

Using Data to Guide Personalized & Evidence-Based Care of Obesity Using a Clinical Decision Support System: Focus on Type 2 Diabetes

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NAM: Roundtable on Obesity Solutions
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Disclosures

Patrick J. O'Connor MD MA MPH is a full-time employee of HealthPartners Institute in Bloomington, MN.

He declares that he has not received payment or services from a third party (government, commercial, private foundation, etc.) for any aspect of the presented work (including but not limited to grants, data monitoring board, study design, session preparation, statistical analysis, etc.) other than research grant funding from the U.S. National Institutes of Health (NIH), AHRQ, and PCORI.

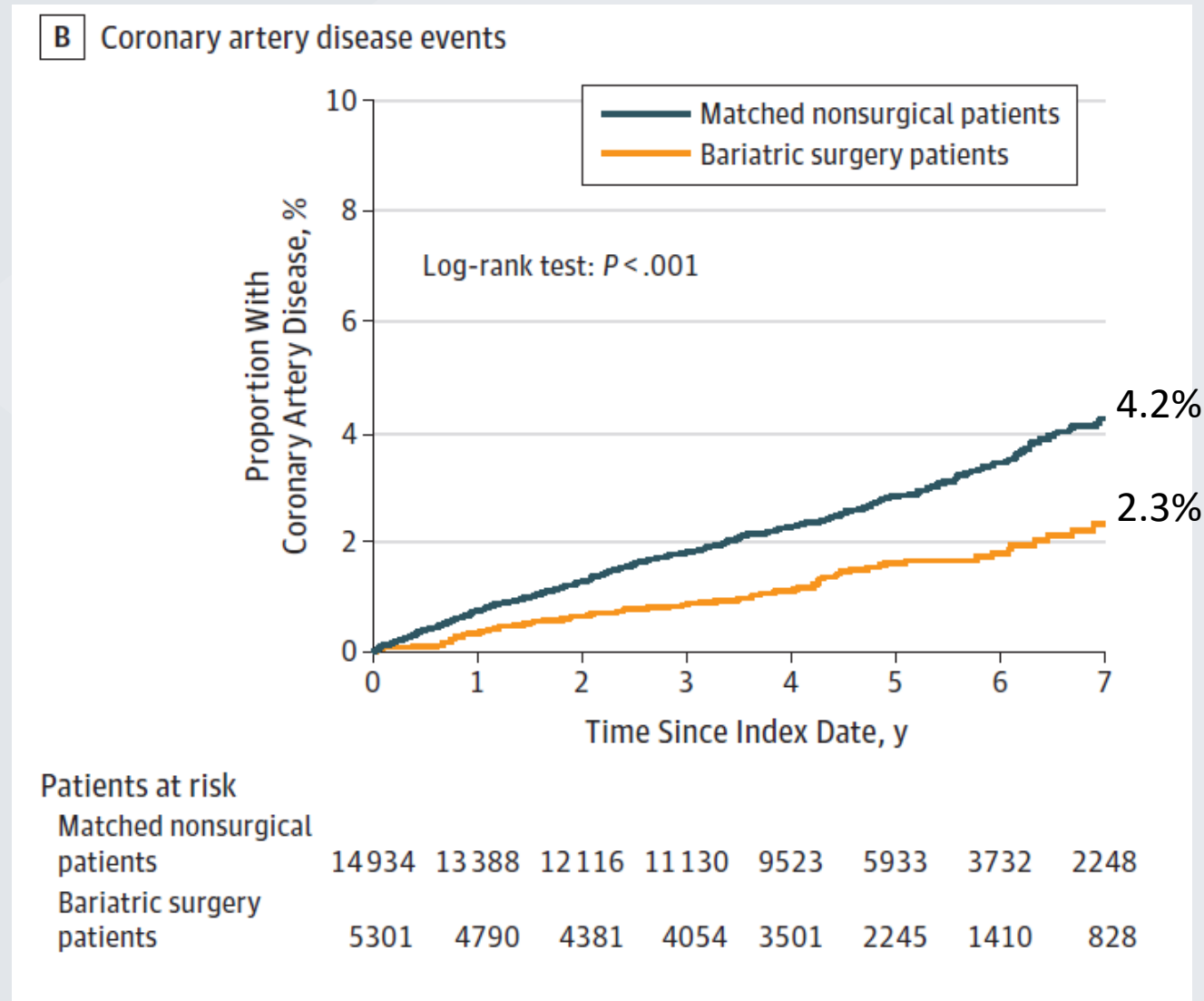
Chronic Disease Management in the U.S. Healthcare System

- Outpatient Chronic Disease Care is suboptimal and improving very slowly (E. Selvin et al, NEJM, June 2021)
- Many gaps in care = Many Opportunities for Improvement
- Data Systems and mHealth infrastructure have been rapidly evolving
- Paucity of Effective Improvement Strategies
- **Clinical Decision Support (CDS)** Systems often improve care
- Patient-Directed CDS can be used at and beyond clinical encounters
- **CDS, Simulated Learning, Gamification, and Incentives** are other promising QI approaches to chronic disease management

Effective (and Underused) Management of Overweight and Obesity

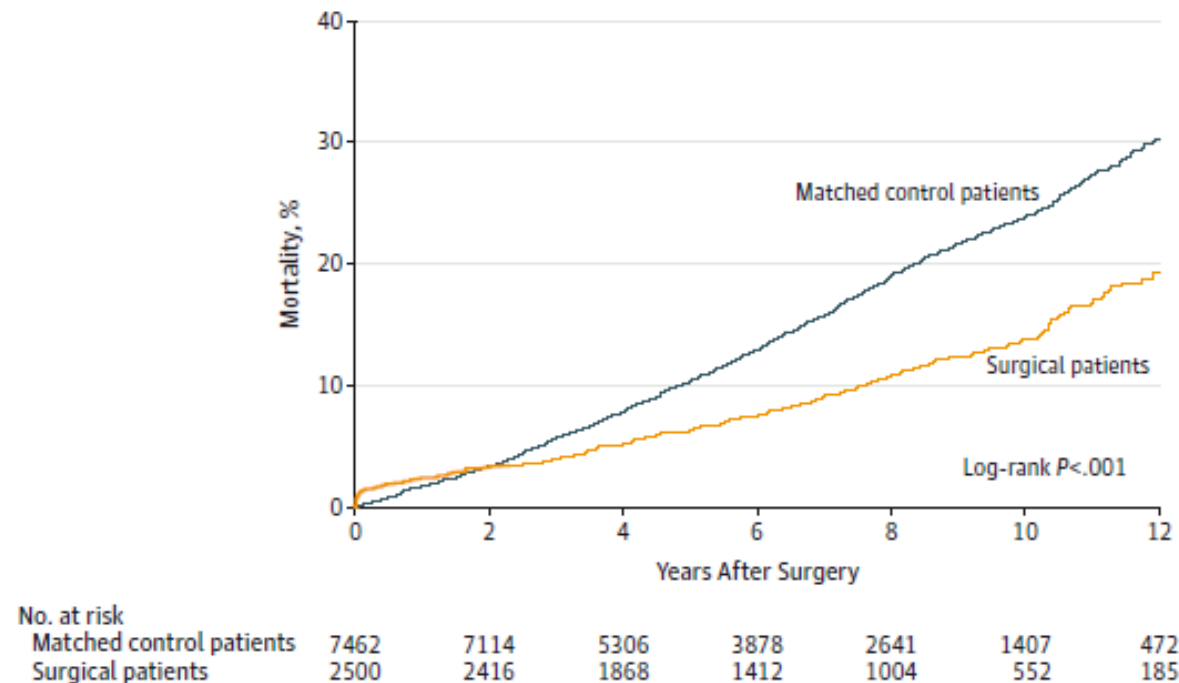
Strategy	BMI 25+	BMI 27+	BMI 35+
Lifestyle			
FDA-Approved Meds			
Metabolic Bariatric Surgery			

Impact of Metabolic Bariatric Surgery on Coronary Artery Disease in T2 Diabetes



Impact to Metabolic Bariatric Surgery on Mortality in Type 2 Diabetes

Figure. Kaplan-Meier Estimated Mortality Curves for Surgical Patients and Matched Control Patients



Arterburn et al.
 Association between
 bariatric surgery and
 long-term survival.
 JAMA
 2015;313(1):62-70

However, Benefit and Risks of MBS in Type 2 Diabetes Vary Widely:

- Age
- Sex
- Baseline BMI
- Baseline A1c (glucose control)
- Insulin Use (Duration of Diabetes)
- Comorbidities
- **Magnitude of Variation:**
 - **6 years QALY gained:** (40 yr. female, new T2DM, no insulin, BMI 40)
 - **6 months QALY lost:** (68 yr. male, long DM, CHD, insulin, high A1c, BMI 55)

“Weight-Loss Wizard”Goals (NIDDK)

Team: HealthPartners (O’Connor, Sperl-Hillen, Hooker, Vesely, McKinney, Crain), Geisinger (Still, Wood), Cleveland Clinic (Aminian), Kaiser Permanente Washington (Arterburn)

- **EMR-linked Web-based CDS system:** real-time, scalable, up-to-date algorithms based on evolving clinical guidelines and FDA actions
- **Identify evidence-based weight loss options for each patient**
- Focus on adults with type 2 diabetes and BMI ≥ 25 Kg/m²
- Communicate benefits and risks of each appropriate weight loss option to both **patient** and **primary care clinician** → **Shared Decision Making**
- Evaluate the impact of the CDS intervention on:
 - Weight trajectories
 - Medication starts and metabolic bariatric surgical referrals
 - Shared decision making (conversation about weight) & Intent to lose weight

What Do Patients Want to Know?

- How much weight will I lose? For how long?
- Will my diabetes go away? For how long?
- Can I stop any of my medicines?
- What are the risks of the surgery or medication?
- Will my insurance cover the costs of surgery or meds?

Other considerations:














- Impact on longevity? Heart attacks? Strokes?
- Impact on eye, foot, or kidney complications of diabetes?
- Need to remove excess skin?
- Quality of Life? Short-Term & Long-Term

How to Present Key Information to Patients and Clinicians: Concise & Understandable


- Primary Care Clinicians are in a hurry
- Clinicians unaware of patient-specific benefits and risks of MBS or meds
- Clinicians do not view MBS/ Meds as treatment for T2 Diabetes
- Tailor to patient's numeracy and health literacy
- Consider personal & cultural meaning of eating, weight, and treatments
- Many patients resist very much the idea of surgery or additional meds
- Overweight/obesity is often an emotionally loaded issue for both patients and clinicians

CV Wizard
Print Patient Only & Close
Print Provider Only & Close
Print All & Close (double sided printer)
Print All & Close (single sided printer)

Provider
Patient
Feedback
Statin Risk Assessment Tool

Patient Name CVW,TESTONE	Age 64	Lifetime Cardiovascular(CV) Risk* Calculated for ages 20-59	10 Year CV Risk* 33.1%
Can you reduce danger of heart attack and stroke?			
Yes, you can! If you want to reduce your chance of a stroke or heart attack, talk to your provider about what you can do about the things with the most  signs. The things with the  are ok.			
Cholesterol	Priority 2	Blood Pressure	Blood Sugar
   Recommendations: A cholesterol lowering drug called a statin may be beneficial for you. Talk to your doctor.		Goal: BP < 140/90 Your BP: (110/80) 	Goal: A1C <= 7.9 Your A1C: 8.8  
Weight	Priority 4	Tobacco	Aspirin or Blood Thinner Use
Your Weight : 183  Recommendations: For support with weight management contact: HP Nutrition Services (952-967-5120), or visit www.healthpartners.com/public/health , or call your clinic.		Tobacco user    Recommendations: For help stopping tobacco use, consider calling HealthPartners at 1-800-311-1052, or the smoking hotline at 1-800-784-8669 (1-800-QUIT NOW). Or visit www.quitplan.com .	

* The estimated likelihood of having a heart attack or stroke in the next 10 years or 30 years (lifetime risk)




















Talk to your provider about anything with one or more  symbols. Take notes here about what you can do to improve your heart health:

Later iteration of CV Wizard patient interface

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Low
literacy,
visual

TALK TO YOUR DOCTOR ABOUT HOW YOU CAN IMPROVE YOUR HEALTH
Start the conversation! Use the priorities below as a guide to take action to better your health.





 Most potential to improve your health	 More potential to improve your health	 Potential to improve your health	 Needs Attention	 Doing Well
 TOBACCO	 Current Tobacco User	For help stopping tobacco use, ask your provider about local options, call 1-800-QUIT-NOW (1-800-784-8669), or go to the website smokefree.gov .		
 CHOLESTEROL	 Your LDL: 94	Your Goal: Talk to your doctor about your statin dose.		
 BLOOD PRESSURE	 Your Blood Pressure: (135/86)	Experts recommend BP goals ranging from less than 130/80 to less than 140/90 Talk to your provider about how to lower your blood pressure and schedule a BP recheck in 2-4 weeks.		
 BLOOD SUGAR	 Your A1C: 5.8	Your Goal: A1C less than 5.7 Participating in lifestyle programs can lower your risk of developing diabetes. Talk to your primary care team about lifestyle programs they recommend.		
 WEIGHT	 Your Weight: 160	Ask your provider about local weight loss options.		
 ASPIRIN OR BLOOD THINNER		Aspirin is not recommended.		
 KIDNEY HEALTH		Good work!		

Clinician
(or high
literacy
patient)
interface

Print
button

Conditions: Hypertension, Kidney Disease, Atrial Fibrillation

Cardiovascular Risk: Risk of having a heart attack or stroke over the next 10 years is 23.0% . Risk over your lifetime is Calculated only for ages 20-59 .

BLOOD PRESSURE  Potential CV Risk Reduction: 7.5 % **	Labs <table><tr><td>BP (mm Hg)</td><td>165/82</td><td>2/11/19</td></tr><tr><td>Last BP (mm Hg)</td><td>154/88</td><td>1/9/19</td></tr><tr><td>eGFR(ml/min)</td><td>56</td><td>11/14/18</td></tr><tr><td>eGFR(ml/min)</td><td>51</td><td>8/1/18</td></tr><tr><td>eGFR(ml/min)</td><td>53</td><td>8/5/16</td></tr><tr><td>K (mmol/L)</td><td>4.3</td><td>11/14/18</td></tr></table> Medications Metoprolol Succinate Tab SR 24HR 200 MG	BP (mm Hg)	165/82	2/11/19	Last BP (mm Hg)	154/88	1/9/19	eGFR(ml/min)	56	11/14/18	eGFR(ml/min)	51	8/1/18	eGFR(ml/min)	53	8/5/16	K (mmol/L)	4.3	11/14/18	Goal: Ideal BP <120/80 Treatment Considerations <ul style="list-style-type: none">No blood pressure was documented today.The blood pressure meets Stage 2 HTN criteria (>=140/90). Consider adjusting BP medication if BP has been consistently elevated, and reassess in 1 month.Consider home BP monitoringConsider ACEI/ARB medications based on kidney function tests. Check a potassium and creatinine test 1-2 weeks after starting ACEI/ARB, and continue them unless the creatinine rises more than 30%.Consider starting:<ul style="list-style-type: none">ACEI/ARBThiazide DiureticCCB
BP (mm Hg)	165/82	2/11/19																		
Last BP (mm Hg)	154/88	1/9/19																		
eGFR(ml/min)	56	11/14/18																		
eGFR(ml/min)	51	8/1/18																		
eGFR(ml/min)	53	8/5/16																		
K (mmol/L)	4.3	11/14/18																		
BMI  Potential CV Risk Reduction: 1.4 % **	Labs <table><tr><td>Weight(lbs)</td><td>273</td><td>2/11/19</td></tr><tr><td>BMI</td><td>41.51</td><td>2/11/19</td></tr></table>	Weight(lbs)	273	2/11/19	BMI	41.51	2/11/19	Treatment Considerations <ul style="list-style-type: none">Discuss advantages of reducing weight by 10-20 lbs. Potential actions are listed on patient interface.Based on BMI and/or other comorbid conditions, consider discussing bariatric surgery.												
Weight(lbs)	273	2/11/19																		
BMI	41.51	2/11/19																		
ASPIRIN  Potential CV Risk Reduction: 2.6 % **	Labs Medications Aspirin Tab 325 MG	Treatment Considerations <ul style="list-style-type: none">CHADS2VASC score is >= 2 indicating a moderate to high risk of stroke. Anticoagulation is strongly recommended.																		
CKD  Potential CV Risk Reduction: 0.0 % **	Labs <table><tr><td>eGFR(ml/min)</td><td>56</td><td>11/14/18</td></tr><tr><td>eGFR(ml/min)</td><td>51</td><td>8/1/18</td></tr><tr><td>eGFR(ml/min)</td><td>53</td><td>8/5/16</td></tr></table>	eGFR(ml/min)	56	11/14/18	eGFR(ml/min)	51	8/1/18	eGFR(ml/min)	53	8/5/16	Treatment Considerations <ul style="list-style-type: none">Consider updating albumin to creatinine ratio resultsTo prevent progression of Kidney disease pay attention to:<ul style="list-style-type: none">Lowering blood pressureStarting an ace inhibitor or angiotensin receptor blocker medicationAvoiding NSAIDs									
eGFR(ml/min)	56	11/14/18																		
eGFR(ml/min)	51	8/1/18																		
eGFR(ml/min)	53	8/5/16																		

Suggestion tab -
to type feedback

Weight Loss
options will be
expanded

RELEVANT INFORMATION AND RECOMMENDATIONS																																
Labs <table><tr><td>Random Plasma Glucose</td><td>139</td><td>8/1/18</td></tr><tr><td>Serum Creatinine</td><td>1.33</td><td>11/14/18</td></tr><tr><td>eGFR(ml/min)</td><td>56</td><td>11/14/18</td></tr><tr><td>LDL (mg/dl)</td><td>47</td><td>8/1/18</td></tr><tr><td>HDL (mg/dl)</td><td>30</td><td>8/1/18</td></tr><tr><td>TRIG (mg/dl)</td><td>434</td><td>8/1/18</td></tr><tr><td>TC (mg/dl)</td><td>122</td><td>8/1/18</td></tr><tr><td>ALT (mg/dl)</td><td>28</td><td>6/1/15</td></tr><tr><td>Smoking Status/Review Date</td><td>NEVER</td><td>2/11/19</td></tr><tr><td>Smokeless Tobacco</td><td>NEVER</td><td>2/11/19</td></tr></table>	Random Plasma Glucose	139	8/1/18	Serum Creatinine	1.33	11/14/18	eGFR(ml/min)	56	11/14/18	LDL (mg/dl)	47	8/1/18	HDL (mg/dl)	30	8/1/18	TRIG (mg/dl)	434	8/1/18	TC (mg/dl)	122	8/1/18	ALT (mg/dl)	28	6/1/15	Smoking Status/Review Date	NEVER	2/11/19	Smokeless Tobacco	NEVER	2/11/19	GLYCEMIC CONTROL <ul style="list-style-type: none">A glucose reading >=100 mg/dL was identified (fasting status unknown). Consider screening for prediabetes with A1c or FPG and/or add prediabetes to the problem list if indicated. LIPID <ul style="list-style-type: none">Patient unlikely to benefit from statin use based on the ACC/AHA lipid guidelines. TOBACCO <ul style="list-style-type: none">Smoking is not identified.	
Random Plasma Glucose	139	8/1/18																														
Serum Creatinine	1.33	11/14/18																														
eGFR(ml/min)	56	11/14/18																														
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Smokeless Tobacco	NEVER	2/11/19																														

Recommendations

- Clinical Decision Support directed to patients and clinicians in primary care and other settings has potential to promote uptake of effective weight management strategies.
- Clinical Decision Support may need to be combined with other care improvement strategies (active outreach, case management, simulated learning, gamification, incentives) to maximize impact on quality of care.
- Evidence informed estimation of the benefits and risks of weight management strategies at the individual level can inform shared decision making around weight management strategies.
- For adults with type 2 diabetes and obesity, framing weight management options as treatments for diabetes (versus obesity) may motivate more serious consideration of such options by some clinicians and patients.

Challenges

- Many clinicians and patients underestimate the effectiveness and safety of FDA-approved medications and metabolic bariatric surgery for weight management, especially for patients with type 2 diabetes.
- Communicating evidence-informed personalized estimates of benefits and risks of weight management options is challenging.
- Tailoring such communications based on numeracy, health literacy, cultural considerations, and clinical status is an unmet challenge.
- Care is needed to assure that informatics-driven quality improvement strategies, such as clinical decision support, improves health equity

- **Clinical Effectiveness**

- Sperl-Hillen JM, Crain AL, Margolis KL, Ekstrom HL, Appana D, Amundson G, Sharma R, Desai JR, O'Connor PJ. Clinical Decision Support Directed to Primary Care Patients and Providers Reduces Cardiovascular Risk: A Randomized Trial. *J Am Med Inform Assoc*. 2018 Sep;25(9):1137-46.
- O'Connor PJ, Sperl-Hillen JM, Rush WA, Johnson PE, Amundson GH, Asche SE, Ekstrom HL, Gilmer TP. Impact of Electronic Health Record Clinical Decision Support on Diabetes Care: A Randomized Trial. *Ann Fam Med*; 2011; 9(1) 12-21. PMCID: PMC3022040.

- **Cost Effectiveness**

- Gilmer TG, O'Connor PJ, Sperl-Hillen JM, Rush WA, Johnson PE, Amundson GH, Asche SE, Ekstrom HL. Cost Effectiveness of an Electronic Medical Record Based Clinical Decision Support System. *Health Serv Res*. 2012 Dec;47(6):2137-58. PMCID: PMC3459233.

- **CDS Design and Implementation**

- Kharbanda EO, Nordin JD, Sinaiko AR, Ekstrom HL, Stultz JM, Sherwood NE, Fontaine PL, Asche SE, Dehmer SP, Amundson GH, Appana DX, Bergdall AR, Hayes MG, O'Connor PJ. TeenBP: Development and Piloting of an EHR-Linked Clinical Decision Support System to Improve Recognition of Hypertension in Adolescents. *EGEMS (Wash DC)*. 2015 Jul 9;3(2):1142. PMCID: PMC4537153
- Desai JR, Sperl-Hillen JM, O'Connor PJ. Patient preferences in diabetes care: overcoming barriers using new strategies. *J Comp Eff Res*. 2013 Jul;2(4):351-4
- Sperl-Hillen JM, Averbeck B, Palattao K, Amundson G, Ekstrom HL, Rush WA, O'Connor PJ. Outpatient EHR-Based Diabetes Clinical Decision Support that Works: Lessons Learned from Implementing Diabetes Wizard. *Diabetes Spectr*. 2010;23(3):149
- O'Connor PJ. Opportunities to increase the effectiveness of EHR-Based Diabetes Clinical Decision Support. *Appl Clin Inform*. 2011 Aug 31; 2(3):350-4. PMCID: PMC3631926
- O'Connor PJ, Desai JR, Butler JC, Kharbanda EO, Sperl-Hillen JM. Current status and future prospects for electronic point-of-care clinical decision support in diabetes care. *Curr Diab Rep*. 2013 Apr;13(2):172-6. PMCID: PMC3595375

Thank you!

Patrick O'Connor

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CV Wizard Impact on Clinician Communication with Patients

Clinician Survey Results	User	Non-user	P-value
Use calculated CV risk while seeing patients	73%	28%	0.006
Feel well prepared to discuss CV risk reduction priorities with patients	98%	78%	0.03
Able to provide accurate advice on aspirin for primary prevention	75%	48%	0.02
Often discuss CV risk reduction with patients	60%	30%	0.06

Clinician Satisfaction with CV Wizard

Wizard User Comments (N=47)	% Agree/Strongly Agree
Improved CV risk factor control	98%
Saved time when talking to patients about CV risk reduction	93%
Efficiently elicited patient treatment preferences	90%
Useful for shared decision-making	95%
Influenced treatment recommendations	89%
Helped initiate CV risk discussions	94%
My patients liked the Wizard	85%

MATRIX MODEL:

Identifying Evidence-Based Care Options for Each Patient at a Given Point in Time

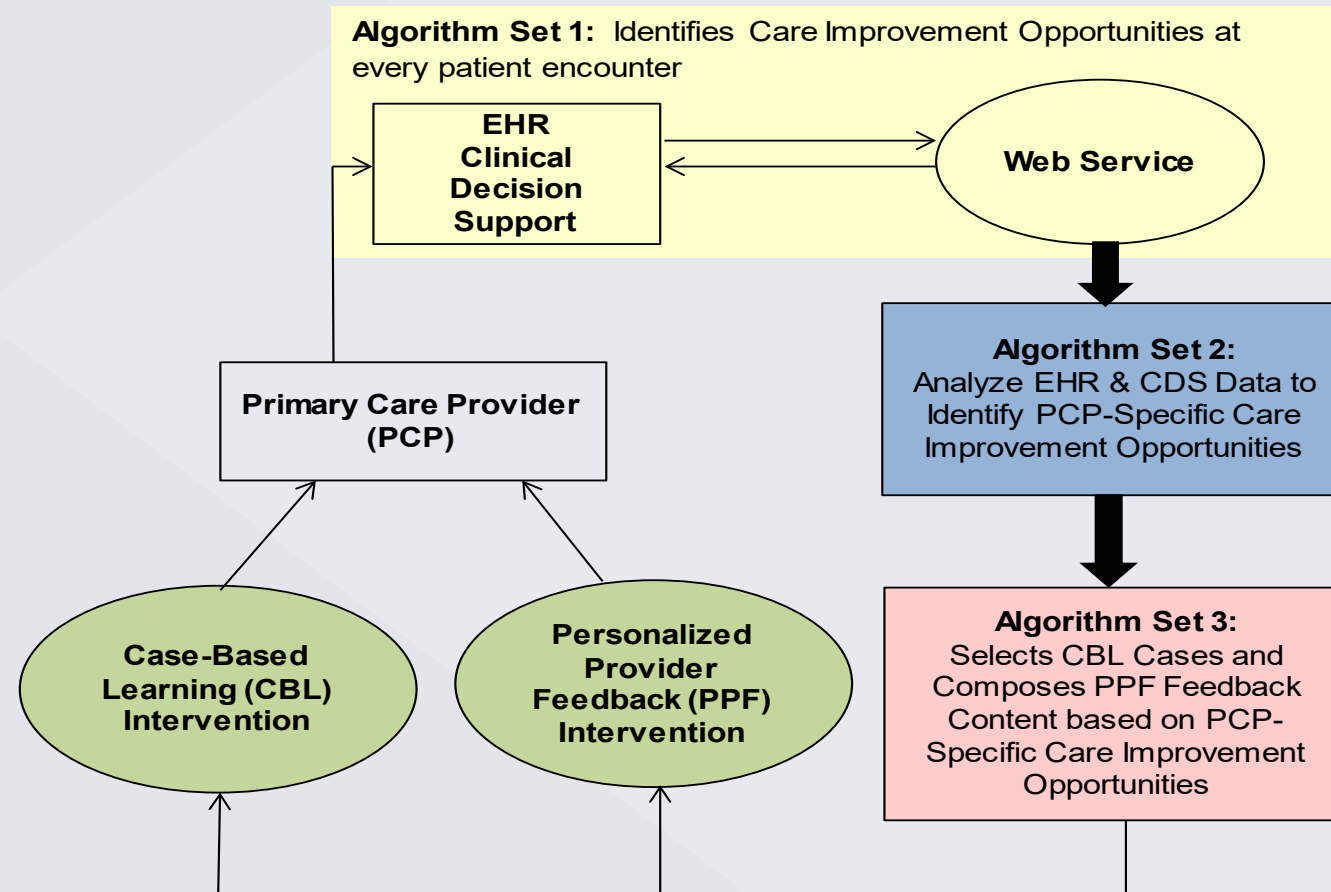
Patient	Evidence-Based Care (N= 100)*						Max Benefit to each Patient***		
	Shots	CA SCR	SMK	Phys Active	A1c, BP, LDL	100**			
A		X		X			91	4	15
B	X		X		X		8	57	81
C		X	X	X	X		94	2	43
D				X			76	30	5

*Data can be drawn both from the EMR and from patient report
**Each column header represents a set of web-based clinical algorithms
***These are prioritized by another set of prioritization algorithms

Conceptual Model of an Outpatient Learning Healthcare System

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CDS Development Support

TOPIC	Principal Investigator, dates	Funding Source
Diabetes	O'Connor/Sperl-Hillen 2004-2009	NIDDK \$3.7 million
Cardiovascular Risk	O'Connor/Sperl-Hillen 2010-2015	NHLBI \$2.6 million
Serious Mental Illness	Rossom/Sperl-Hillen 2014-2020	NIMH \$2 million
Prediabetes	Desai/O'Connor 2015-2021	NHLBI \$3.7 million
Cancer Prevention	Elliott/Sperl-Hillen 2015-2020	NCI \$3 million
BP Management in Adolescents x 2	Kharbanda/O'Connor 2012-2023	NCI \$4.9 million
Pediatric Acute Abdominal Pain in Emergency Care	Kharbanda/O'Connor 2014-2020	NICH \$3.6 million
CVD care in the Safety Net	O'Connor/Sperl-Hillen 2016-2021	NHLBI \$3.7 million
Opioid Use Disorder	Rossom/Sperl-Hillen 2018-2024	NIDA \$4.5 million
Medication Adherence	Sperl-Hillen/O'Connor 2018-2023	NHLBI \$3.6 million
Chronic Kidney Disease; Cognitive Impairment; Weight Loss	Sperl-Hillen/O'Connor/Hanson 2018-2026	PCORI; NIDDK; \$9.6 million
Total Federal Funding		\$42.9 million