Foundations of Data Science

*3 Project Ideas*

## September 5, 2016

# #1

# Are HAIs (Healthcare- associated Infections) Rates Concentrated Geographically in The USA? Are some areas more “patient unsafe” then others?

Are patients in certain areas of the US more prone to suffer from an illness, or disease, acquired while staying in a hospital? Using data available on Data.gov, and a graphic overlay of the US, I should be able to depict a pattern. Are certain zip codes more patient unsafe (dangerous) then another? My guess is, as healthcare is practiced differently in the US, we’ll find a pattern. I believe we can depict different care patterns by combining HAI data, and other general data about the various hospitals in the USA.

Client Need: As a product leader at GEHC we used some early reporting information to help highlight hospitals that really should have one or two of our products. Had I had the foresight, I would have used data science techniques to better define market opportunities. Additionally, armed with more knowledge the opportunity to interview providers (i.e. hospitals) with HAI problems would have been extremely powerful. Why hadn’t the hospital adopted an anti-HAI system, or if they had, why wasn’t it producing the results they need to improve patient safety?

Why is this important to the hospital customer? HAIs affected more then 1.7 million patients annually in 2002, with an estimated 99,000 deaths as a result of nosocomial infections. The annual medical costs of healthcare associated infections in US hospitals for Inpatient Hospital Services are estimated to be between $28B and $45B annually.

# #2

# Is there a correlation between Medicare spending (per claim or per patient) & HAIs? Or HCAHPS (quality scores)?

Medicare spending can represent ~40% of a hospitals total revenue (national average), while covering about 31% of the US population. 54% of the US population is covered by private insurance provided either through an employer (49%) or purchased directly by an individual (5%). Called a “payer mix” we can examine sources of revenue for hospitals, further:

* Medicare 39%
* Medicaid 16%
* Private Payer 35%
* Uncompensated 6%
* Other 4%

Some hospitals will have a lower “Federal” payer mix, some higher, depending upon the demographic served. Using this demographic measure is it likely that higher Medicare payer mix results in more HAIs in the hospital?

Combining a couple data sources available on US Gov databases, and perhaps overlaying with a map of the US we can draw some conclusions and test the theory.

Client Need: As a product leader at GEHC we used some early reporting information to help highlight hospitals that really should have one or two of our products. Had I had the foresight, I would have used data science techniques to better define market opportunities. Additionally, armed with more knowledge the opportunity to interview providers (i.e. hospitals) with HAI problems would have been extremely powerful. Why hadn’t the hospital adopted an anti-HAI system, or if they had, why wasn’t it producing the results they need to improve patient safety?

Why is this important to the hospital customer? HAIs affected more than 1.7 million patients annually in 2002, with an estimated 99,000 deaths as a result of nosocomial infections. The annual medical costs of healthcare associated infections in US hospitals for Inpatient Hospital Services are estimated to be between $28B and $45B annually.

# #3

# Have hospital infection rates improved since October 1, 2008 (when CMS stipulated they’d no longer pay)?

It used to be that if a patient acquired an HAI (hospital associated infection) that hospital could “bill” CMS (Medicaid, Medicare), or the Private Payer for the care associated with that infection.

## A Little Background

My aunt, a nurse in the Philadelphia area, used to tell me a “hospital is no place for sick people.” Here’s what she meant:

* Hospital surfaces can be a source of infection. A 2009 study found that 75% of all hospital rooms have surfaces infected with C. Diff, or MRSA.
* Healthcare workers (HCW) can be a source of infection. With about a 50% hand hygiene compliance rate in most hospitals (conservative/generous estimate) the HCW can be a source of infection.

We’ll focus on hand hygiene v. surface cleaning. It turns out that a HCW should be sanitizing or washing his/her hands (World Health Organization 5 Moments for Hand Hygiene):

* before touching a patient
* before clean/aseptic procedures
* after body fluid exposure/risk
* after touching a patient, and
* after touching patient surroundings.

There are new hardware/software solutions today to assist with improving hand hygiene compliance. These are likely the simplest, most effective measure for preventing nosocomial (hospital-associated) infections. Turns out what your mother told you to do was correct; “wash your hands.”

## Back to Our Story

So, if CMS (Center for Medicare & Medicaid Services) will no longer pay for an infection the patient gets in the hospital, then the hospital is financially incented to not make the patient sick. Isn’t it? More than 1.7M patients in the US are affected by HAIs. The cost to the healthcare system for these infections is between $28B and $45B. So, has this change in reimbursement policy really been effective at reducing HAIs?

By combining data sets available by state, and maybe nationally, we might be able to demonstrate if any improvement has been made by hospitals who are now on the hook for $28B to $45B in costs they can no longer pass to the federal government.