

GEOSPATIAL MAPPING HELPS AVOID READMISSION PENALTIES

Background

GeoDimensional Decision Group LLC (GeoDD) was engaged to provide St. George Glenview Medical Center (GMC), a community hospital with 492 certified beds, 38 psych unit beds, and 40 rehab unit beds, a numerically justifiable analysis of the ROI to avoid 2015 Federal government mandated readmission penalties for Chronic Obstructive Pulmonary Disease (COPD) when these occur within 30 days of discharge. GeoDD was given three tasks.

1. **Diagnose current actions with COPD patients** – Analyze the activities in current treatment of COPD patients and discern areas for improvement to reduce readmissions.
2. **Provide improvements to reduce COPD readmissions** – Make recommendations that will reduce the number of readmissions.
3. **Provide means to measure improvement** -- Provide performance measures that will translate into positive return-on-investment computations to reduce and avoid penalties.

CHALLENGE

Numbers: In 2012, there were 171 (29%) readmissions at GMC within 30 days out of 611 patients with a primary diagnosis of COPD. Further analysis showed that of GMC's 524 pneumonia admissions in 2012, 256 (49%) had a secondary diagnosis of COPD. Combining the numbers meant that COPD patients actually represented the second-highest volume of hospital readmissions within 30 days of discharge at GMC after patients with Congestive Heart Failure (CHF).

Penalty: The Federal government, through the CMS, will penalize hospitals for readmissions (within 30 days of discharge) for COPD at a rate of 3% of total admission revenues! The fact that so many pneumonia patients also were COPD patients mean that interventions to reduce COPD and pneumonia readmits would have dual penalty-avoidance leverage.

Established intervention: There is an established approach for reducing COPD readmissions that involves identifying patients at risk and using countermeasures. For risk stratification purposes, COPD patients with coexisting CHF, lung cancer, anxiety and depression and osteoporosis have been shown to be at high risk for readmission. For countermeasures, a full-court-press care management and coordination program has proved effective. In independent studies, inpatient education by nurses and respiratory therapists, immediate telephone follow-up and ongoing telephonic monitoring after discharge, patient educational home visits, primary care physician education, and insuring that COPD patients have their flu shots all have proven to be associated with reductions in readmissions.

GMC's intervention: An interdisciplinary COPD Readmission Reduction Team was formed with a primary care physician, a pulmonologist; a nursing representatives from the hospital and primary care physician staffs, a nurse educator, a social worker, an IT representative, a Respiratory Therapist, and an RN Care Manager/Team Captain. In its data review, the Team discovered that GMC patients with a primary or secondary definition of COPD had, on average, eight other co-morbidities. The Team agreed that this population was at risk enough that further stratification didn't make a lot of sense. After a hard look at the program budget, it was decided that invitations to join the readmission reduction program should be offered to (a) all patients who were admitted with a primary diagnosis of COPD and (b) all patients admitted with a secondary diagnosis of COPD who also had a primary diagnosis of pneumonia. Patients undergoing chemotherapy or receiving end-of-life treatment would be excluded.

Preparation. Before the program launched, the team developed and delivered hospital staff and primary care physician training based on the latest Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD) guidelines. The program opened on December 1, 2012. Beginning on that date, eligible patients who agreed to participate were given on admission a comprehensive survey covering demographics and history, including compliance with a comprehensive care plan (if one had been developed by their physicians and/or GMC), use of inhalers and nebulizers, medications, types of education provided by physicians, nurses, RTs, etc. All participants were entered in a registry and tracked monthly. All program participants who were readmitted within 30-days from discharge were tested and interviewed using a comprehensive questionnaire that probed compliance and the cause(s) of the “acute exacerbation” (flare up) that led to the ER visit that in turn resulted in a readmission.

Early Results and the Challenge. After six months, a formal assessment of the program showed a 24% readmit rate versus a starting rate of 29%, a 5% improvement. Assuming the CMS will want a readmit rate of less than 20%, more needs to be done to lower the readmit rate. As part of the formal evaluation of the data, the discussions revolved around environmental causes for the readmission. Thus the causative entities exacerbating COPD after discharge is a mystery, especially when the Global Initiative guidelines were followed. We can’t solve the problem if we don’t understand the cause. Says a GMC spokesperson, “We’re not getting anywhere on our own,

SOLUTION

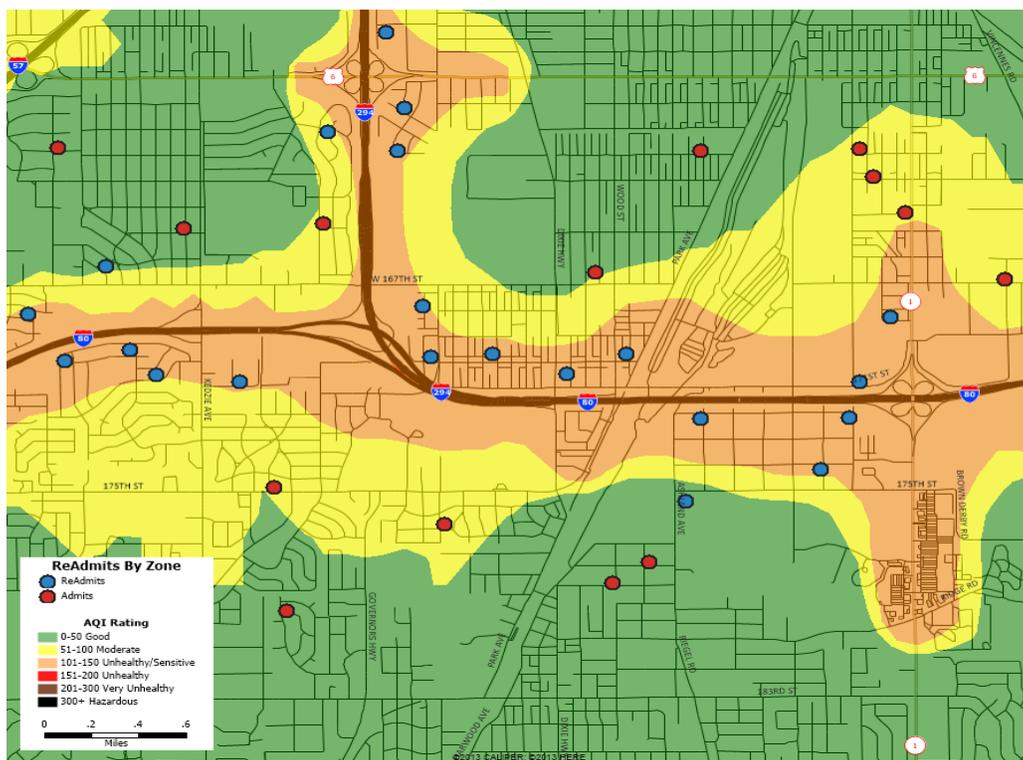
Unlike other firms involved in population health management, GeoDD regularly uses electronic maps, i.e., geospatial analysis to bring greater definition to any problem. Geospatial analysis adds physical location to the mix and allows multiple layers of data for analysis. That means we can connect some dots where others cannot. And when you are managing a population, the location of its members relative to public transportation, to providers, to community resources and so forth can play a huge role in the members’ health outcomes, their relationship with their healthcare providers, you name it. “GMC has already done an analysis by ZIP Code and the mystery readmits are pretty equally distributed through eight different ZIP Codes east to west, with four on the north side and four on the south side of the service area.”

GeoDD mapped the residential address for all admits and then each mystery readmit was converted to a latitude/longitude coordinate to create a dot for each admit (red) and readmit (blue) precisely on a map (see below). This highly accurate process pinpoints the locations of the mystery readmits, and reveals a wide range of geographic information – including critical understandings of proximity to each other and other features on the map. Additional Air Quality Index (AQI) data collected from Federal and State environmental agency monitoring stations, historical AQI data sets, regional weather, transportation load data from the Department of Transportation (DOT), interstates, roads and terrain elevation were just some of the data sets assembled for analysis. Using all the data collected, GeoDD modeled AQI zones that reflected the standard Air Quality Health Index which provides a number from 1 to 10+ to indicate the level of health risk associated with local air quality. Pollution zones were created and also converted to latitude/longitude coordinates and precisely located on the map below. It became apparent that of the 21 mystery readmits, 19 were located within the most dangerous air quality zones. The bands were separated north to south by between $\frac{1}{4}$ and $\frac{1}{3}$ of a mile. When the zones were superimposed on the service area map, the solution jumped out at them. The individuals were indeed spread out primarily east to west across the service area, but all 19 individuals in the most dangerous air

0 – 50	51 – 100	101 – 150	151 – 200	201 – 300	300 +
Good	Moderate	Unhealthy Sensitive	Unhealthy	Very Unhealthy	Hazardous

quality zone lived within a few blocks of Interstate 80. Thus this mapped AQI factor may be the major contributing factor triggering COPD acute exacerbations.

The Culprit. As it turned out, measurements several times a day over two weeks revealed that during June at least, there was a 52-point difference between the AQI near the Interstate and the overall AQI for the city. Assuming that this spread was roughly constant over the seasons, it was a large enough difference to drive the air pollution level at any time of the year from “Moderate” yellow to “Unhealthy for Sensitive Groups” orange. The “sensitive groups” category, as defined by EPA, includes individuals with COPD. “For COPD patients, it’s not only the overall level of pollution, it’s the size of the particles of pollutant,” explained the engineer. “COPD patients are affected by both of the elements of air pollution, ozone and particulates. But they are especially sensitive to particulates. The finer the particles, the more likely they are to trigger a COPD acute exacerbation. And on I-80, most of the pollutant particles come from diesel engines. Those particles are fine and ultrafine.”



IMPACT

Recommendation. Develop a standard education and assistance program for all COPD patients who live near either side of the Interstate. GMC’s program was based on encouraging COPD patients who

lived near the interstate to do four things: 1) run errands early in the morning; 2) avoid outdoor exertion; 3) stay indoors in general as much as possible; and 4) make the indoor environment as clean as possible by beefing up weather stripping and having the highest-quality filters in air conditioning and heating systems. The program was rolled out immediately.

COPD Readmit Reduction Target Near. Over the next six months GMC narrowed the gap between its COPD 30-day readmits and its 2015 goal. Not only did results from the original program continue to improve, but also the special interventions for patients close to the interstate began to show significant results. Of 291 COPD patients, 58 were readmitted for a 20% rate, clearly on target for the projected 20% penalty cut-off of CMS. With another quarter in 2014, it appears that GMC will exceed its target and reduce its COPD readmits below 20%.