

Health IT in Ambulatory Care Settings: Effects on Quality and Disparities

Final Progress Report

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1. Structured Abstract

Purpose:

This project measured the effects of health information technology (IT) on ambulatory care quality and disparities.

Scope:

Previous research on the impact of health IT focused on the inpatient hospital setting. Similarly, US government investments focused on incentives for health IT in hospitals and by individual physicians. This is despite the fact that most health care is delivered in ambulatory settings and the value of health IT may be especially great there. This research contributes to filling the gap in health IT research by studying the ambulatory setting.

Methods:

Measures of county-level ambulatory care quality were constructed for 2002 to 2013 using the rate of hospital admissions for ambulatory care sensitive (ACS) conditions. Data on hospital admissions are from Medicare and the Nationwide Inpatient Sample (NIS). Measures of county health IT adoption in the ambulatory care setting were constructed using the Healthcare Information and Management Systems Society (HIMSS) Analytics™ Database. Estimation was conducted using difference-in-differences panel data regressions with location and time fixed effects as well as controls for observable factors related to healthcare quality and population demographics.

Results:

Greater adoption of ambulatory health IT in a county was found to significantly lower rates of ambulatory care sensitive (ACS) Medicare hospitalizations, suggesting quality improvements. The magnitudes imply a 45 percent increase in ambulatory IT adoption (the average increase over our sample period) lowered ACS admissions by 1.6 percent. Estimates were imprecise for younger populations and no significant effects were detected on disparities.

Key Words:

Health IT, ambulatory care quality

2. Purpose

The overall goal of this project was to measure the effects of health information technology (IT) on ambulatory care quality. In order to achieve the goal, the project included three specific aims:

Aim 1: Develop a national panel database that measures the degree of ambulatory health IT in local areas.

Aim 2: Combine the data on ambulatory IT with local-area panel measures of ambulatory care quality and controls for population and healthcare factors.

Aim 3: Estimate the effects of health IT on the quality of ambulatory care. Estimate differential effects of health IT on different racial and ethnic sub-populations.

3. Scope

Considerable resources are being devoted to promoting the diffusion of information technology (IT) in health care. However, there is limited empirical evidence about the effects of health IT on health care quality and potential differences in impact across racial and ethnic groups, and research to date has primarily focused on the inpatient hospital setting. Ambulatory settings may be particularly important for health IT diffusion. They are the location in which the majority of health care services are provided and are an area in which potential cost savings from preventing hospitalizations may be quite large. Yet evidence of the effects of health IT in ambulatory settings is scarce.

This research addresses the gap in the scholarly literature on the effects of health IT on healthcare quality by studying the effects of health IT on quality and disparities in the ambulatory care setting. The results can contribute evidence to inform policy-making in the area of health IT, where federal resources are being devoted to promoting health IT adoption, under the assumption that it will reduce costs and improve quality. Federal government investments to date have focused on incentives for health IT in hospitals and by individual physicians. If health IT is also beneficial in the ambulatory setting, additional incentives may be worthwhile.

4. Methods

This exploratory project developed and implemented an empirical framework for the assessment of the impact of health IT adoption on the quality of ambulatory care using national panel data. Studying the impact of ambulatory health IT poses new measurement challenges for researchers. Measures developed for the hospital setting will not translate directly to ambulatory care. The measures and models developed in this study can be applied by other researchers for future large-scale evaluations of health IT implementation in ambulatory settings.

Following the research methodology described in the proposal, we obtained data from the Healthcare Information and Management Systems Society (HIMSS) Analytics™ Database, which is importantly a source that is available to other researchers and easily can be obtained for future studies. We compiled data on ambulatory health IT systems in place in the 2012 data along with information about the types of systems (electronic medical records; picture archiving; and practice management) and initial contract years with vendors. We collected data from earlier years of the database to impute missing contract years. We have also created measures of hospital IT adoption, using the same methodology described above with variation in system type defined based on achieving Stage 3 or Stage 4 EMR Meaningful Use under the HIMSS model.

Using these facility-level panel databases, we created two local area level adoption panel databases, by aggregating the data to different local area definitions. Our primary local area definition is based on counties (specifically, AHRQ's modified county definition that groups together cities and counties in Virginia). As a secondary geographic unit, we also used the hospital referral region (HRR), defined in the Dartmouth Atlas, as a larger local area.

Following the approach in the proposal, we constructed our outcome measures for ambulatory care quality at both local area levels. To do this, we first obtained access to the Healthcare Cost and Utilization Project (HCUP) inpatient databases described in the proposal: The Nationwide Inpatient Sample (NIS) and the Kids' Inpatient Database (KID). Using these data, and the algorithms developed by AHRQ to compute "Prevention Quality Indicators" (PQIs) and a relevant subset of the "Pediatric Quality Indicators" (PDIs), we computed rates of ambulatory care sensitive hospitalizations. We created a total measure for the entire local population to use for overall effects and separate measures for different sex/race/ethnicity/age subgroups to use for disparities.

After building these databases on outcomes using the HCUP data, the research team separately obtained access to the 100% sample of Medicare fee-for-service inpatient records for the time period 2002-2013 and used them to create Medicare measures of the PQIs. Because the Medicare data are more comprehensive (the NIS are based on a 20% sample of hospitals and the KID are not annual), we decided to focus on the Medicare outcomes for the analysis. We used the measures based on HCUP data for supplementary analysis for younger populations.

Finally, we merged the local health IT and PQI databases together and with our local area control variables. The variables were selected to cover a range of observable and time-varying local area factors that may be associated with both health IT and with the outcomes of interest. We controlled for health care market and demographic characteristics of the population that are likely to influence the county ACS hospitalization rate, including the supply of primary care, scope of the local health care safety net, availability of hospital beds, pervasiveness of managed care, and insurance status and income level of the population.

We measured primary care physician supply using the county-level number (per 10,000 population) of non-federal doctors of medicine (M.D.) and doctors of osteopathy (D.O.) providing direct patient care who practice principally in general internal medicine, general or family

practice, pediatrics or obstetrics and gynecology. Our hospital supply measure includes the number short-term general hospital beds per 1,000 population in the county. Our safety-net measures include the number of federally qualified health center (FQHCs) grantees per 100,000 low income population in the county and a state-level health and hospital spending variable, which includes state, county, and local expenditures for public health administration, immunization programs, outpatient health clinics, hospital facilities directly administered by the government, and other support for the provision of hospital care. The HMO penetration rate is the percent of the total population in the state enrolled in an HMO and the uninsured rate is the percentage of the total population in the state without health insurance coverage during the year. The county level poverty rate indicates the percentage of the population in the county with income less than the federal poverty line (FPL).

We then used our merged panel database to estimate difference-in-differences models in order to understand the impact of health IT on ambulatory care quality. The models included fixed effects for location and time and time-varying local area controls. Standard errors were clustered at the county level to account for serial correlation within counties.

5. Results

Our main results are from the county-level analysis of Medicare data. In the basic difference-in-differences model, with time and county fixed effects and only controlling for county population, we find that a 45 percentage point increase in ambulatory IT adoption in a county (the average increase over our sample period) is associated with a 104 point drop in PQI admission rate (per 100,000 relevant population per year) in that county, or about a 1.6% decline. Adding controls had a limited effect on the estimated effect of health IT on the PQI rate, though several controls did have statistically significant effects on the PQI rate. The results are also robust to including state-specific linear time trends, to using weighted (by population, to improve precision) or unweighted models, and to defining the outcome as a count (number of admissions) or rate (per population) or taking a natural logarithm transformation.

We find that the decline in PQI admissions is coming from both acute and chronic conditions. The absolute magnitude of the decline in hospitalizations for chronic conditions is larger, but the effects are more similar in proportion to their average values.

Using the outcome measures based on HCUP databases, we first confirmed the main finding from the Medicare data for the population aged 65 and older. When we turned to younger populations, we again found negative point estimates (suggesting fewer PQI admissions with greater ambulatory IT), but they were not statistically significant. This indicates that, while there may be benefits from ambulatory EMR for younger patients, the largest gains accrue to older ones. Associations at the HRR level are very similar but not as precise statistically. We did not find any significant associations between ambulatory HIT and pediatric outcomes (PDI measures) using either NIS or KIDS data. Finally, we found no consistent differential effects of ambulatory IT on different demographic groups defined by sex, race or ethnicity, and therefore,

no effects of ambulatory IT on disparities.

6. List of Publications and Products

Gresenz CR, Laughery SP, Miller AR, et al. Health IT and Ambulatory Care Quality. Social Science Research Network Working Paper #2265664. Available at <http://dx.doi.org/10.2139/ssrn.2665664>