

Mauscript Submission for Journal of Clinical Hypertension Article

Home blood Pressure: Good or Bad choice for Hypertension Management

Abstract

Millions of Americans suffer from hypertension. These require care and attention, as the precautions and medications necessary for wellness often necessitate constant readings and doctor visits. In this report the authors provide qualitative method to formalize collection of home blood pressure and pulse measurements continuously or otherwise in real life setting. This approach recognizes the value of patient – provider interaction critical to guide treatment. We attempt to better understand latent factors missed in present setting for traditional practice. We also identify potential feature selection on repeated measures to assemble estimates on blood pressure, pulse and variability. Then we provide information exchange platform for interaction and rapid patient care further explaining the framework for continuous systematic report integration in the electronic medical record. After collecting patient data for more than 2500 patients we provide an in-depth analysis that would help present the model to adapt better ways to utilize home blood pressure monitoring.

Keywords: mobile health, monitoring, vital signs, patient centered medical system, BP monitoring, Diabetes, Hypertension, chronic disease, continuous BS monitoring.

Introduction

Hypertension is the most common modifiable risk factor for cardiovascular disease at global level (Kearney). The treatment of elevated blood pressure is well accepted to prevent cardiovascular events in healthcare. It is common that diagnosing hypertension is easy and treatment can achieve desired level of control through low cost medication. It is prevalent that hypertension is on the increase in the United States and across the globe. In the U.S according to revised guide line, approximately 96 million adults are affected by hypertension (Munter) and, this is an increase by 32% since 2000(Fields). In this context of increasing certainty of “elevated blood pressure is bad” there is growing pressure on general clinical care givers’ to go low. Measuring blood pressure for testing hypothesis in research and endorsement to enable clinical care givers is much-debated issue. The process of Blood pressure measurement and technical details (manual or automated), number of observations, time of measurement, knowledge on observed or otherwise, validation of urinary bladder status and such other steps are common in research. In every day clinical practice blood pressure measurement is routine. Observations are made under different circumstances. How good is the data collected in the clinic remains unsolved yet? In practice clinical significance to blood pressure over several generation, has remained static. Two discrete set points, systolic and diastolic blood pressure are used as success or failure in every day clinical practice. The

detection of blood pressure heterogeneity requires a challenging quantifiable operational process. There is admittedly, increase in interest to use out of office blood pressure as a tool to provide additional information on blood pressure phenotypes (Shimbo). There is common interest in other areas of blood pressure such as; better define various classes and phenotypes of blood pressure to support clinical practice, data estimates to support clinical confidence during intervention, report format to detect variability(kairo) and mean blood pressure, integration of pulse readings and assembling risk categories to assist better patient care based on disease association. **Another critical issue in clinical practice is data collection, validation, facilitative synchronous or asynchronous interaction, report design, integration in sequence and exchange during cross collaboration.**

Ambulatory Blood Pressure Monitoring (ABPM)

In this context characterization of blood pressure a non-static phenomenon, influenced by system level interaction (intrinsic or extrinsic) decisively, attached high level of significance to ABPM in research and encourage adoption in practice. The quality so convincing to attest superiority of ABPM over other method of blood pressure monitoring is due to inference drawn by summarizing a variable continuously as time series. This ability to monitor detect biological phenomenon in AMBP over extended time frame lends to, avoid any error inflation. However, the major challenges are many such as; cost, training, standards for usage, device and data validation, data integration, equal access to population, upgrading software, protocol for repeated measures and more. (Shimbo,Siu)

Home Blood Pressure Measurement (HBPM);

There is good quality evidence to suggest Home Blood Pressure measurement ABPM are in agreement and interchangeable in patient care. (Shimbo, Siu, Ntineri) HBP devices are automatic, more affordable, easy to validate, cuff size is appropriated, assists user interaction, set personalized goals with flexible time lines. Patients can easily become technically skilled in self measurement. Therefore, a large number of observations made at high frequency, continuously or in intervals can be advantageous to clinical management.

My take below would be to limit to Methods and patient demographic.

Below this will assemble sets on data components such as assembly on individual patient's, summary and display variability.

Follow this with data display on multiple patients' summary (Million hearts) and with variability component if possible.

This will support basic structural needs of the article for us to expand some discussion ???

?? This is not so-Ambulatory monitoring is getting to be an older method of practicing medicine and certainly seems very mechanical. ??The office setting seems to be a perfect fit for better readings of blood pressure and blood sugar (If office readings perfect our operation is invalid).

Hence the need for home blood pressure and blood sugar is getting very common in even older patients. (This following part should be reflected in demographics with averages)The average patient age for hypertension for our population has been seen around 74; hence most of our patients are over the average age of population in the community (Do we have supporting community average???) (For lack of better system >) The contemporary based approach of taking blood pressure in the office has been (in practice) (Limitation is in every one young and old) helpful because of limitations in providing with assisted technology for older people that they are use in a simple way. It could cost an annual average of over \$8,000 per patient who suffers from either of these chronic diseases [Bliese].

In an effort to improve quality of care the authors working with patients established a reliable (and cost effective) means to collect self-monitored blood pressure, blood sugar, pulse and weight routinely for fast interaction and integration of validated components continuously in the electronic medical record. The availability of affordable and reliable (Self-monitoring) blood pressure monitor, blood sugar testing device enabled us to take additional steps such as generating designed report components and solutions to integrate coordinated treatment and disease association. Formalization of the temporal process of data collection and report in every day clinical practice involves understanding (more?) flexible patient factors and actions to support evidence based guide lines. (Following discussion describes platform) In this report a basic platform for continuous information exchange, facilitate monitoring critical subsets with patient's alerts, platform for bidirectional information exchange, (factors contributing to clinical care, sustenance) and linear multi-sector data integration in the electronic medical record.

{Demographics summarizes patient categories such as age, sex, race.}

The following contents
Clinical Relevance of data (We are mixing below age of study group with data modeling with no prior introduction this. What you have mentioned above is quality aspect in the frame work-the next objectives of big data and modeling to control chronic diseases is not in line)

This method of operation reviewed data from over 2500 patients with over 1,500,000 readings from patients over the course of six years. The range for ages of patients were between the ages of 30 and 90 years old. Our main objective is to find out meaningful clinical information using statistical prediction modeling to understand the big number of data points collected after implementing these continuous monitoring methods. (As of now we are only able to interact live stream and expect to design data on blood pressure variability- beyond this we have nothing in writing) A method for patients and providers to (almost virtually interact in management in select disease conditions) ?control chronic disease states through validated continuous monitoring and medication control.

From method we are jumped in at discussion below?

Patients and Providers document vitals only in several high-stress situations per year?, leading to skewed results. This is problematic, especially for patients with chronic diseases like hypertension

or those at risk, because the provider cannot gain continuous and accurate results from a nearly random sample set. Current methods of attaining vital measurements do not provide regular direct connection between patients and providers.

Need to segregate sections under

Data collection, data components, designated format for validation and integration, frame work for synergistic interaction, care coordination, collaborative components, report assembly, format designed for care givers, data sets to detect factors involved in intervention, classify components to assist intervention sectors, (frame work for modeling trend,) tracking future population research? Format

We may need to organize sections. I see many overlapping ??

Treatment Effects of new method

The data for the analysis were obtained between 2013 and 2019 as part of the modern treatment method for a clinical practice. All subjects were patients at a endocrinology practice in NY that serves a predominately ???White, Black or African, not very densely populated, low-income neighborhoods.??? Most patient readings consist of all readings they entered through the application (Did you expect any other readings ?). All readings were then validated through the healthcare coach after the built-in algorithm . Each blood pressure measurement used in the analysis was obtained from patients through the application (Explained in validation scheme) and double checked through the system algorithm and the healthcare coach. (This mentioned before as HBPM) Systolic and diastolic measurements were obtained using an automated blood pressure monitors with different patient seated, (How did this come here??) after the child had been seated comfortably for several minutes. Only systolic blood pressure is discussed here. Data is collected using SQL Server databases and approximately in last 4 years of implementation over 500,000 readings have been collected from 1500 patients. Some of the key data elements that were collected were Age , Gender, Pulse, Height, Weight, BMI, # of CHAT messages, Blood Pressure, Blood Sugar, Diet times, Smoking . Medications and changes in medication doses have been collected for these patients.

(This is OK to expand in your discussion)

The alternative solution to this was to make patients record their vital signs from home after their each meal into an application which will allow them to be more efficient as well as keep themselves up-to-date on information that needs to be transferred instantly and effectively to their provider without saving any paper records or keeping track of when and what was their reading. There were many advantages to this system including no paper trails, no manual entry, no staff required to enter data, as well as patients are now very happy about them not saving these hundreds of logs , and taking these logs to places where they go. They did not have to worry about losing it anymore either, these logs were backed up daily and the physicians were able to talk to them instantaneously receive feedback from providers.

Some of the cons of this system were patients have now become more concerned about their health which makes it harder for them not to think if they number follows an upward trend, and hence would make them more concerned about their health. We needed to find out how do we take advantage of these readings and can have patients give a better feeling about what level of care do they need. The statistical analysis part of the model here allows us to create something called “Customized control bars for each patient”, which basically means that these patients now have their own control bars to monitor their blood pressure, blood sugar and their pulse. The algorithm presented in this paper will allow each patient to see even if they are higher than the normal blood pressure band, would they plainly need to worry too much about their health, or they could rely on this algorithm to say that even if they are higher than the normal, they are still under control. These control bars will then show the patients immediately about their current health status, and when should they actually make a call to their doctor about their concern. This certainly does not mean that the doctor does not need to worry about the patients even if number of readings fall out of the controlled region for that particular patient. The doctor intervention lines could also be seen on these modelled graphs which basically allow other physicians from different specialties to determine when to make an intervention for that patient based on their (Expectation) history, demographics as well as their averages seen through the application.

(We have distracted from BP data to a more OMNIBUS) The app aims to provide a solution to a long-time problem for healthcare providers treating patients with these types of illnesses: record keeping. Patients and providers document vitals only in several high stress situations per year, leading to skewed results. There is no way to gain continuous and accurate results from a nearly random sample set. The app serves as a place where both parties can interact and exchange vital information in real time, making for a more inclusive healthcare experience.

It's simple. Patients download the application for use on their phone or tablet device and record their blood pressure, blood glucose levels and pulse. This information is shared with the physician in charge of their care via the application on a real time basis. From there, doctors go on to use the data to better treat their patients. The application also features a chat system that allows providers to chat directly with their patients.

(I believe the descriptive components on various functionalities of the app should be filtered. Variability feature requires select information and those who are interested in app design will be referred to article with design and theme, appropriate for different place !!!)

Clinical considerations

- What considerations do practice perform to adapt to the new practice of understanding variability of SBP

Conflict of Interest

NONE

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