Improving Diabetes Prevention with Benefit-Based Tailored Treatment: Disseminating Individualized Risk Estimates

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Health System Reluctance to Screen

High rates of patients with prediabetes and few resources; if only we could prioritize... (AMGA's Together2Goal® Campaign)

Developing the Predictive Model

A risk-stratified analysis of individual patient data from 32 clinical trials including a reanalysis of Diabetes Prevention Program (DPP) Study (Figure 1)[1,2,3] showed:

- Heterogeneity of treatment effect, i.e., not all patients will receive average absolute risk reduction.
- Wide and highly skewed distribution of risk for developing diabetes within 3 years.[4]

The predictive model was implemented in 2 health systems, Premier Medical Associates and Mercy Health, using Allscripts and Epic, respectively.

Methods

OPTUM Labs

Design: Pre/post implementation study, 2018 – 2019.

Population studied: ~3,000 patients with prediabetes, 10 pilot primary care clinics, 40 providers, 2 health systems: (1) providers access model via EHR click, data elements auto-populate (2) manual data entry required.

Adaptations: Predictive model adapted for EHR use using Optum data:

- Removed variables like waist-to-hip ratio, see Table 1 for complete list of 11 variables and Figure 2 for patient prototype;
- Calculated coefficients for missing variables. Table 1 lists three required variables.

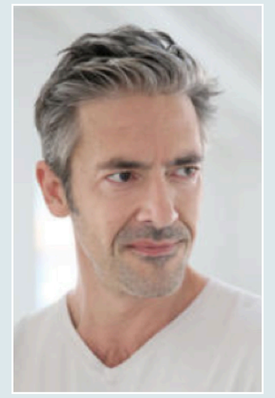
Surveys: Pre-implementation focus groups and surveys with patients & providers

Evaluation: Measures for Reach, Adoption, Maintenance (RE-AIM)[5] (Figure 3); Pre/post implementation surveys (Figure 4); and assessment of "balance" measures, e.g., preventive care screening rates.

Both have pre-diabetes. Who is at greatest risk for diabetes?

- 38-year-old female
- BMI: 34
- HbA1c: 5.8
- SBP: 153
- African American

HIGH RISK



LOW RISK

- 58-year-old male
- BMI: 22
- HbA1c: 6.1
- SBP: 121
- HDL: 100
- Former Smoker

Figure 2. Predictive model results as displayed in EHR, high- and low-risk patients

Interpretation high-risk patient

Predicted risk of T2DM at 3 years	Treatment	Relative Risk Reduction (RRR)	Number Needed to Treat (NNT)
26.0%	Usual Care	Reference	na
19.8%	Metformin	24%	17
10.9%	DPP Lifestyle	58%	7

Add to Chart

Interpretation low-risk patient

Predicted risk of T2DM at 3 years	Treatment	Relative Risk Reduction (RRR)	Number Needed to Treat (NNT)
15.0%	Usual Care	Reference	na
15.0%	Metformin	0%	na
6.3%	DPP Lifestyle	58%	12

Add to Chart

Study Objective

Implement in an EHR a predictive model for people with prediabetes that provides individualized benefit estimates for taking metformin or participating in the Diabetes Prevention Program

Figure 1. Heterogeneity of Treatment Effect: DPP Study

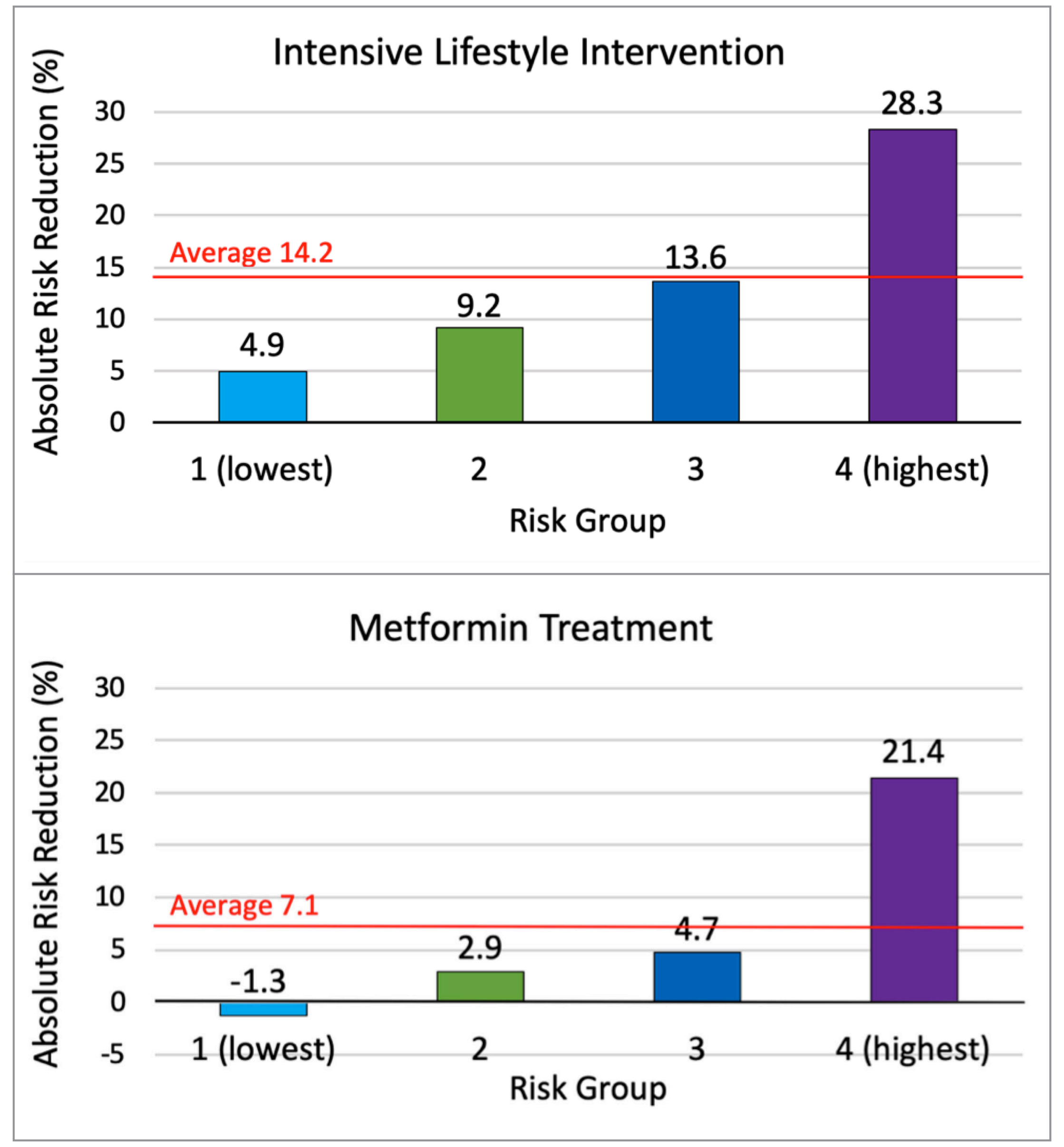


Table 1. Diabetes Risk Calculator

EHR Variables	Value	Required
Age (25–75)	74	Yes
Gender	F	Yes
Race	B	No
Smoke	Y	No
Hypertension	Y	Yes
A1c (%)	6.4	No
FPG (mg/dL)*	103	No
Triglycerides (mg/dL)	263	No
BMI (kg/m^2)	30	No
Systolic BP (mmHg)	150	No
HDL cholesterol (mg/dL)	32	No
SCORES		
usual care	56.0%	
DPP lifestyle	23.5%	
metformin	25.1%	

Conclusions

- A predictive model, embedded in the EHR, that predicts individual patient risk for developing diabetes at the point of care improved treatment for patients with prediabetes.
- Use of individualized risk estimates resulted in prioritization of treatment for patients at greatest risk of developing type 2 diabetes.

Implications

- Only 3.7% of patients with prediabetes receive metformin; even fewer enroll in the DPP. Change is needed to engage patients and empower providers with tools to increase shared decision making around treatment choices.
- Providers and systems need tools to help prioritize limited resources to increase patient treatment, referral, and adherence through more targeted and tailored treatment recommendations.
- Potential to impact the ~86 million people in the US, one in three adults, with prediabetes. Most are undiagnosed and therefore untreated.
- Cost savings estimated at $17,500 per patient averted or delayed diabetes for 5 years.

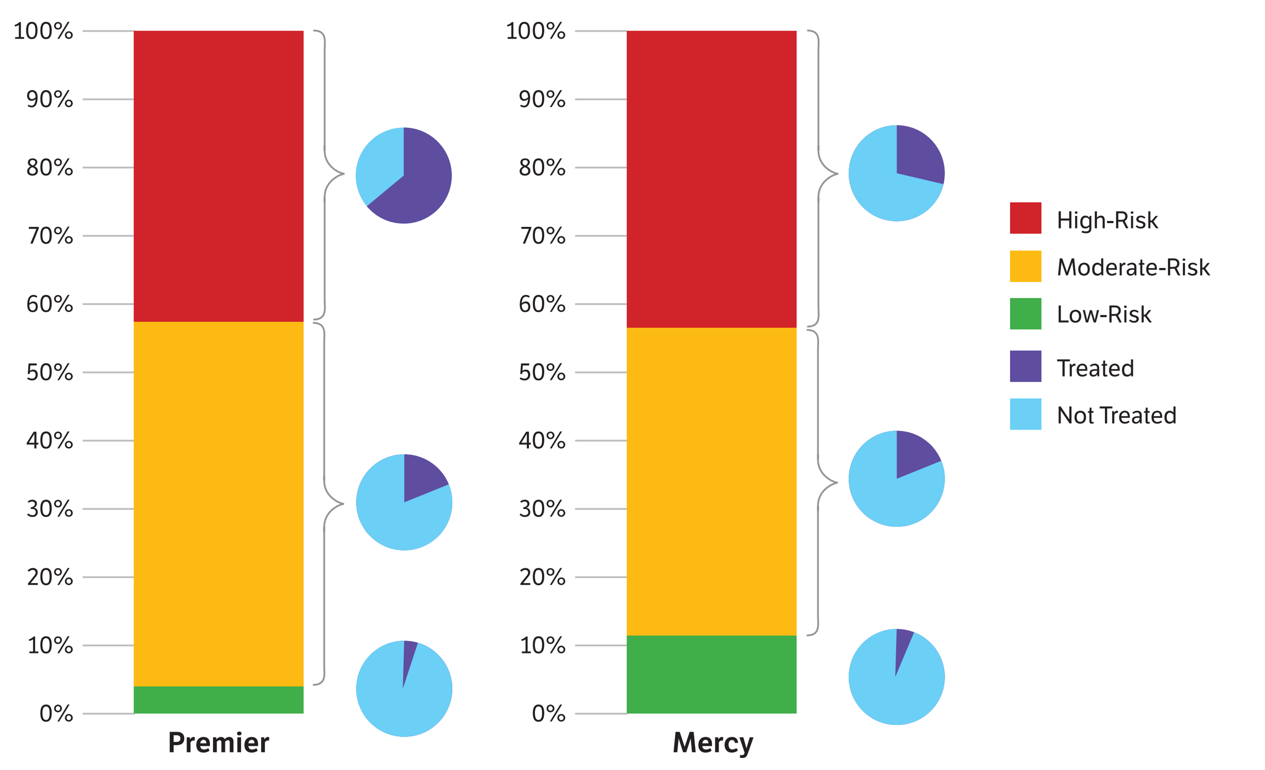
Results

Site #1	Site #2
Automated process	Manual process
2304 patients with prediabetes	710 patients with prediabetes
68% received risk tool	49% received risk tool

Table 2. Pre/Post-intervention referrals to DPP or metformin Rx among high-risk patients, by site

Organization	Pre-intervention	Post-intervention
	DPP Lifestyle	
Premier	0%	44%
Mercy	0%	12%
	Metformin	
Premier	2%	19%
Mercy	3%	17%

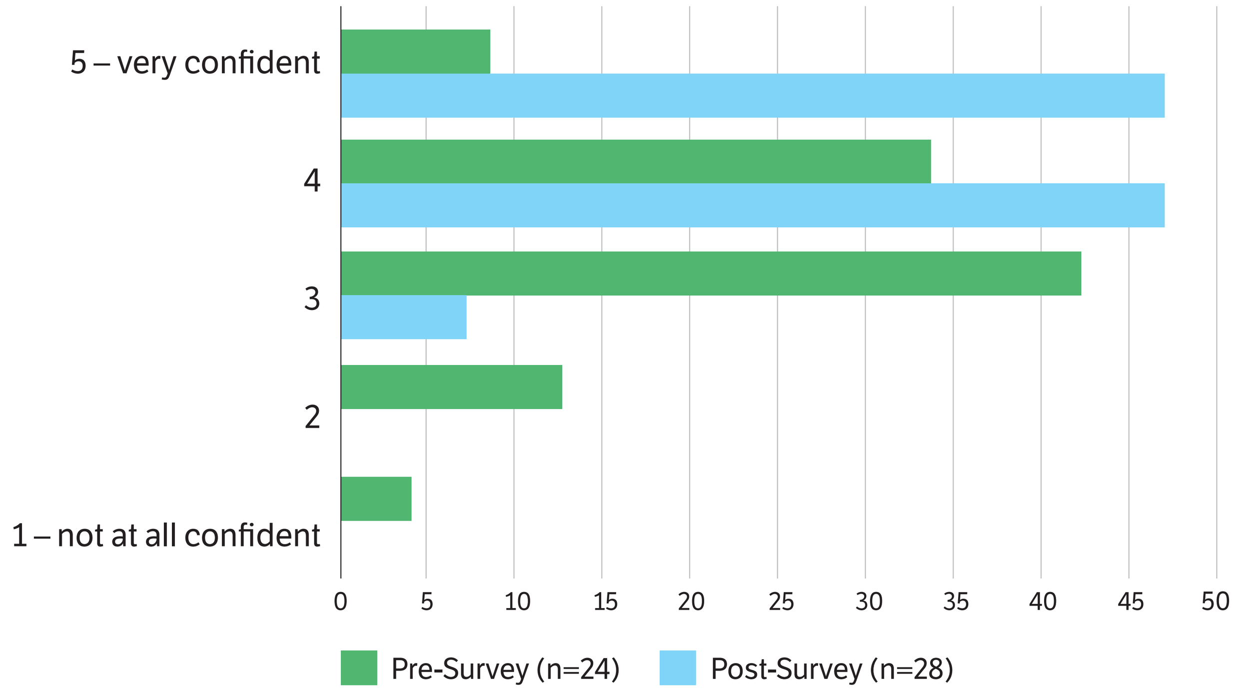
Figure 3. Patients identified and treated,* by risk level



*Treated with DPP or metformin

Figure 4. Provider confidence survey question

How confident are you in your ability to estimate the average risk of diabetes progression for your patients with prediabetes?



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