Abstract—Medicare Risk Adjustment Model (RAM) is a methodology used to mitigate the impacts of potential adverse selection and stabilize premiums in the individual and small market groups. The federal government and individual states desire a tool to adjust premiums/payments to the plan initially based on very simple demographics. The Risk Adjustment Model should be able to quantify the acuity level of that patient population and adjust premiums where the risk covered lives is the greatest due to higher patient acuity levels. In this study we are explaining the characteristics of a web-based application developed for RAM utilizing Tele-Medicine as a pathway to gather and transmit patient data. The tool would be utilized by emergency departments and urgent care centers to identify patients who are accessing care that is typically considered non-emergent. It is essential to capture as much data as possible during these encounters at the Point of Service (POS). The aim is to use the technology to develop a clinical pathway that could provide stakeholders the ability to gather the necessary data to have payments adjusted to fairly accurately predict future risk and healthcare costs. The developed web application consists of collecting data, generates report for each individual and then aggregates it into an overall score for each insurance plan. We believe that this technology can help improve the quality of care received by the Medicare beneficiaries and provide valuable data for accurate risk adjustment.

Keywords—Tele-Medicine; Risk; Adjustment; RAM; HIPAA; Medicare

I. INTRODUCTION

A. Tele-Medicine

Tele-Medicine is the use of medical information exchanged from one site to another via electronic communication to improve patients’ health [6]. A manifestation of Tele-Medicine is in the area of Medicare Risk Adjustment. The purpose of the CMS-HCC Medicare Risk Adjustment is to pay the Medicare Advantage (MA) and Prescription Drug Plans (PDPs) correctly and justly by altering payment for enrollees based on health status and demographics [2].

Medicare Risk Adjustment data will need to be collected by a third-party and sent to the managed care plans. A risk-assessment tool or methodology will convert the data collected into a risk score for every person. Individual risk scores are then collected into an overall score for each insurance plan [9]. Precise risk adjustment is predominantly vital for certain high-risk beneficiary groups that are more costly and challenging to treat. These groups may benefit mainly from the coordination of care Medicare Advantage plans can provide [1]. The basis of the Risk Adjustment project is to gather high-level data from patients. This data is used to generate reports that are used managed care plans for risk adjustment.

Data is collected by using a browser based intake information form. This data is parsed into a HIPAA compliant database. Managed care providers have access to their patients completed forms. The managed care providers use the data that is gathered to identify ‘at risk’ patients that are not managing underlying conditions. A data sample includes patient’s name, date of birth, gender, age, weight, height, contact information, insurance plan with member id, primary care physician, last visits, underlying conditions, medications, blood pressure, and glucose. This high-level data can be generated into downloadable reports by the managed care providers. All data collected and queried will be HIPAA compliant, as well as, the storage location on the website host. Failure to alter the budget for the risk of the population can lead to a payment that is not enough to cover the exact medical needs of the patients covered by the budget-based payment system [3].

Figure 1. Process flow of Medicare Risk Adjustment [12]

B. Evolution of Medicare Risk Adjustment

Starting in 1980, the Medicare users have been able to choose if they want the regular fee-for-service plan, (where the federal government pays a set fee to the health care providers for each service), or the Medicare Advantage (MA), (meaning the government pays private health plans a fee for every person they enroll). Currently one quarter of these users are enrolled in Medicare Advantage plans [11].

The Balanced Budget Act (BBA) of 1997 required a number of changes in Medicare. Medicare’s managed care program was reinvented as “Medicare + Choice”, providing
different types of delivery system options for the users and a schedule of payment changes that will drastically influence managed care plans. In support to a mandate given by BBA, Health Care Financing Administration (HCFA) had to implement health status based risk adjustment for Medicare captivation payments managed care plans made in the period from 1997 to January 1, 2000. This resulted with a large collection of data that includes diagnoses and other information mainly used for chronic medical problems identification [10].

Starting with 2000, Medicare Advantage plans have used Medicare risk adjustment techniques based on risk adjustment formula. These techniques use diagnostic data collected from hospitals to adjust for a member’s health risk. In the process of risk adjustment payment calculation, CMS uses diagnoses reported from encounter and claims data by the health plan. Therefore, accurate claims data reporting from the provider to the health plan is more important than ever.

There were several risk-adjustment models evaluated by CMS, (which actually use both, ambulatory and inpatient diagnoses), such as: ACGs (Weiner et al. 1996), the chronic disease and disability payment system (CDPS) (Kronick et al., 2000), clinical risk groups (CRGs) (Hughes et al., 2004), the clinical detailed risk information system for cost(CD-RISC) (Kapur et al., 2000b). DCG/HCC Medicare risk adjustment model was the one chosen by CMS, since it is easy and open to modifications, transparent, and it is clinically coherent [14].

Figure 2. Area under the ROC curve as more risk factors are included in a risk-adjustment model [15].

Numerous associations have implemented Medicare Risk adjustment today such as “National Pace Association”, “MediConnect Global - an Affiliate of Versik Health”, “Health Net”, “Berkeley Research Group”, “HCC Risk Adjustment coding” etc. [5]. Many of these have become professionals in the process of retrieval, digitization, and indexing medical charts. For example, “MediConnect Global” is providing several advanced services related to Medicare Adjustment risk, such as:

- Online Medical Record Retrieval
- Experienced Professional Coders
- ICD-9 coding
- HCC Coding
- Errors and Omissions Coding
- Provider Education Materials
- Record Documentation Management and Workflow
- RADV Audit

However latest experience showed that there are still some problems and common errors in encounter and claims data reporting:

- Limited diagnosis codes – receiving only one or two diagnoses per encounter when some members can actually have more than that.
- Lack of accuracy – diagnoses should be coded to the fifth digit
- Invalid diagnoses codes- ICD-9 code
- Low submissions - data on irregular basis

C. Improvements Through Tele-Medicine

Telemedicine is used to improve a patient’s health by the use of medical information that is shared from one site to another through electronic communication [6]. Telemedicine is regarded as an economical alternative to the more outdated face-to-face way of providing medical care (e.g., consultations or examinations [7]).

Today this process is rapidly developing where the medical information is transferred over phone, internet and other means of communication. Remote healthcare service is increasingly being used that enables practitioners in evaluating, diagnosing and treating patients with a quick response time [8].

From the company Global Med Telemedicine they tell us 6 ways how Telemedicine can be beneficial to the traditional in person Medicare

1. Numerous patients find it problematic to travel to hospitals, clinics, or doctors’ offices for any number of reasons. Telemedicine can be a logical alternative for patients with disabilities or in circumstances that make it difficult to travel to receive medical care [8].
2. The cost of medical assistance from doctors and healthcare providers are reduced greatly compared to regular office visits. This is done through the use of video conferencing and other telemedicine technology that is provided for the patient [8].
3. There is an increasingly popular demand for remote medical technology that allows doctors and healthcare providers to administer preventative healthcare assistance and manage conditions that are chronic [8].
4. Telemedicine is beneficial in monitoring discharged patients and in tracking there recovery rate. This also facilitates communication between doctors and patients more frequently [8].
5. Research has proved that the use of technology for telehealth conveys many benefits and encouraging outcomes that include much less hospital remittance, an increase in prescribed courses of treatment and a faster turnaround period in recovery [8].
6. Enables hospitals to be connected and create networks with each other for information and support. With ease they can now share expertise service outside of their healthcare facility. With this technology doctors are enabled to offer incredible input to other medical colleagues and care takers [8].

![Figure 3. Telemedicine Concept](image)

Telemedicine has a great impact on patient’s families and communities from all over. The use of telemedicine reduces travel and many other stresses for the patient. Past study shows that telemedicine has allowed treatment to patients from remote locations. It has also allowed health facilities to expand their reach beyond their offices.

II. METHODOLOGY

A. Application Description

A program was developed to collect Medicare Risk Adjustment data that is accessible via Internet browser. The primary purpose of this program is to collect medical data to identify ‘at risk’ patients. A patient ‘at risk’ means that they are not managing their underlying conditions (e.g. high blood pressure, hypertension, etc.). The program provides the framework for “well” visits and identifies conditions that may allow the system to manage their paneled patients.

The program houses a questionnaire to capture high level data that could be used by the managed care plans to identify “at risk” patients that may not be managing underlying conditions. The information that the questionnaire collects will be able to be sorted by: Insurance plan, Policy number, Primary care physician, Last physical, Last seen by MD/NP, Reason for MD/NP visit, Reason for urgent care visit, Underlying conditions, Medications, Blood pressure, Glucose.

Furthermore the questionnaire also collects personal information from patients in the database including: Name, Date of Birth, Gender, Age, Weight, Height, Phone Number, Address, Social Security Number, and Email Address.

The users of the Risk Adjustment program are doctors, health care professionals, and insurance companies. The users of the program are able to log into their own accounts and have the option to select a variety of different conditions that patients could have. Once the specifications have been selected by the user the program gives the names and personal information of patients that fit within the selected categories. The program aims to make patient data gathering a quick and efficient process for its users.

B. System Design

The Risk Adjustment program was developed on a server provided by Pace University and housed on a standard HTML webpage utilizing PHP scripts to interact with a MySQL database. The database consists of tables that house each patient’s personal information and their associated medical conditions. The medical conditions that users can select are handled through query strings that will interact with the MySQL database and provide the user with the needed information.

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) protects the privacy of individually identifiable health information called protected health information (PHI). The data collected from our program is considered protected health information, and therefore HIPAA requires our data to be encrypted to ensure confidentiality, integrity, and availability [4]. Furthermore the Act requires covered entities to maintain reasonable and appropriate administrative and technical safeguards for protecting the PHI. To ensure the program is in full compliance with the Act we will be taking the following steps in the program creation process: utilizing AES encryption method on collected data, using SSL for web-based access to sensitive data, and password protecting all access to the program [13].

C. User Manual

The program is accessible through Internet browsers. It is also compatible with Internet Explorer, Firefox, Chrome, and Safari. To ensure the best experience it is recommended that the latest version of the browser is used. Upon entering the URL of the website the program lives on users are presented with the logo, the program’s name, a brief description of the program, and a text field where they can login. The system will be using social security numbers as the user account number. The homepage of the program will have the following format:

Identify applicable sponsor/s here. If no sponsors, delete this text box (sponsors).
III. EXPERIMENTAL RESULTS

A. Results

This program effectively gathers and generates reports that managed care plans can use. The data collected identify at-risk patients that may not be managing their underlying conditions. This web-based intake form provides a framework or structure for a ‘well’ visit. Once the underlying conditions are identified, the system can then be able to manage their paneled patients. The information gathered is put into buckets that managed care plans can access as they relate to their members. The patient can also review their record if they choose by providing their Social Security Number.

B. Usefulness and Utility

The reports that are generated contain specific information about the patient, and only be accessible to managed care plans. The managed care plans then use this information to determine the risk score for each patient, and be able to find an overall score for each insurance plan. These scores are used to help determine the payment plans for Medicare. Personal risk scores are built from data on patient demographics, institutional status, disability, and diagnoses. These scores are used to help regulate monthly payments made to health care plans for each person enrolled in Medicare Advantage, state Medicaid managed care programs, and Medicare Part D prescription drug benefits [9].

The reports generated help carry out risk adjustment and help mitigate financial risk for the insurers. They are used in accordance with the Affordable Care Act and its two mechanisms: Transitional Reinsurance Program, and Risk Corridors.

Transitional reinsurance program: “All non-grandfathered health insurance issuers and self-insured group health plans in a given state will be assessed contributions based on their relative market share to a temporary reinsurance program for that state. The state will then channel funds to any plans in the individual market that end up covering people who have extraordinarily high medical costs. Although the details remain to be worked out, the reinsurance payments will cover a percentage of claims paid above a certain level—referred to
as an 'attachment point'—and up to a specified cap or maximum amount [9]."

Risk corridors: "Financial arrangements known as risk corridors will be structured to protect insurers from the consequences of having to pay for care for high-cost individuals. These will be particularly useful in a period of transition, such as is likely to be the case in 2014 when many sicker people and those with preexisting health conditions will be buying coverage through insurance exchanges for the first time. Under this arrangement, insurance plans whose costs turn out to be at least 3 percent less than their target cost projections—presumably because their enrollees experienced fewer health problems than expected—will pay a percentage of the money they saved to HHS. The agency will then use that money to compensate insurers whose actual costs turned out to be more than 3 percent higher than projected—presumably because their enrollees had more health expenses than initially projected. The payments in effect will cover a portion of any losses that the plans incurred on high-cost individuals [9]."

C. Test Queries and Use Case

Sample data is used in the demo of this program. The sample data includes 40 various patients and their underlying conditions in order to get a full understanding of how the reporting is structured. This tool would be utilized by emergency departments and urgent care centers to identify patients who are accessing care that is typically considered non-emergent. Once a patient comes into one of these facilities, the nurse or primary care physician fills out this form:

![Figure 7. Intake Data Form](image)

All the data gathered is stored into a HIPAA compliant database. Each managed health care unit is able to query this sample data, and generate specialized reports. These reports provide stakeholders the ability to gather the necessary data to have payments adjusted to accurately predict future risk and healthcare costs. The reports can be obtained by clicking the Export in CSV button:

![Figure 8. Record Retrieving Landing Page](image)

IV. CONCLUSION

Tele-Medicine is the use of medical information exchanged from one site to another via electronic communication to improve patients’ health. We have accomplished this by creating program to be accessed by clients at the fingertips of their own homes. The clients have to sign into a web based questionnaire and answer simple questions relating to their health. The data collected from the Medicare risk adjustment site is analyzed and determine a health score for each patient. This determines payment plans for Medicare.

The use of telemedicine is a great alternative to providing a service with communities that have a limited infrastructure. The future of telemedicine will rely on technology, economy and human factors.

Telemedicine has just started to become known to society and there are many great supporting qualities, benefits and outcomes, fewer hospital admissions, creation of networks between hospitals, and fast diagnosis with a chronic issue. There is an immense cost savings by the use of telemedicine. There is an increase in communication between hospitals and doctors in sharing inputs and ideas from around the world.

Telemedicine has a bright beginning and will continue to increase in servicing patients with healthcare. Telemedicine has benefitted in health costs, efficiency in management diseases, quicker diagnoses, and better access to patients. This will also aid patients in remote locations or people incapable of transporting themselves to medical facilities and healthcare providers. This use in operation will allow caregivers to transfer data from one location to another.
REFERENCES


