MIDS W271
Applied Regression and Time Series Analysis

Lab 3: Analysis Proposal

What is Driving the Cost of Care? A Study of the Factors Influencing Increasing Hospital Inpatient Charges Over Time

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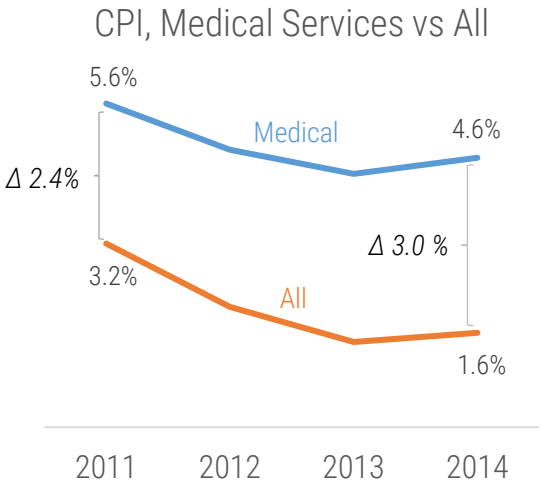
Medical costs in the United States are rising. Between 2011 and 2014, general inflation in the United States slowed from 3.2% to 1.6%, while hospital and related services slowed from 5.6% to 4.6% (U.S. Bureau of Labor Statistics, 2012, 2013, 2014). The increase in cost of medical care has long outpaced the increases in costs of all goods and services in the U.S., and at an estimated $3 trillion in national health expenditures (National Center for Health Statistics, 2016), this difference in inflation is significant. With an aging Baby Boomer population, Medicare spending has doubled as a proportion of total health care expenditure between 1970 and 2014, from 10.1% to 20.2%. In essence, medical cost inflation is higher than general inflation in a population getting increasingly older.



Hospitals seek to cover the expenses across the wide range of services they provide by adjusting what they charge for those services. They cannot charge different amounts to different people, regardless of who pays, whether the patient is covered by Medicaid, by Medicare, by a private insurer, or if the patient pays out of their own pocket. Of course, not every payor is expected to reimburse the hospital the same amount: Medicaid generally pays relatively little, while Medicare pays a bit more, and private payers generally pay even more, and all of these insurers pay less than what the hospital charges. These insurers pay according to different reimbursement methodologies, but these methodologies typically are sensitive to the charges in order to adequately cover unusually high-cost hospital stays (through "outlier" or "stoploss" payments). It could thus be advantageous to a hospital to increase charges to a level that could trigger some of these higher alternative outlier payments and increase revenue surplus. There are significant downsides to such an approach, however—those patients who must pay out-of-pocket are expected to pay the full charges, leading to a lessened quantity demanded for those services, and some insurers may similarly seek to divert patients to other nearby hospitals. All the while, a hospital's own costs change over time: local

wages and overhead costs are subject to market conditions, and new medical technologies are developed every year.

Often the drivers of these annual charge adjustments aren't clear, and recent work to improve the transparency of charge discrepancies between hospitals have muddied this issue even more (Mogul, 2013). Hospitals have complete control over what they charge, and they may react to any number of factors when evaluating what amount to charge. One hospital may drop their charge for a particular service over a period of time, while a neighboring hospital may raise theirs (see *DRG 193* table below).

DRG 193 - SIMPLE PNEUMONIA & PLEURISY
W/MAJOR COMPLICATIONS OR COMORBIDITIES

	New York Downtown Hospital		NYU Hospitals Center	
	Avg. Chg.	Discharges	Avg. Chg.	Discharges
2011	$1,452.92	17	$889.62	74
2012	$881.44	27	$1,052.46	58
2013	$729.05	28	$1,798.65	32

Source: CMS Medicare Inpatient Provider Charge Data, 2011-2013

Can we gain insight into the factors that motivate shifts in hospital charges? Do these factors move in ways that explain an overall charge increase that surpasses general cost inflation? We seek to explore this question using several publicly-available data sets that cover hospital service-level[1] charges for the entire set of hospitals in the United States for Medicare inpatient stays between 2011 and 2014. Explanatory variables are available not only from that same data set (in the form of local-market competition charges and service demand), but also from complimentary data sets that describe resource availability and utilization within those same hospitals and their surrounding areas.

[1] The level of service granularity here is the diagnosis related group (DRG). A DRG is a standard unit for inpatient payment that is designed to describe the expected resource cost of an inpatient acute-care hospital stay, given the nature of the illness of the associated patient.

Description of the data sets

Inpatient Charge Data, 2011-2014

Source: Centers for Medicare & Medicaid Services (CMS)

https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/

Stats:

- 681,215 rows
- 3,446 hospitals
- 566 services
- 27,453,280 discharges (avg. 6,863,320 per year)

Primary elements

- Hospital identifier, name
- Hospital location (address, city, state, ZIP)
- Diagnosis-Related Group
- Year (of date discharged)
- Number of inpatient discharges
- Average charge per discharge (stay)
- Average Medicare payment per discharge (stay)

Medicare Fee-for-Service Enrollment, 2011-2014

Source: Centers for Medicare & Medicaid Services (CMS)

https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/CMSProgramStatistics/2013/Enrollment.html#Total (Fee-For-Service and Managed Care) Medicare Enrollment

Stats:

- 1,224 rows

Primary elements

- State
- Hospital referral region

- Number of Medicare beneficiaries (Part A and Part B)

Provider of Services, 2010-2014

Source: Centers for Medicare & Medicaid Services (CMS)

https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Provider-of-Services/index.html

Note: including 2010 POS file to allow for leading indicators. Hospitals may be responding to market conditions in the prior year to set charges for the current year.

Stats:

- 676,131 rows (avg. 135,226 per year)

Primary elements

- Number of times this provider has undergone a change of ownership
- Facility is eligible to participate in the Medicare and/or Medicaid programs (1/0).
- Number of affiliated providers
- Indicates if the provider has any other affiliated resident program
- Number of beds in Medicare and/or Medicaid certified areas within a facility
- Total number of beds in a provider, including those in non-participating or non-licensed areas
- Number of full-time equivalent other personnel employed by a provider
- Number of full-time equivalent physicians employed by a provider
- Number of full-time equivalent licensed practical or vocational nurses employed by a provider
- Number of full-time equivalent registered nurses employed by a provider
- Hospital location (city, state, ZIP, CBSA, urban/rural indicator)
- There are over 180 hospital-level data elements in this file. We will choose a reasonable explanatory subset of these (in addition to those above) prior to analysis.

References

Mogul, F. (2013, December 12). *New York Data Show Hospital Charges All Over The Map*. Retrieved from Kaiser Health News: http://khn.org/news/ny-state-hospital-charges-vary-wildly/

National Center for Health Statistics. (2016). *Health, United States, 2015: With Special Feature on Racial and Ethnic Health Disparities.* Hyattsville, MD: National Center for Health Statistics (US).

Tompkins, C., Altman, S., & Eilat, E. (2006, January). The Precarious Pricing System For Hospital Services. *Health Affairs, 25*(1), 45-56. doi:doi: 10.1377/hlthaff.25.1.45

U.S. Bureau of Labor Statistics. (2012). *CPI Detailed Report, Data for December 2012.*

U.S. Bureau of Labor Statistics. (2013). *CPI Detailed Report, Data for December 2013.*

U.S. Bureau of Labor Statistics. (2014). *CPI Detailed Report, Data for December 2014.*