

## Background

Falls are one of the common causes of injuries or fatalities that require medical attention in most cases. Population most prone to falls and most affected by falls and fall related injuries are elderly population who are 65 years or older. At least 30% of this population fall each year, and half of these falls result in injuries and 10% of which are serious, these rates increase with age. The financial burden of fall injuries is expected to increase as the population ages and may reach \$67.7 billion by 2020. For elderly population, falls with or without injuries affect quality of life. Prior falls lead to a fear of falling and lead the elderly to limit their activities. This further impacts their psychological welfare.

Falls result from a combination of extrinsic and intrinsic factors. Extrinsic being the environmental hazards and situational hazards and intrinsic being factors such as physiological, pharmaceutical and neurological.

Intrinsic factors such as sensory impairment, muscle weakness, bone weakness and balance impairment have been a primary cause for falls and fall related injuries in elderly population even when extrinsic factors are not present. To assess and manage the intrinsic factors, American Geriatrics Society (AGS) has published a practice guideline on screening, assessing and managing fall injuries. The AGS guideline recommends an annual fall risk screening for adults 65 or older. Based on these screenings physicians can suggested appropriate treatments to improve neurological and physiological health which in turn can prevent falls and fall related injury.

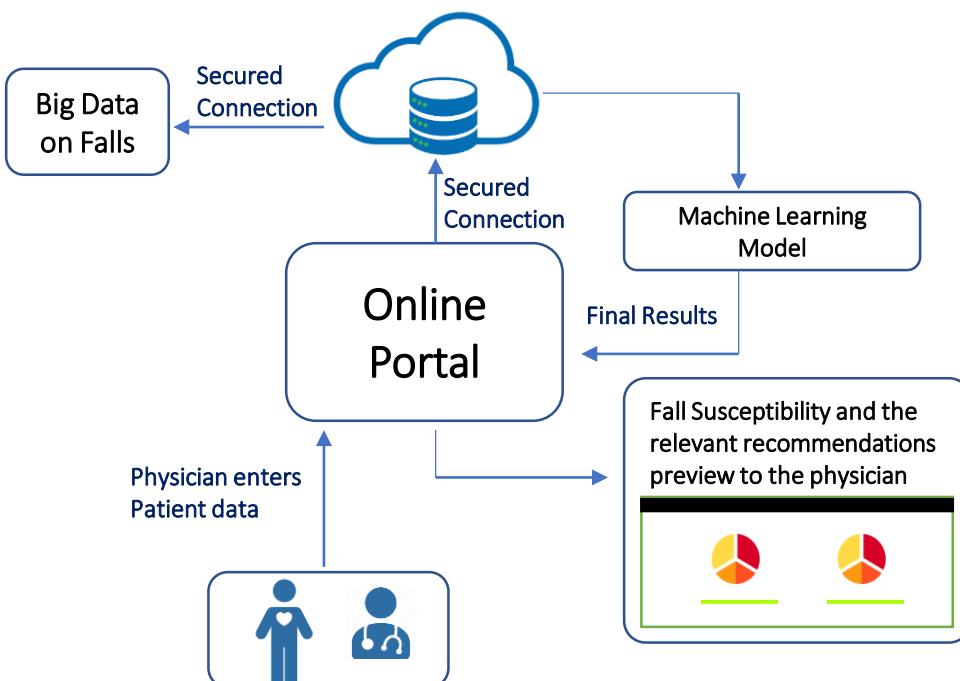
## Design Constraints



- Must have a simple design
- Has to be easy to use for the physician
- Secure database and network connections to ensure confidentiality of protected health information

## Proposed Solution

- A web application which provides a visual display of the susceptibility of a patient given his physiological conditions and the medications he uses. This solution is designed to be an assisting tool for physicians in the fall risk screening process for the elderly patients.
- **Important Guideline:** All the sensitive information identifying a patient will be protected during all the stages of the product development and deployment.








### Preliminary Phase:

1. Gather and clean Electronic Health Records data of large number of elderly patients
2. Research trends: medication usage, sensory impairment, vitamin deficiency and bone density vs falls
3. Work on a machine learning (ml) model
4. Build an interactive website connecting the database and ml model
5. Maintenance of the website and ml model

### Usage:

1. Enter a patient's current info into the patient profile on the website which will be added to the database
2. The susceptibility of a fall results will be displayed

# Stakeholder Analysis

Stakeholder	Benefits	Challenges	Constraints
<b>Patient</b> 	Prevention of future falls, better quality of life	Accurate reporting of falls; reject consent to provide data for furthering research	Comply with the HIPPA guidelines
<b>Hospital</b> 	Lower costs and healthcare resource consumption pertaining to fall assessment or treatment	Not allowing the program to be established in hospitals for financial reasons	Comply with HIPPA; the quality of the depends on the data availed by the hospital
<b>Physician</b> 	The program will be a good aide for fall risk screening and management	Distrusting the credibility of the system and avoid the use in their assessments; not entering data appropriately in a timely manner	Physicians consistency in updating each patient's profile
<b>Pharmaceutical Industry</b> 	Supplementary research material to aid their future drug formulations	Disinterest in the data collected	Limited data available on each drug; restrict use of data about a company's drug
<b>Department of Health</b> 	Lower annual expenditure that related to fall injury treatments	Disinterested in the application or unsure of its efficiency	Limits of use in the health records made available

## Market Opportunity

This application will be set up for physician use only, thereby the target market would be primarily geriatric medicine in addition to family medicine or internal medicine physicians. The primary target market are the specialties which deal with preventive care, and the secondary market is focused on specialties that focus on post fall care. According to AAMC 2015 Active Physicians in Largest Specialties report, there are about 251,000 active preventive care physicians.

## Competitive Landscape

**KenSci:** this is a Seattle based startup that used Machine Learning to help customers predict who will get sick, what they will come down with and how much it will cost. This application has a competitive edge over KenSci, because of its narrow target population leading to lower consumption of computing resources, computing services, and brain power.

## Team

- **Data Scientist:** Works on cleaning the data, data analysis, data visualization.
- **Machine Learning Engineer:** Works on building machine learning models to best suit the data and make reasonable prediction. Works closely with the data scientist.
- **Database Management Engineer:** Maintains the database and its security and provides modified and accessible versions of the data to the data scientist.
- **Cyber Security Engineer:** Maintains the security of the data and the website.
- **Full-Stack Web Developer:** Creates a clean and dynamic website.
- **Associates from Geriatric Medicine:** provide insights and feedback on design of the application.
- **Rotating Associates from Department of Health:** provide insights privacy policies and guidelines, and feedback on design.
- **Rotating Associates from Pharmaceutical companies:** provide insights on pharmaceutical research and approach.

## Business Model

### Budget allocation

- **Employees:** Technical team, Associates, other non-technical members (e.g. HR, marketing) (depending upon the growth of the product)
- **Resources:** Cloud Services (AWS or Google Cloud Services) to host the application and the database, other computing resources, miscellaneous utilities

The main funding for the application is expected to the come from private hospitals and the U.S. Department of Health to serve both private and public facilities. The funding is expected to go to primary part of the budget which are the computing resources and the preliminary engineers and other core members of the team.

### Works Cited

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