

**Big Data, meet Homecare:** How artificial intelligence can help your help your clinicians prevent readmissions

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# 14% increase in global GDP in2030 as a result of ArtificialArtificial Intelligence (AI)

(\$15.7 trillion)

The highest potential impact sector is healthcare with **37%** of the provider that are expected to adopt AI within **2020**.

Daily Health Check	1974 <u>-</u> 1974	01	2 1
Your Blood Pres	sure Measurement Readings.		
	85%	85+	
84	Illi	HR	
96 sp	<sup>22</sup> sp02		•
	99%	60 TODAY	





#### Main areas of AI potential in healthcare



#### Supporting Diagnosis



#### Pandemics

### Imaging Diagnostics

# Now what?

How does this impact homecare

#### The building blocks of Al

**Machine Learning** 

BetterOutcomes

**The Cloud** 

Sensors + Data



# Sensors are the building blocks of Al







#### **Your EHR Data**



**Cloud computing** provides a simple way to securely access servers, storage, databases storage, databases and a broad set of set of application services over the internet. internet.

#### Machine Learning



In [25]: model = LogisticRegression()
In [26]: model.fit(x\_train, y\_train)
In [27]: model.predict\_proba(x\_test)
Out[27]: 0.546



### **Example of AI Opportunities**

- Predicting adverse events (ER visits, falls, rehospitalizations)
- Predicting time to heal for a wound
- Predicting employee churn
- Predicting employee no-shows
- Predicting demand
- Predicting revenue

Al @ AlayaCare

# Remote Patient Monitoring (RPM)

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NEXT >





# SOUTHLAKE REGIONAL HEALTH CENTRE



() the HUB

St. Michael's





#### **HEALTH DRIVERS**



Source: 1 IBM's Healthcare 2015 white paper - Institute for Business Value, adapted from Ralph Synderman 2 Ontario ICES – Concentration of Healthcare Spending. May 30, 2012

### SHIFT TO THE LEFT



### **OUR FOCUS: COPD and CHF**

#### Chronic obstructive pulmonary disease (COPD)

- Characterized by progressive airflow limitation, with symptoms of dyspnoea, cough, and sputum production.
- •780,000 Ontario (5.9%) 2011 data, projected to be 1.2 million (6.9%) in 2041 with 200,000 requiring daily oxygen and up to 215 new cases per day and 157 deaths per day (2041)
  •Economic burden 3.3 billion (2011), projected to be cumulatively 172 billion by 2041 with 1 in 27 workers in 2011 living with moderate to severe forms and by 2041 1 in 11 workers

#### Congestive Heart Failure (CHF)

- •Characterized by a chronic, progressive inability and inefficacy of the heart muscle to pump, often associated with increased fluid build up around the heart
- •Single greatest reason for hospital admissions
- •2-3% of the population in developed countries and 8% of those over 75
- •Comorbidities with CHF also increasing particularly with diabetes, 29% (2004) to 45% (2013)
- •Only considering hospital admissions, the 2013 avg. cost per admission (Canada) was \$11,000, projections to 2020 are to be \$12,000 and by 2030 \$14,000 per admission
- •CHF patients hospital admission costs in 2014 were 482 million and by 2030 are projected to be 722 million

### Goals of the program

- Demonstrate that RPM could reduce hospital utilization for chronically ill patients (COPD and CHF)
- Study whether effects of selfmanagement of chronic diseases persisted post-discharge from RPM
- Analyze whether Machine Learning (AI) generated risk scores were predictive of adverse events (ER visits and hospital readmissions)



#### Solution

- Monitoring plans tailored to each patient
- Daily monitoring of vitals:
  - Blood Pressure
  - Heart Rate
  - Weight
  - Blood Oxygenation
- Questions on relevant topics such as medication compliance, etc.
- Qualitative feedback
- RN set threshold alerts on vitals
- Dynamic risk score generated by AlayaCare Al













#### **Distribution of Cohort by Gender**



- Cohort was largely elderly, but not exclusively
- In addition to the primary diagnosis, many patients had co-morbidities
- There was a female skew
- In a separate analysis, we found the health outcomes were better for women than for men in this cohort



#### Results



### SmartCoach Remote Monitoring Program

- 73% reduction in emergency department visits
- 64% reduction in the number of hospitalizations for patients
- A 35% drop in patients who need at least one hospitalization
- Estimated cost-savings to the health-care system for 74 patients of over \$150,000







#### The Smart Coach Program has helped clients learn more about their conditions



100%

Rating on Satisfaction with the Smart Program



#### Smart Coach Program has made a positive difference in Clients life





#### Client would recommend the Smart Coach Program to a Friend or Family Member



Client recognize when to go to: Emergency Department vs Monitoring at Home or seeing personal Physician before a flare up



#### Client feel more confident managing signs and symptoms related to Disease



- 79% Would strongly recommend program to Friend/Family
- 88% Now recognize when to take appropriate actions: ER vs Home Monitoring vs Visit a Personal Physician
- 63% Strongly feel that can manage disease symptoms and signs better

### **Clinical frailty**



Clinical frailty between baseline and follow up



 TeleHealth Dashboard

 ALERT
 RISK (LATEST)
 LIVE MONITORING
 LAST HEALTH CHECK DATA

 1.20
 2017-11-09
 13:48:15

 2017-11-09
 2017-11-09
 13:48:15

 2017-11-09
 89 KG

 East Results Answers
 89 KG

### Overall Risk Score Analysis

#### \* Risk Scores generated on total cohort

	High Risk Score	Low Risk Scores	Totals	Accuracy	68%
Associated with Clients			EE AE		
who HAD an Event	974	4571	5040	True Positive Rate	18%
Associated with Clients who	1210	17007	24000		
had NO Events	4342	1/02/	21909	True Negative Rate	79%
Total Risk Scores Generated	5316	22198	27514	Precision	18%
				Recall	18%

True Positive (TP): 974 high risk scores generated on clients who HAD an event

- ✤ False Negatives (FN): 4571 low risk scores generated on clients who HAD an event
- False Positives (FP): : 4342 High risk scores generated on clients who had NO event
   True Negatives (TN): 17627 Low risk scores generated on clients who had NO event
  - 68% of the time, ML algorithm accurately predicts that a client has a high risk of either (Hospitalization or ER Visit) or no event at all

## We are all data organizations

# We are all going to use Al

# Using AI is not that hard

# How will we achieve better outcomes in 2030?

# THANK YOU