

Why do Data Scientists Need Medical Experts?

The Medical Expert Role

- To explain medical concepts
- To identify clinical features, variables, guidelines
- To connect to other medical experts
- To provide clinical scenarios/patient feedback
- To interpret results of predictive models

Diabetic Medical Concepts

Hemoglobin A1C – a long term index of glucose control that when elevated correlates with the development of Diabetic Complications such as:

MICROVASCULAR

Diabetic Retinopathy

Peripheral Neuropathy

Kidney Disease

MACROVASCULAR

Peripheral Vascular Disease

Stroke

Heart attack

Identify Appropriate Guidelines for Model Variable Selection

Endocrinology Guidelines

Important Clinical Parameters

Hemoglobin A1C (average blood sugar) < 7%

Blood Pressure –Stroke Prevention

ACE Inhibitor - Blood Pressure Treatment

Creatinine Blood Test – Reflects Kidney Function

Cholesterol – Risk Of Heart Attack

Aspirin – Stroke and Heart Attack Prevention

Heart Disease Concepts

Searching for Heart Attack Patients in HER

“Chest Pain” Symptom vs Troponin blood test

Troponin: specific heart muscle enzyme released into the blood stream during a heart attack. Elevated Troponin = heart damage

Chest pain is not specific : could be pneumonia, muscle strain, indigestion

A Multidisciplinary Undertaking

Diabetic Educators

Endocrinologists

General Internists and Pediatricians

Cardiologists

Pharmacologists – Adverse Drug Events

Business School Marketing Personnel – Focus Groups

Medical Center Administrators (De-Identified EHR)

Institutional Review Board Directors (De-Identified EHR)

Who are Consumers and What do they Want?

Diabetic Patients

One website to support their self-management efforts

Tracking of glucose, blood pressure, cholesterol, diet, activity, weight

Diabetic News, Diabetic Recipes, Forums, Research

Diabetic Educators

Instructional Videos

- Finger-stick glucose (FSBG) testing using glucometers

- Insulin injection

- Glucagon injection

- Insulin Pump and Continuous Glucose Monitoring

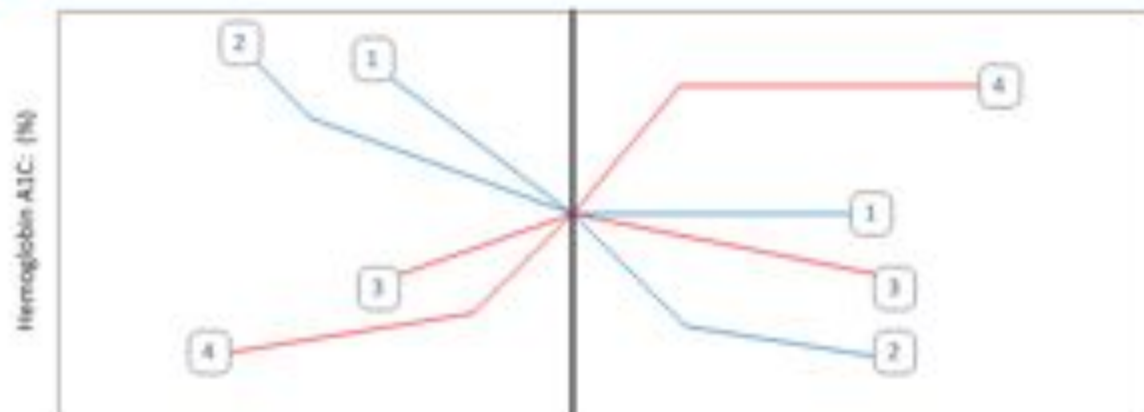
- Management of Hypoglycemia

- Diet

Endocrinologists

One uniform platform to collect FSBG and insulin pump data

Summary of patients like you



Before Day 0

2 patients (1, 2) have improving trends of HbA1c
2 patients (3, 4) have worsening trends of HbA1c

	Improving patient(s)	Worsening patient(s)
# of smoker:	0 (0%)	1 (50%)
# of overweight:	1 (50%)	2 (100%)
# of hospitalized:	1 (50%)	2 (100%)
Exercise (minutes/week):	120	60
Complications: (see more details)	Stroke: 2 (100%)	Stroke: 2 (100%) Blindness: 2 (100%)
Treatments:	Metformin: 2 (100%)	Metformin: 2 (100%) Insulin: 2 (100%)

After Day 0

2 patients (2, 3) have improving trends of HbA1c
1 patient (4) has a worsening trend of HbA1c

	Improving patient(s)	Worsening patient(s)
# of smoker:	0 (0%)	1 (100%)
# of overweight:	2 (100%)	1 (100%)
# of hospitalized:	1 (50%)	1 (100%)
Exercise (minutes/week):	120	0
Complications: (see more details)	Stroke: 1 (50%)	Stroke: 1 (100%) Heart attack: 1 (100%)
Treatments:	Metformin: 2 (100%) Insulin: 1 (50%)	Metformin: 1 (100%) Insulin: 1 (100%)



DiabeticLink-US: Risk engine

What is my risk?

Step 1: Enter Your Risk Profile

Enter your health indicators

Basic medical profile (All fields are mandatory)

☐ Male ☒ Female

Smoking ☐ Yes ☒ No

Current Age

Duration of Diabetes (Years)

A1c (%)

Total Cholesterol (mg/dl)

HDL Cholesterol (mg/dl)

LDL Cholesterol (mg/dl)

Systolic BP (mmHg)

Creatinine

Atrial Fibrillation ☐ Yes ☒ No

Analyze Your Risk

Smoking - Select "yes" if you have smoked any cigarettes in the past month.

Systolic blood pressure - Systolic blood pressure is the first number of your blood pressure reading. For example, if your reading is 120/80 (120 over 80), your systolic blood pressure is 120.

Total cholesterol - Total cholesterol is the sum of all the cholesterol in your blood. The higher your total cholesterol, the greater your risk for heart disease.

LDL cholesterol - Low density lipoproteins (LDL) is the "bad" cholesterol. LDL cholesterol is considered the "bad" cholesterol because it contributes to plaque, a thick, hard deposit that can clog arteries and make them less flexible. This condition is known as atherosclerosis. If a clot forms and blocks a narrowed artery, heart attack or stroke can result. If a blood clot forms and blocks a narrowed artery, a heart attack or stroke can result. Another condition called peripheral artery disease can develop when plaque buildup narrows an artery supplying blood to the legs. ([American Heart Association: Good vs. Bad Cholesterol](#))

HDL cholesterol - High density lipoproteins (HDL) is the "good" cholesterol. HDL cholesterol is considered "good" cholesterol because it helps remove LDL cholesterol from the arteries. Experts believe HDL acts as a scavenger, carrying LDL cholesterol away from the arteries and back to the liver, where it is broken down and passed from the body. One-fourth to one-third of blood cholesterol is carried by HDL. A healthy level of HDL cholesterol may also protect against heart attack and stroke, while low levels of HDL cholesterol have been shown to increase the risk of heart disease. ([American Heart Association: Good vs. Bad Cholesterol](#))

Creatinine - Creatinine indicates how well your kidney's work. If kidney function is not normal, creatinine level increases in your blood. This is because less creatinine is released through your urine. ([MedlinePlus Page: Creatinine blood test](#))

Advanced profile (optional)

Input values that are significant to hospitalization and stroke predictions

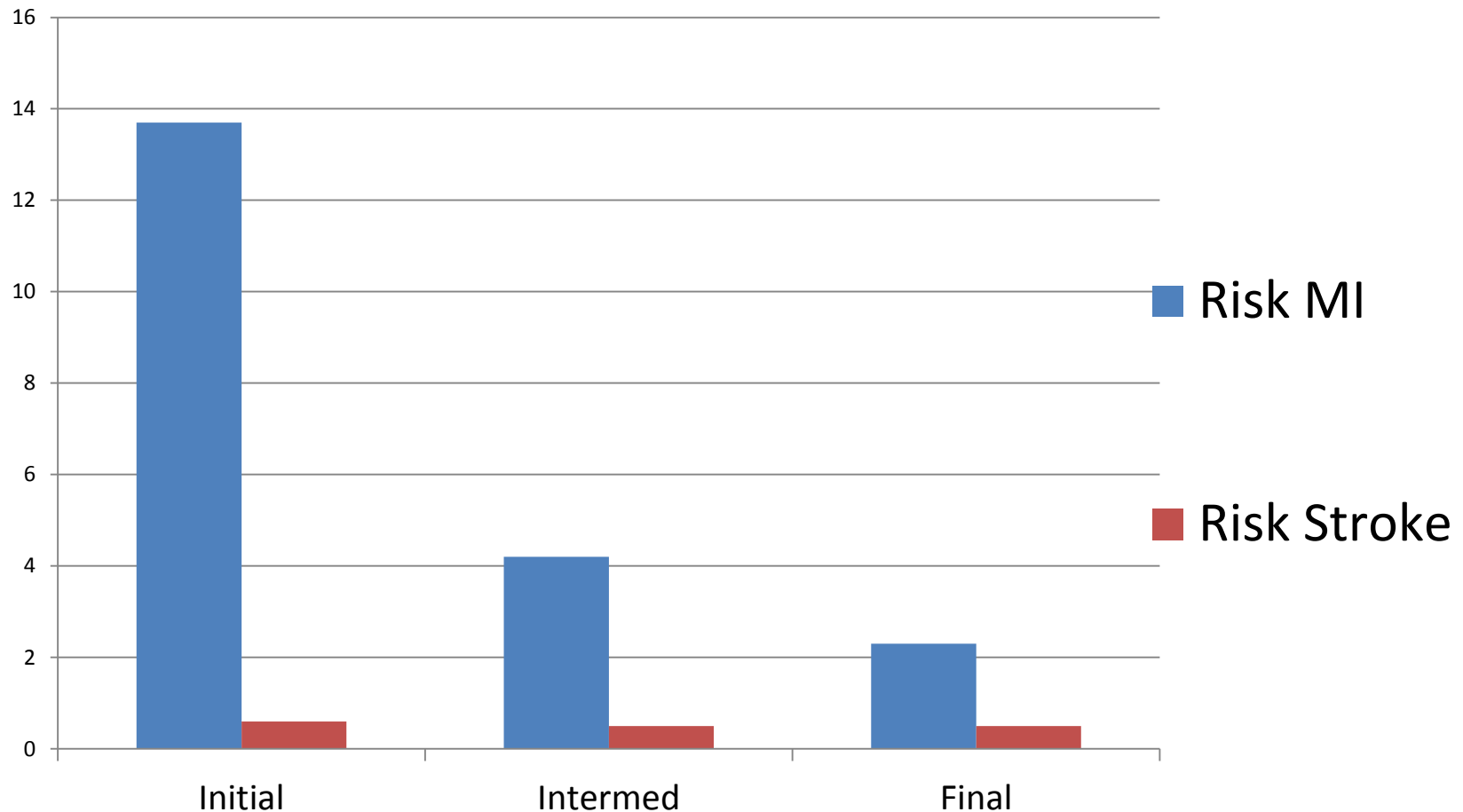
Optional inputs regarding diagnoses and drugs

Patient A Diabetic Variables

Initial, Intermediate and Final

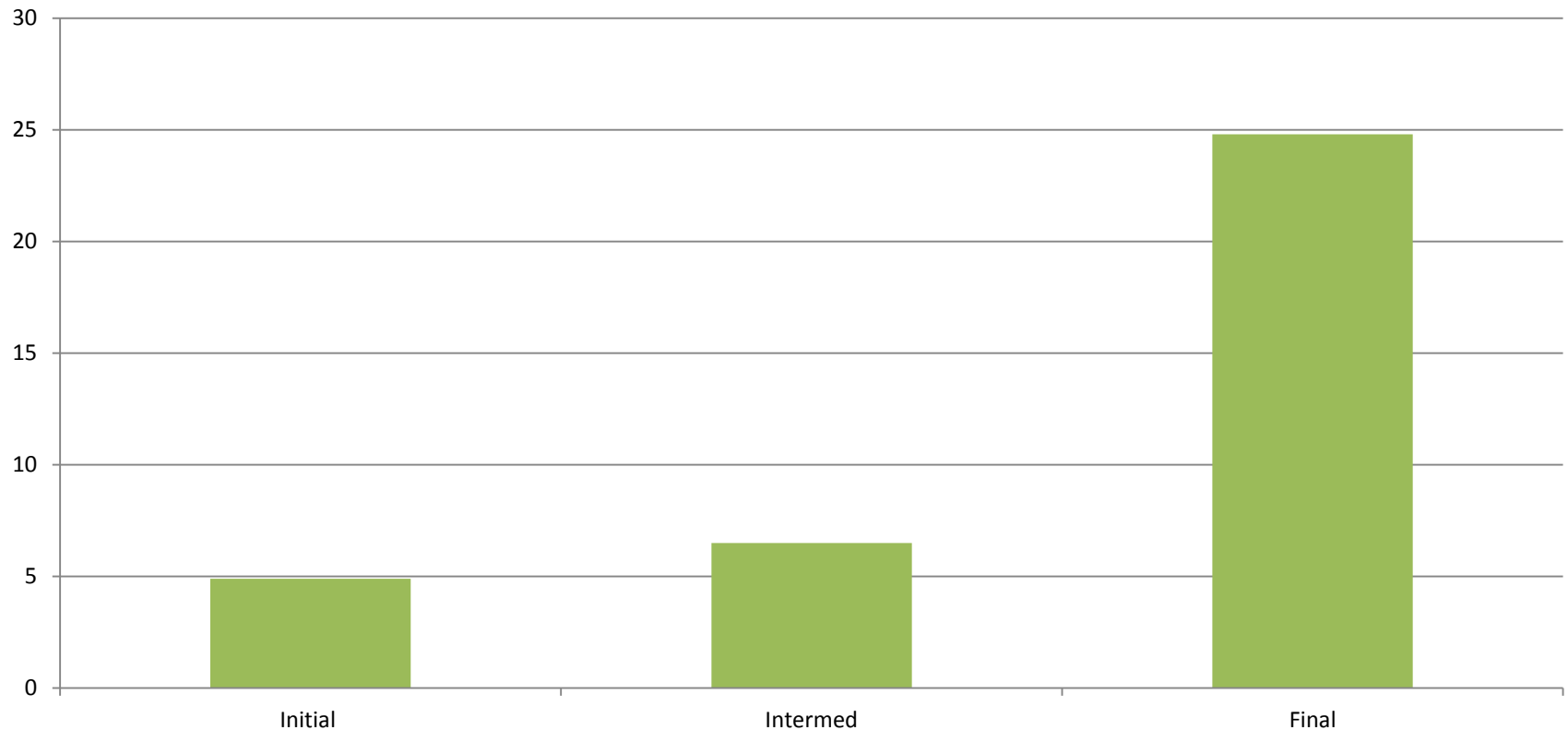
HgbA1C%	12.9	9	6.9
Corresponding Average Glucose	324	212	151
Total Cholesterol	240	141	114
HDL cholesterol	39	35	30
LDL Cholesterol	155	60	59
Systolic Blood Pressure	120	118	100

Motivating patient A to keep working to improve diabetic control



Odds Ratio for Hospitalization as a Function of Treatment over Time

Hospitalization



Conclusion

Healthcare data analytics is a multidisciplinary effort requiring participants to learn the language of a new knowledge domain.

It is most likely to be successful when an institution has multiple partners invested in the project in a collaborative fashion.

Individual patient experience suggests a health portal like Diabeticlink can have a profound effect on patients to motivate them to maintain good control of their Diabetes. Future work could utilize EHR data to develop additional strategies to improve diabetes management.