP HVBP HRRP	HAC	VM	SNF-VBP	APMs MIPS

LEGISLATION

ACA: Affordable Care Act

MACRA: the Medicare Access & CHIP Reauthorization Act of 2015

MIPPA: Medicare Improvements for Patients & Providers Act

PAMA: Protecting Access to Medicare Act

PROGRAM

APMs: Alternative Payment Models

ESRD-QIP: End-Stage Renal Disease Quality Incentive Program

HACRP: Hospital-Acquired Condition Reduction Program

HRRP: Hospital Readmissions Reduction Program

HVBP: Hospital Value-Based Purchasing Program

MIPS: Merit-Based Incentive Payment System

VM: Value Modifier or Physician Value-Based Modifier (PVBm)

SNFVBP: Skilled Nursing Facility Value-Based Purchasing Program

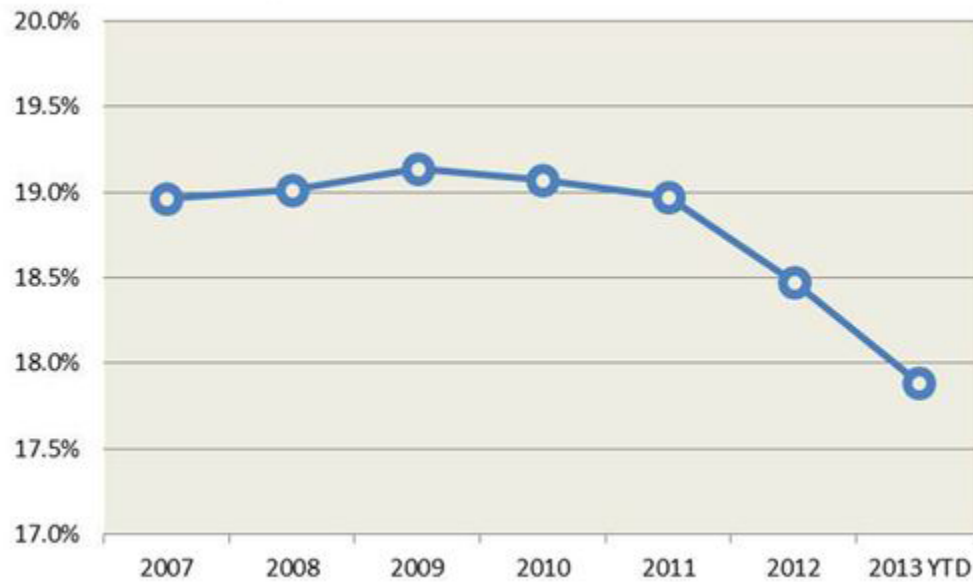
Value-based care has emerged as an alternative and potential replacement for fee-for-service reimbursement based on quality rather than quantity.



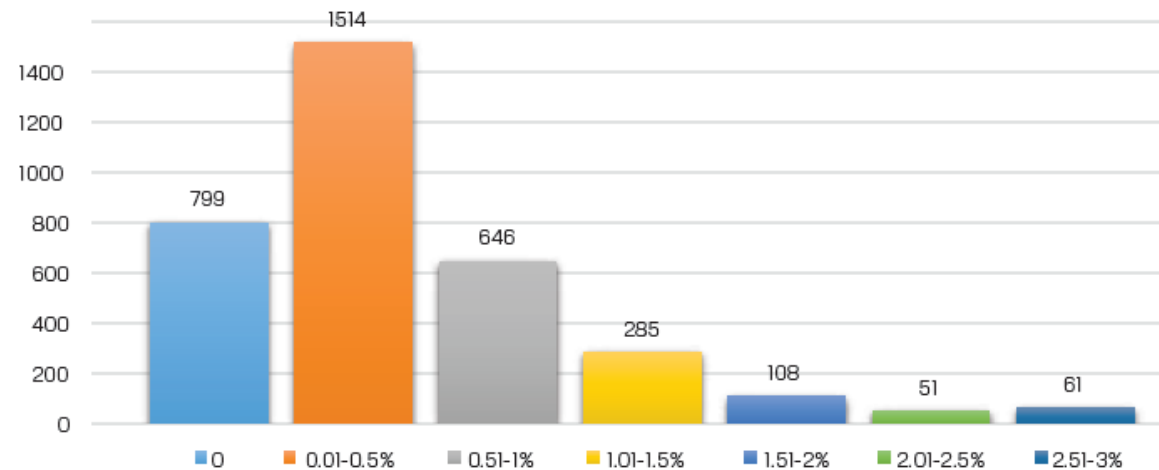
Hospital Readmissions Reduction Program



30-Day, All-Condition Medicare Readmission Rates



Distribution of Hospitals by Level of Readmissions Penalty- FY 2016



The Measures and the Data Source

		Data Collection Period	
		From	Through
Mortality (7)	Death rate for heart attack patients	7/1/2013	6/30/2016
	Death rate for coronary artery bypass graft (CABG) surgery patients	7/1/2013	6/30/2016
	Death rate for chronic obstructive pulmonary disease (COPD) patients	7/1/2013	6/30/2016
	Death rate for heart failure patients	7/1/2013	6/30/2016
	Death rate for pneumonia patients	7/1/2013	6/30/2016
	Death rate for stroke patients	7/1/2013	6/30/2016
	Deaths among patients with serious treatable complications after surgery	7/1/2014	9/30/2015
Readmission (9)	Hospital Return Days for heart attack patients	7/1/2013	6/30/2016
	Rate of unplanned readmission for coronary artery bypass graft (CABG) surgery patients	7/1/2013	6/30/2016
	Rate of unplanned readmission for chronic obstructive pulmonary disease (COPD) patients	7/1/2013	6/30/2016
	Hospital return days for heart failure patients	7/1/2013	6/30/2016
	Rate of unplanned readmission after hip/knee surgery	7/1/2013	6/30/2016
	Rate of unplanned readmission for pneumonia patients	7/1/2013	6/30/2016
	Rate of unplanned readmission for stroke patients	7/1/2013	6/30/2016
	Rate of unplanned readmission after discharge from hospital (hospital-wide)	7/1/2015	6/30/2016
	Rate of unplanned hospital visits after an outpatient colonoscopy	1/1/2016	12/31/2016

- Claim based measures:
 - National wide claims data (Preprocessed MEDPAR files)
- Hybrid measures:
 - National wide claims data
 - EHR data
- Related research:
 - National wide claims data
 - EHR data
 - American hospital association survey data
 - Denominator files
 - ...

The process of developing a measure

- ❖ Identify the cohort
 - ✓ Condition/procedure specific or hospital wide
 - ✓ Inclusion criteria/Exclusion criteria
- ❖ Fit a risk adjusted model:
 - ✓ Adjust for comorbidities, age, gender
 - ✓ Adjust for principal discharge diagnosis, etc.
- ❖ Calculate the estimate (a ratio) for hospital-specific quality-of-care signal
- ❖ Calculate the confidence interval for the ratio
- ❖ Reliability test, validity test, etc.
- ❖ Empirical focused analysis (EFA), Social economic status adjustment, etc.

The statistical methodologies and models

- ❖ Hierarchical generalized linear model (HGLM)
- ❖ Latent variable model
- ❖ Bayesian framework, MCMC
- ❖ Bootstrapping for confidence interval
- ❖ Ratios like predicted over expected, observed over expected, etc.
- ❖ Survival analysis method in research or EFA.

Every Measure involves:

- ❖ A Balance among Scientific methodology, Clinical meaningfulness, Face validity (Public acceptance), Measure implementation
- ❖ A Choice between Sensitivity and Specificity
- ❖ Collaborative work among multiple groups of people from Measure develop team, Working Group, CMS, Expert Team, will go through public comments, and endorsed by National Quality Forum (NQF)
- ❖ Aim for a fair comparison of Quality of Care among Hospitals
- ❖ Some criticism and debate going on all the time
- ❖ More challenges on the way

Some thoughts about Using Healthcare Big data

- ❖ Data accessibility
 - ✓ The people who have the data who have the power
- ❖ Data Quality
 - ✓ Volume, Velocity, Variety
- ❖ The analysis software/algorithm need to be upgraded for big volume data.
- ❖ The way of thinking & logic are important
- ❖ Understanding of the particular field of interest is crucial
- ❖ Cross-functional collaboration is necessary
- ❖ An exciting field

Another related subtopic

- ❑ The status of application of healthcare big data in the U.S.
 - Authorities
 - Small start-up companies
 - Big pharma companies

- ❑ The opportunities of data scientists with statistics background in the U.S.
 - Observations from my classmates, colleagues, friends
 - Observations from conference talks
 - Observations from Seminars

Thank you.

Any Questions?