

Pediatric Readmissions at Children's Hospitals of Minnesota

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Abstract

Preventable pediatric readmissions have become a growing concern in Minnesota. Constantly returning to the hospital, places an increased physical and emotional strain on patients and the patient families. Additionally, increased readmissions have begun to negatively impact hospital resources. This analysis will use GIS to map the incidence of pediatric readmission rates, by census tract, in the 11 county Twin Cities Metro area. Using pediatric patient data from Children's Hospitals of Minnesota, census data, and demographic data provided by Business Analyst, health incidents will be geo-coded and demographic trends will be identified. This analysis will help identify locations, containing high levels of pediatric readmissions within the study area. The goals of this analysis are to (a) identify census tracts, within the study area, containing a higher number of preventable pediatric readmissions; (b) compare pediatric patient demographic data with census tract demographic data to identify causal factors for the increase in preventable pediatric readmission rates; (c) provide recommendations to help Children's Hospitals of Minnesota reduce preventable pediatric readmission rates.

What is the Research Question?

The research question being proposed is: How can GIS help Children's Hospitals of Minnesota identify geographic locations, in the 11 county Twin Cities Metro area (study area), with a high concentration of preventable pediatric readmissions and how can GIS help Children's Hospitals of Minnesota reduce these preventable pediatric readmissions?

Provide Some Background on the Topic and on the Need for the Study?

Each year, millions of children are admitted and then readmitted to U.S. hospitals. Hospitals spend billions of

dollars on pediatric readmissions.

Increased health care costs have resulted in budget crises at the Federal and State levels. These financial crises have reduced funding to Minnesota hospitals. Decreased funding has resulted in hospitals reducing operating budgets. As a result, hospitals have looked for ways to lower costs but maintain a high standard of care. Readmissions rates have become the new standard for pediatric patient care.

Readmissions can be planned and unplanned. Unplanned readmissions can be non-preventable and preventable.

Reducing pediatric readmission rates may prove difficult. A majority of pediatric readmissions are not preventable. As a result, hospitals are focusing their

efforts on potentially preventable readmissions (PPRs) to help reduce pediatric readmission rates.

Using readmissions as a quality metric for pediatric health has proven controversial. The reason for this controversy is there is no clear agreement on the definition of “readmission”. Studies use differing time frames for the definition of “readmission”. These differing time frames have created confusion.

Numerous alternatives have been suggested to measure the quality of pediatric care. Various community intervention programs have proven highly successful.

What is the Value of This Research?

The current fiscal trend has been for the Federal government to provide less revenue to State governments. State government has then reduced allocated revenues to local governments. This financial short fall has to be accounted for somewhere in the fiscal budget of some geographical entity. More often than not, this short fall has resulted in counties and cities receiving less money and reducing social services to its citizens. Medical services are one of the first social services to be reduced at the local level.

Identifying census tracts, in the study area, with a high level of preventable pediatric readmissions will allow for more focused and efficient use of medical resources. By identifying demographic factors common to PPRs, Children’s Hospitals of Minnesota can provide improved treatment for current pediatric patients and also reduce the number of future pediatric readmissions.

GIS has the potential to help Children’s Hospitals of Minnesota: (a) locate and map PPR addresses within the study area; (b) help identify demographic

factors that are causing PPRs; (c) reduce the number of PPRs, and (d) help Children’s Hospitals of Minnesota more efficiently manage and distribute its medical resources through a better understanding of the Twin Cities metro community.

What is/are the Data Needed for the Study?

Completion of this study will require many different data sets.

The primary data to be collected will be the medical records of pediatric patients seen at Children’s Hospital of Minnesota. These records will provide information which includes patient addresses, whether the hospital visit was an admission or readmission, the recorded illness, the length of hospital stay (LOS), as well as demographic data about the patient and where possible, about the patient’s family background.

Census data will provide information on demographic and socioeconomic variables about the study area.

Community Analyst will provide additional demographic data about the study area and its population.

In addition to these data sets, vector layers for the study area will be used to show county boundaries, major roads, and census tract polygons. These layers will provide a more enhanced visual graphic to better represent the data and its meaning.

What is the Data Collection Procedure?

Multiple data sources and data sets will be required to complete this study.

Medical related information will be obtained from Children’s Hospitals of Minnesota. The hospital will provide two

limited data sets. One data set will include patient information related to pediatric admissions. A second data set will include patient information related to pediatric readmissions.

Demographic data about the inhabitants of the study area will be obtained from Census data (www.census.gov). This data will include health and socio-economic variables.

Demographic information about the study area and its inhabitants will also be obtained from Community Analyst. This data will include additional health and socioeconomic variables not found in census data.

Finally, vector data will be obtained from the MN Geospatial Commons website (gisdata.mn.gov). Vector data will contain features within the study area, such as roads and hospital point features.

What Data Attributes are Needed to Conduct a thorough Analysis?

Several data attributes are needed for analysis.

Children's Hospital will provide limited data sets on pediatric admissions and readmissions. These data sets will focus primarily on patient information. They will include patient addresses, whether the hospital visit was an admission or readmission, the recorded illness, the length of hospital stay (LOS), as well as demographic data on each patient. Demographic data will include address, age, race, gender, parental marital status, and payment information.

Census data will include information about the study area, such as address ID and census tract information. Age, nationality, and other demographic variables will also be used for analysis and recommendations.

Community Analyst will provide additional demographic information about the study area, such as the household income and access to medical care.

Information obtained from medical records will be narrow and focus on pediatric patients. Information obtained from census data and Community Analyst will be broader and focus on the study area.

Finally, attribute tables in ArcMap will need unique field identifiers to join census data with health-related data.

Describe how Meaning will be made of the Raw Data.

Data sets downloaded from the Minnesota Geo Spatial Commons website will not need to be manipulated in ArcMap. These data sets are primarily vector data used to enhance the final product. The same is true with geocoding hospital patient addresses. Community Analyst and/or Google are usually accurate with respect to X, Y coordinates and street address locations.

However, the same cannot be said of the Census data or the health data.

Census data often contains field heading errors. Sometimes errors occur in the data itself. The same is true with health data. The provider of the health data may have numerous departments, each with a different syntax for field headings. This study will devote time to ensuring data accuracy. Metadata will be reviewed. Specific attention will focus on data definition and data collection of the health incidents.

What are the Assigned Analysis Method(s)?

Geocoding

Geo-coding involves converting address

information into their respective longitude and latitude coordinates.

Geocoding will be used to identify and plot patient addresses in arc map.

The merge tool will be used to aggregate the address points into larger polygons to protect patient confidentiality.

Statistical Analysis

Two .csv files will be created to separately store admission and readmission patient addresses, and their respective demographic information, and other related health care data. This will help ensure data integrity. These .csv files will be imported into ArcMap and then joined together.

Statistical tools will be used from the Spatial Analyst toolbox in ArcMap to determine whether there is a pattern of readmissions in the study area.

Using the Intersect and Sort by Location tools in the ArcMap toolbox, it will be possible to identify locations in the study area with a high number of PPRs.

Examples of the Expected Deliverables to be Generated from the Analysis Methods.

The products of this analysis will be two maps and a geo app.

The first map will identify PPR rates by census tract within the study area. The zones will be symbolized from highest to lowest.

The second map will combine and compare patient information with census tract demographic and other related information. This will allow for analysis of the geographic and demographic factors associated with PPRs.

The geo app would allow the various departments within Children's Hospital that utilize pediatric readmissions

data to dynamically interact with and easily update the data and resulting maps.

Will this Design Answer the Research Question?

Geocoding patient readmission addresses will allow PPRs to be mapped by census tract. Census tracts, within the study area, will be symbolized from low to high PPR rates.

Comparing geographic and demographic variables between pediatric patients and other inhabitants of the study area will help understand why some census tracts have a high number of readmissions and other areas have a low number. This will allow for an analysis of ways to help reduce pediatric readmissions.

What Specific Problems Might a Critical Researcher Anticipate with regard to this Study?

A critical researcher may face three specific problems.

First, the data privacy act requires that patient consent be obtained for access to certain health and patient demographic data. Patients usually provide consent for studies. However, it is possible that some patients will decline to participate in this study. In this case, the data would be less than 100% complete.

Additionally, Children's Hospitals of Minnesota may not separate admissions from readmissions into different data sets. Some information may be aggregated into one or the other data set. In this instance, specific attention will have to be paid to determining whether the pediatric patient was an admission or a readmission so that each health incident and its accompanying demographic information are placed in the correct data set.

Finally, Children's Hospitals of Minnesota may not record all of the data variables mentioned in the previous sections. In this case, the study would have to be adjusted so as to use what demographic data is available.

To whom can the Findings be Generalized?

The findings in this study can be generalized to three primary groups of health care professionals.

First, the findings can be generalized to Children's Hospitals of Minnesota. The medical data being reviewed will come from patients of this hospital. Children's Hospitals of Minnesota should be aware of what geographic and demographic factors may play a part in creating or reducing PPRs.

Second, the findings can be generalized to other hospitals within the study area. There are several other hospital systems in the study area. By reviewing the factors contributing to increase in PPRs, other Twin Cities hospital systems can examine their own patient data to better inform decision making about the PPRs under their care.

Third, the health care community as a whole might find the results applicable. While the focus of the study is the Twin Cities Metro area, the general methodology could be applied to any city in Minnesota, or the United States. Any locality can gather the same data sets relative to their geographical location.

The purpose of this study is ultimately to increase the awareness of PPRs in the Twin Cities area. Data that helps explain PPRs is applicable to every locality. The lessons learned and the recommendations made in this study have general applicability to any locality. As long as it is understood each locality is

unique and may have to modify aspects of this study.

What Specific Ethical Concerns Exist Within this Research?

There are three main ethical concerns that exist within this research.

First, there is the potential for bias. Researchers must always guard against bias. Analysis must be approached without preconceived notions. A researcher should acknowledge bias beforehand. Awareness can help reduce bias or render it a non-factor.

Second, there are data accuracy concerns. Individual health data variables are not always available. Health data must often be studied in aggregate form. Errors can occur in data entry affecting data aggregation and geo-coding. When possible, a researcher should check for data accuracy without compromising individual patient privacy.

Third, there are serious privacy concerns. Data should be collected and received in a form that protects patient identity. Most medical data is released for geocoding at the zip code level. The goal is to weight the need for medical information against the privacy rights of the patient. If this trade-off is successful, valuable information about individual and community health can be gained without compromising the concerns of patient confidentiality. This allows cities, to be more efficient with their health care budget. More efficiency allows more citizens to receive more and better health care while using less overall resources.