

Primary Care Electronic Health Record Data: Good to the last byte

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CPCSSN

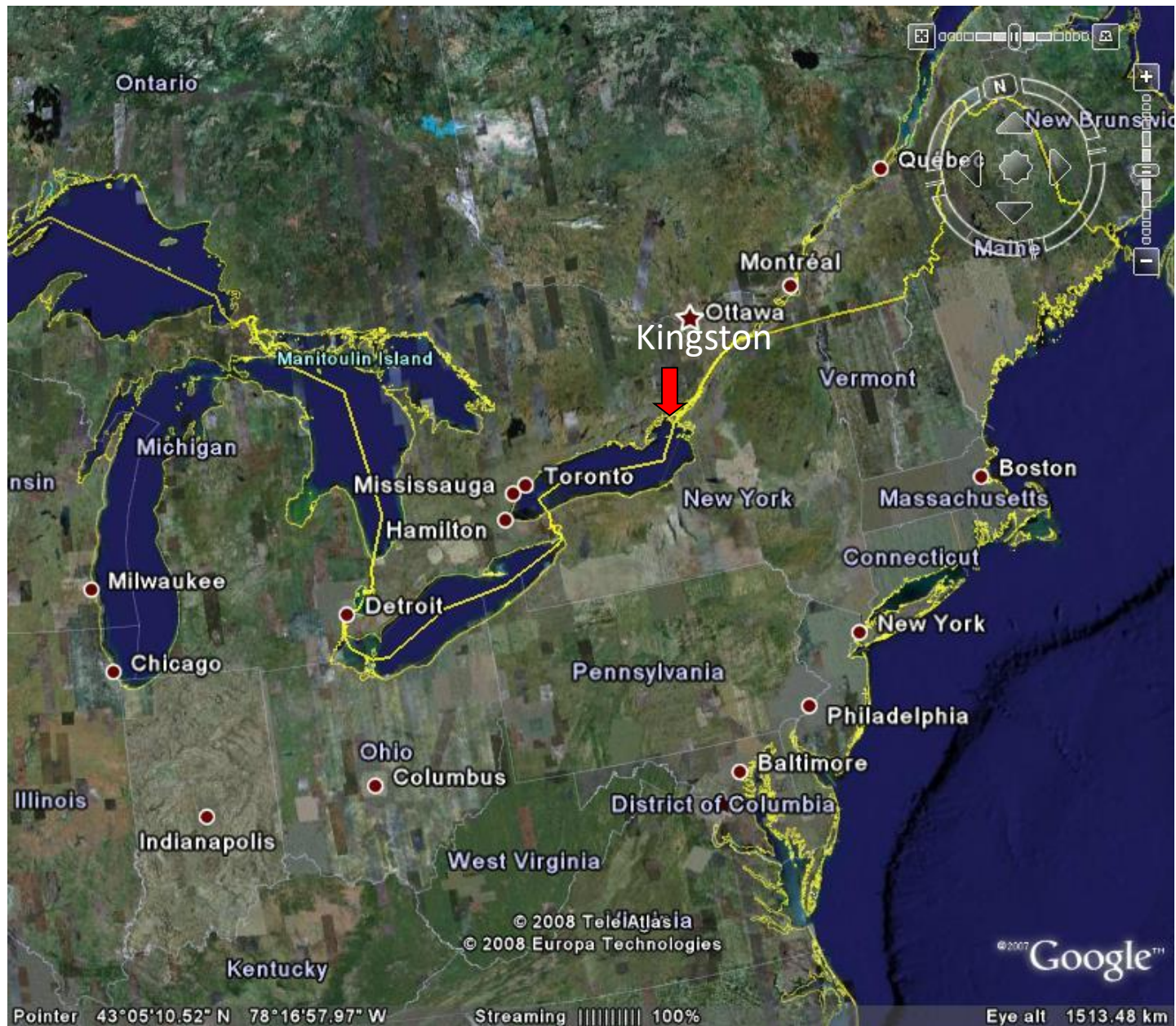


RCSSSP

Canadian Primary Care Sentinel Surveillance Network
Réseau canadien de surveillance sentinelle en soins primaires

**I have no conflicts of interest related
to this presentation.**

- 1. The importance of using data for the health system and quality clinical care.**
- 2. Overview of the Canadian Primary Care Sentinel Surveillance Network (CPCSSN).**
- 3. Examples of use of EMR data for surveillance, research and clinical practice.**



Kingston Canada



Commonwealth Fund International Scorecard

EXHIBIT ES-1. OVERALL RANKING

COUNTRY RANKINGS

Top 2*
Middle
Bottom 2*



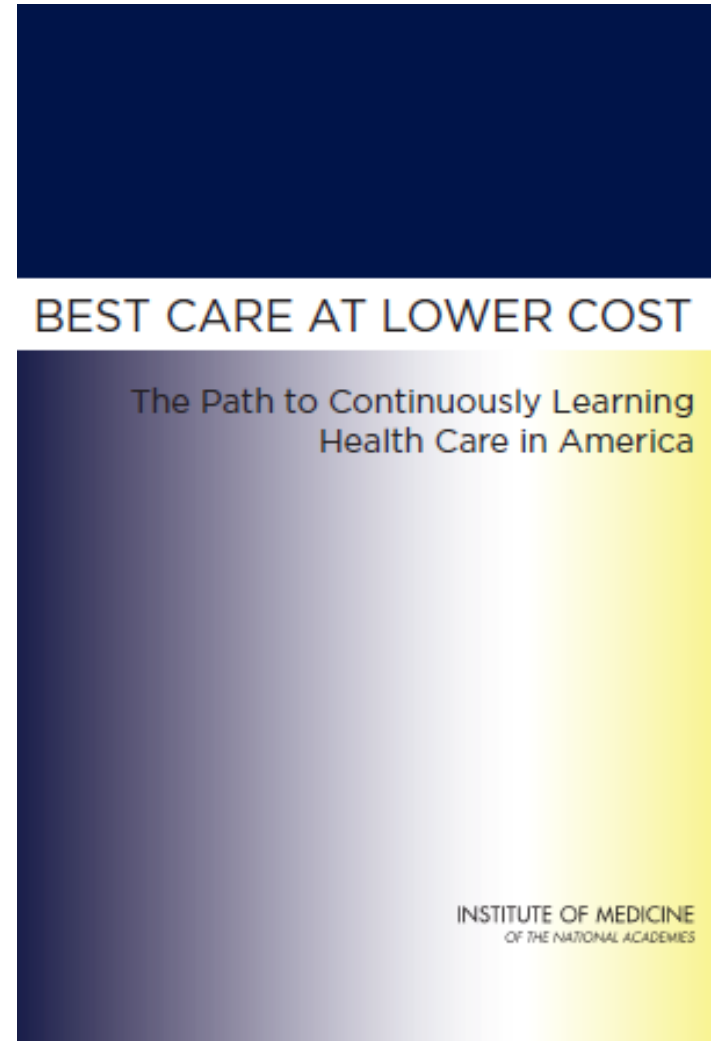
	AUS	CAN	FRA	GER	NETH	NZ	NOR	SWE	SWIZ	UK	US
OVERALL RANKING (2013)	4	10	9	5	5	7	7	3	2	1	11
Quality Care	2	9	8	7	5	4	11	10	3	1	5
Effective Care	4	7	9	6	5	2	11	10	8	1	3
Safe Care	3	10	2	6	7	9	11	5	4	1	7
Coordinated Care	4	8	9	10	5	2	7	11	3	1	6
Patient-Centered Care	5	8	10	7	3	6	11	9	2	1	4
Access	8	9	11	2	4	7	6	4	2	1	9
Cost-Related Problem	9	5	10	4	8	6	3	1	7	1	11
Timeliness of Care	6	11	10	4	2	7	8	9	1	3	5
Efficiency	4	10	8	9	7	3	4	2	6	1	11
Equity	5	9	7	4	8	10	6	1	2	2	11
Healthy Lives	4	8	1	7	5	9	6	2	3	10	11
Health Expenditures/Capita, 2011**	\$3,800	\$4,522	\$4,118	\$4,495	\$5,099	\$3,182	\$5,669	\$3,925	\$5,643	\$3,405	\$8,508

Notes: * Includes ties. ** Expenditures shown in \$US PPP (purchasing power parity); Australian \$ data are from 2010.

Source: Calculated by The Commonwealth Fund based on 2011 International Health Policy Survey of Sicker Adults; 2012 International Health Policy Survey of Primary Care Physicians; 2013 International Health Policy Survey; Commonwealth Fund *National Scorecard 2011*; World Health Organization; and Organization for Economic Cooperation and Development, *OECD Health Data, 2013* (Paris: OECD, Nov. 2013).

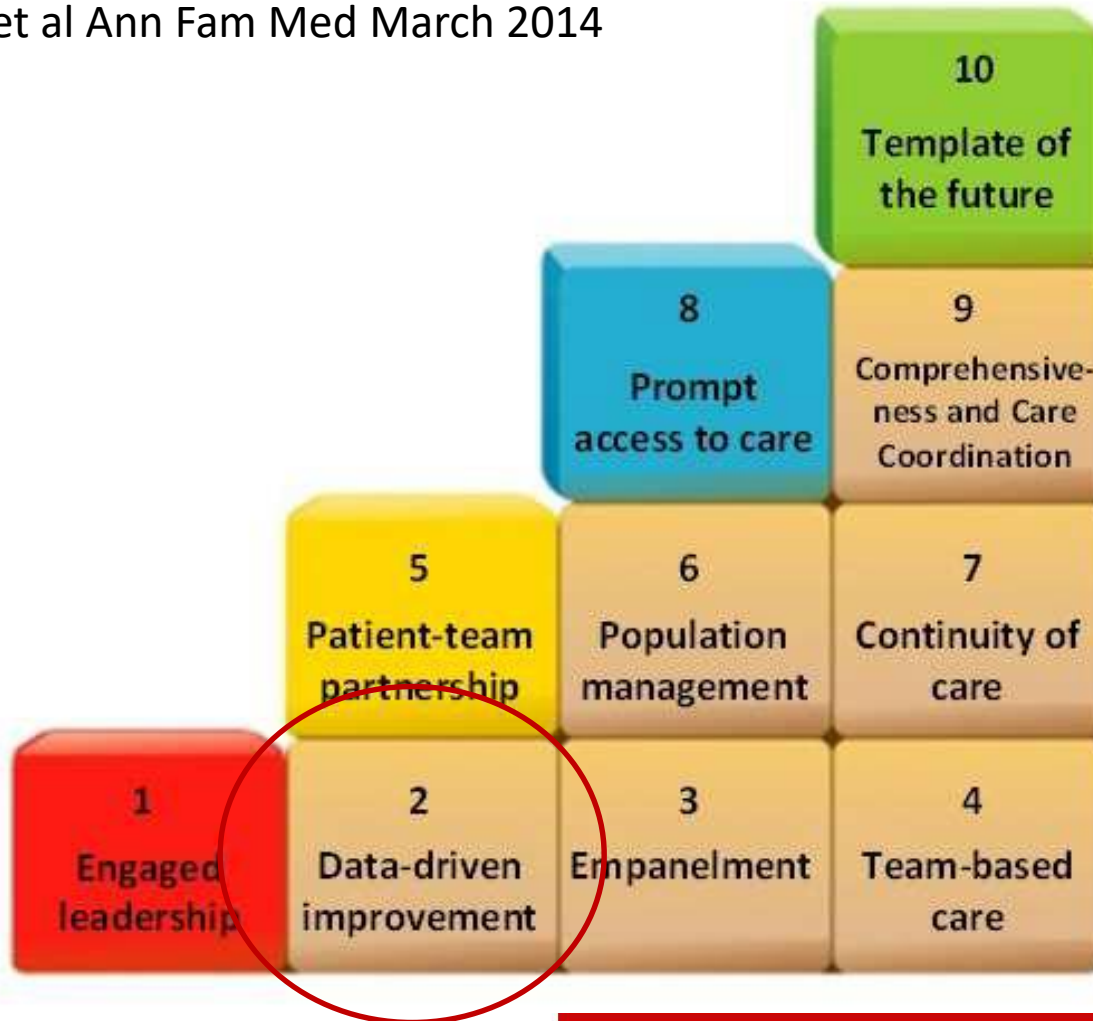
2012 IOM Recommendations

1. Digital Infrastructure
2. Data Utility
3. Clinical Decision Aids

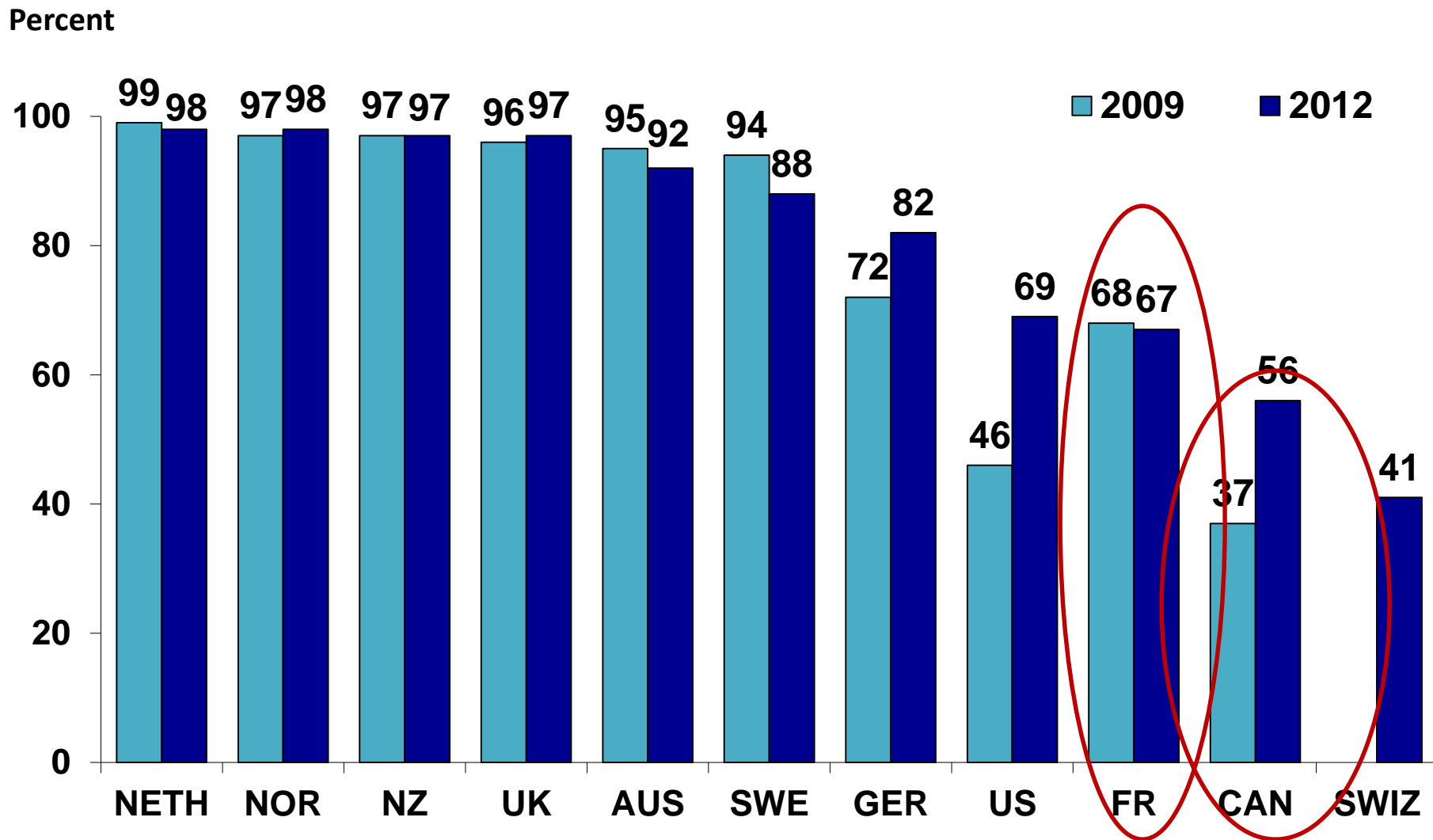


10 Building Blocks of High-Performing Primary Care

T Bodenheimer et al Ann Fam Med March 2014

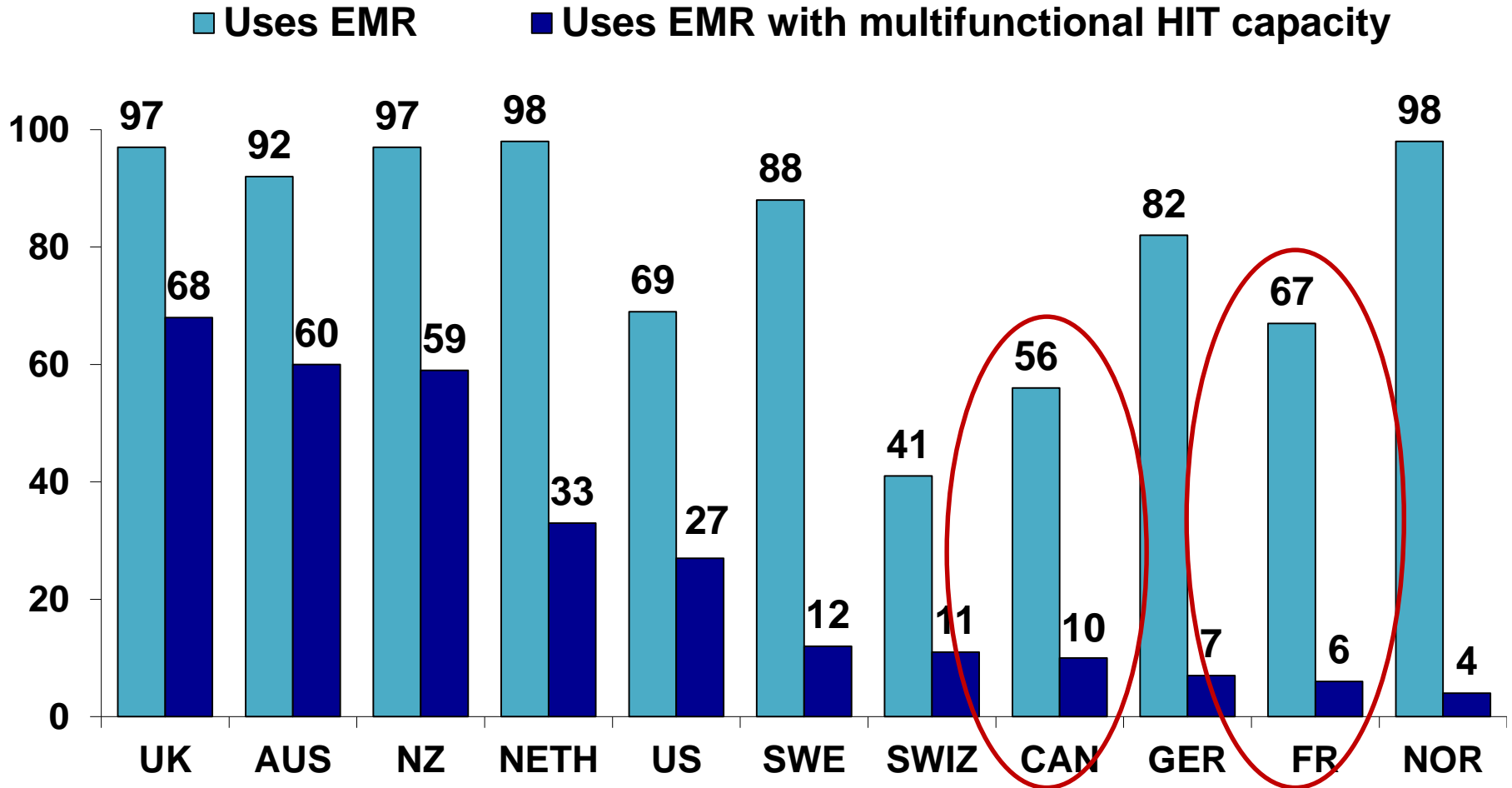


Doctors' Use of Electronic Medical Records in Their Practice, 2009 and 2012



Doctors with Electronic Medical Records and Multifunctional Health IT Capacity

Percent



Note: Multifunctional health IT capacity—uses electronic medical record and at least two electronic functions: for order entry management, generating patient information, generating panel information, and routine clinical decision support.

Source: 2012 Commonwealth Fund International Health Policy Survey of Primary Care Physicians.

Primary Care Data goes into a ‘black hole’

The data gets sucked in but never comes out



The Canadian Primary Care Sentinel Surveillance Network:

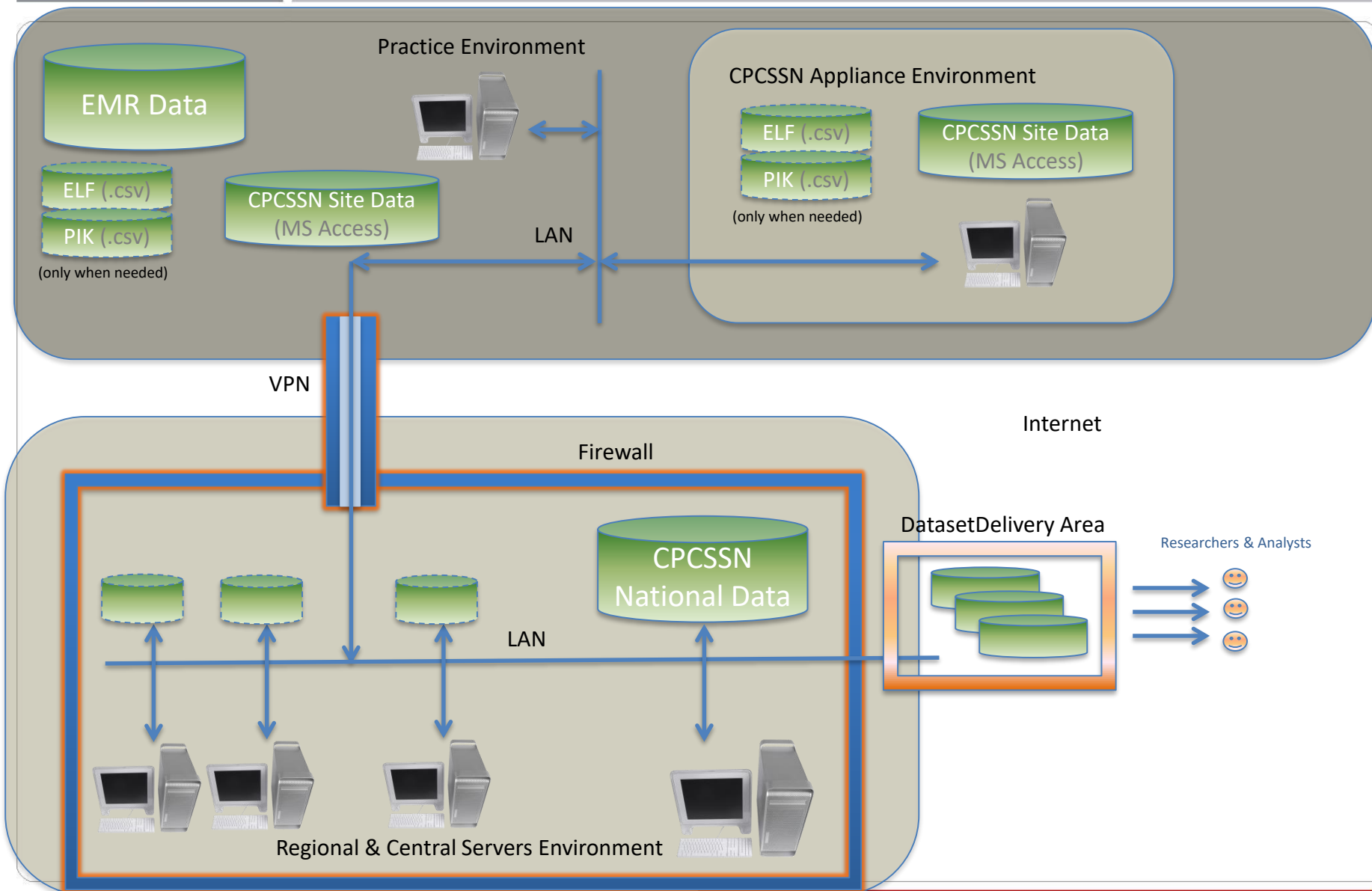
- 1.5 million Canadian patients
- 1200 practices
- 11 PBRNs in 7 provinces, 1 territory
- Some EMR data back to 2003
- Started in 2008
- \$12.5M funding from PHAC
- Strong partnerships with College of Family Physicians of Canada, Queen's and other Universities



B.C. (BCPCReN), Alberta (SAPCReN, NAPCReN), NWT, Manitoba (MaPCReN), Ontario (DELPHI, UTOPIAN, EON, MUSIC), Quebec (RRSPUM), Nova Scotia/New Brunswick (MaRNet), Newfoundland (APBRN)


- Opt-out consent
- 12 Research Ethics Board approvals
- Stored in a highly secure facility
- Data is de-identified





Notes:

ELF = EMR Linkage File (used for re-identification purposes within the practice)
 PIK = Patient Identifier Key (used for data linkage to other data sources)

- 
- Provider profile
 - Patient socio-demographics
 - Disease/ health condition
 - Encounter data
 - Risk factor data
 - Examination data
 - Medications
 - Laboratory data
 - Referral data
 - Procedure data

Data Quality Framework

- **Accuracy**
- **Comparability**
- **Usability**
- **Relevance**



Issues with Data

- **“Dirty data”** (misspellings, extra words in field, inconsistent strings (ex smoker, ex-smoker), multiple diagnoses in a single field
 - Can be cleaned by data managers
- **“Missing data”** (dosages, dates of onset, occupation, ethnicity)
 - Cannot be fixed, other than having it entered
- **“Inconsistent data”** (Diagnoses stored in several different places –notes, PMH, problem list, Inconsistent Risk Factors coexisting –smoker, ex-smoker)
 - Need to find the best source of data for each EMR
- **“Cloudy data”** (referral to xray or Dr. Jones)
 - Cannot be fixed, other than enter correctly

Issues with Data

- **“Lacking Meta Data”** (Diagnosis not in problem list, Medication in encounter notes,)
 - Cannot be fixed, other than enter correctly
- **“Lacking standardization”** (multiple, changing, inconsistent names or results for lab tests –HbA1C, glycosylated hemoglobin, 7% vs. 0.07 for test results)
 - Must be fixed by national lab standards
- **“Lacking data feeds”** (lab results not coming in electronically)
 - Needs to be fixed at clinic level



Representativeness



Patients in Database

- **Chronic Obstructive Lung Disease** **29,146**
- **Depression** **108,775**
- **Diabetes** **67,651**
- **Hypertension** **148,300**
- **Osteoarthritis** **77,235**
- **Dementia** **18,199**
- **Epilepsy** **8,477**
- **Parkinson's Disease** **2,675**



Number of Chronic Diseases	Number of Patients (%)	
0	685,593	(69.6)
1	186,876	(19)
2	76,900	(7.8)
3	27,412	(2.8)
4	7,362	(0.75)
5	1,391	(0.14)
6	162	(0.02)
7	13	

Chronic Disease Surveillance

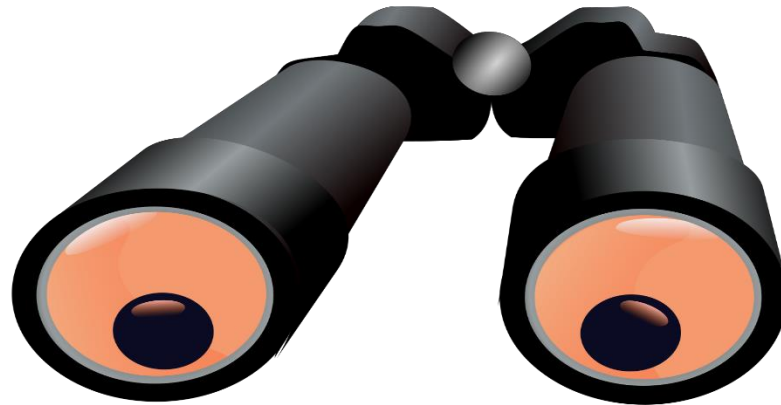
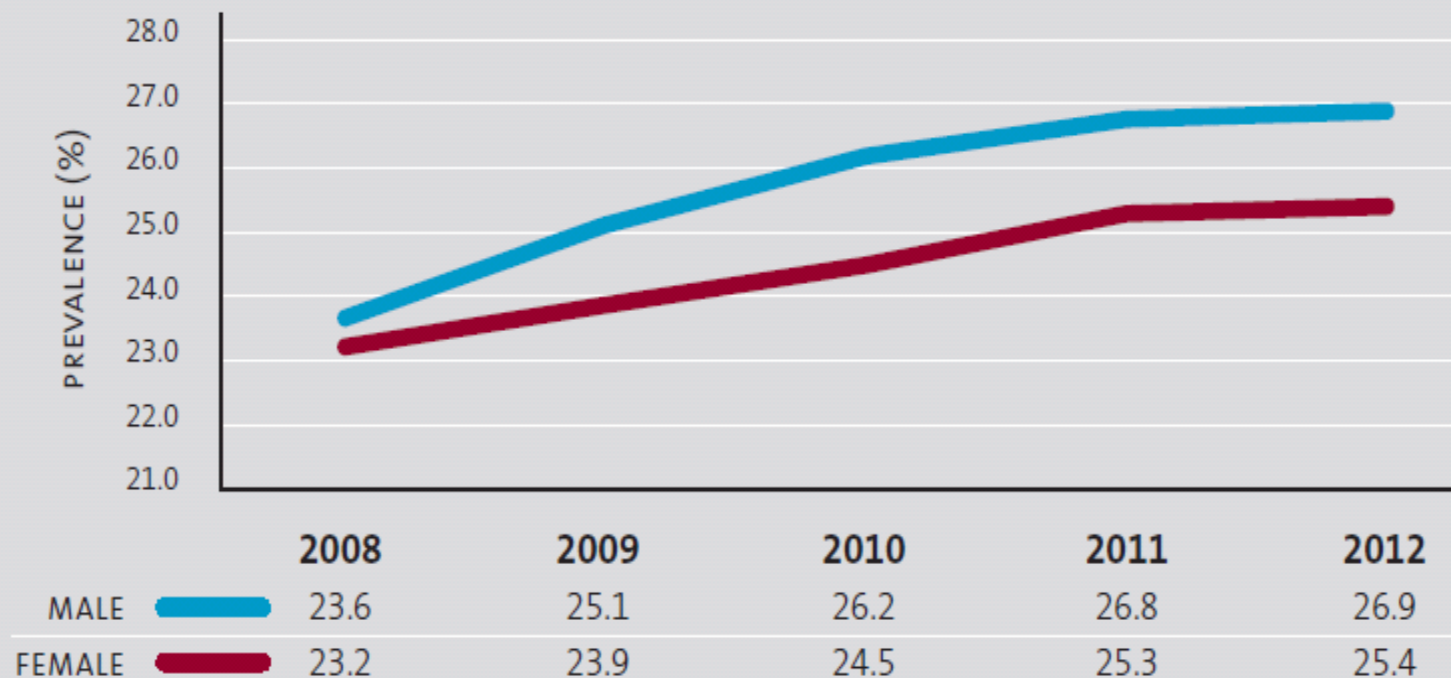


Figure 9: Prevalence of Obesity by Sex from 2008 to 2012*



* data as of December 31, 2012 is based on a cohort of 304,412 patients who had one or more encounters in the last 24 months with a CPCSSN sentinel.

Research



Herpes Zoster Infection (VZV) in People with Diabetes in Canadian Primary Care Practice



Risk Ratios for VZV by select disease status

Variable	With Zoster (n)	Without Zoster (n)	Unadjusted 95% CI RR Lower Upper			Age-sex adjusted 95% CI RR Lower Upper		
No indication of diagnoses of interest*	3343	470407	Reference			Reference		
With Diabetes	1210	60950	2.73	2.55	2.92	1.27	1.19	1.37
With COPD	521	22546	2.87	2.57	3.21	1.24	1.10	1.39
With any Neoplasm	1454	73947	3.57	3.29	3.86	1.60	1.47	1.74
With HIV/AIDS	48	1418	6.13	4.16	9.01	4.34	2.95	6.38

*Patients who have no indication of Diabetes, COPD, Hypertension, Depression, Osteoarthritis, Dementia, Epilepsy, Parkinsonism, any Neoplasm, or HIV/AIDS.

?

Data Linkage



Primary Care EMR with Administrative data

- Hospital Records
- Emergency Department Records
- Social Determinants of Health (e.g. neighbourhoods, income, education)



Level of HbA1c and hospital and emergency room utilization

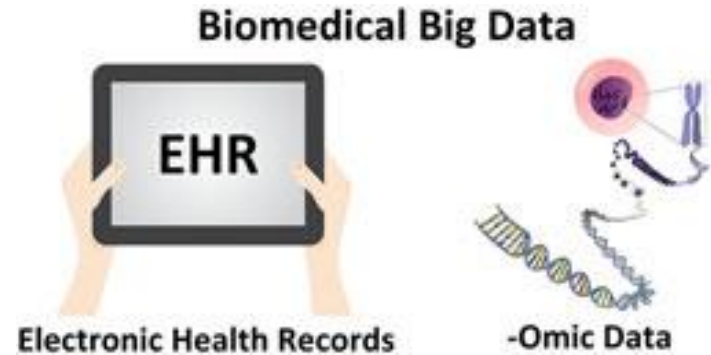
Variable	A1c level	<7	7-8	>8	Missing	P value
N		5526	2662	1814	2356	
Age (yr)	Mean	65.7	64.7	58.1	61.0	<.001
Female	%	50.1	47	45.4	50.3	<.001
Any acute complication	%	1.9	3.1	6.0	-	<.001
Any chronic complication	%	2.1	3.3	3.8	-	<.001
ER visits	Mean	0.63	0.67	0.95	-	<.001
Inpatient episodes	Mean	0.18	0.22	0.26	-	<.001
ADGs		6.39	6.15	5.98	6.35	<.001

Data Analytics



Personalized Medicine

- EMR with Omic Data



emerge network
ELECTRONIC MEDICAL RECORDS AND GENOMICS

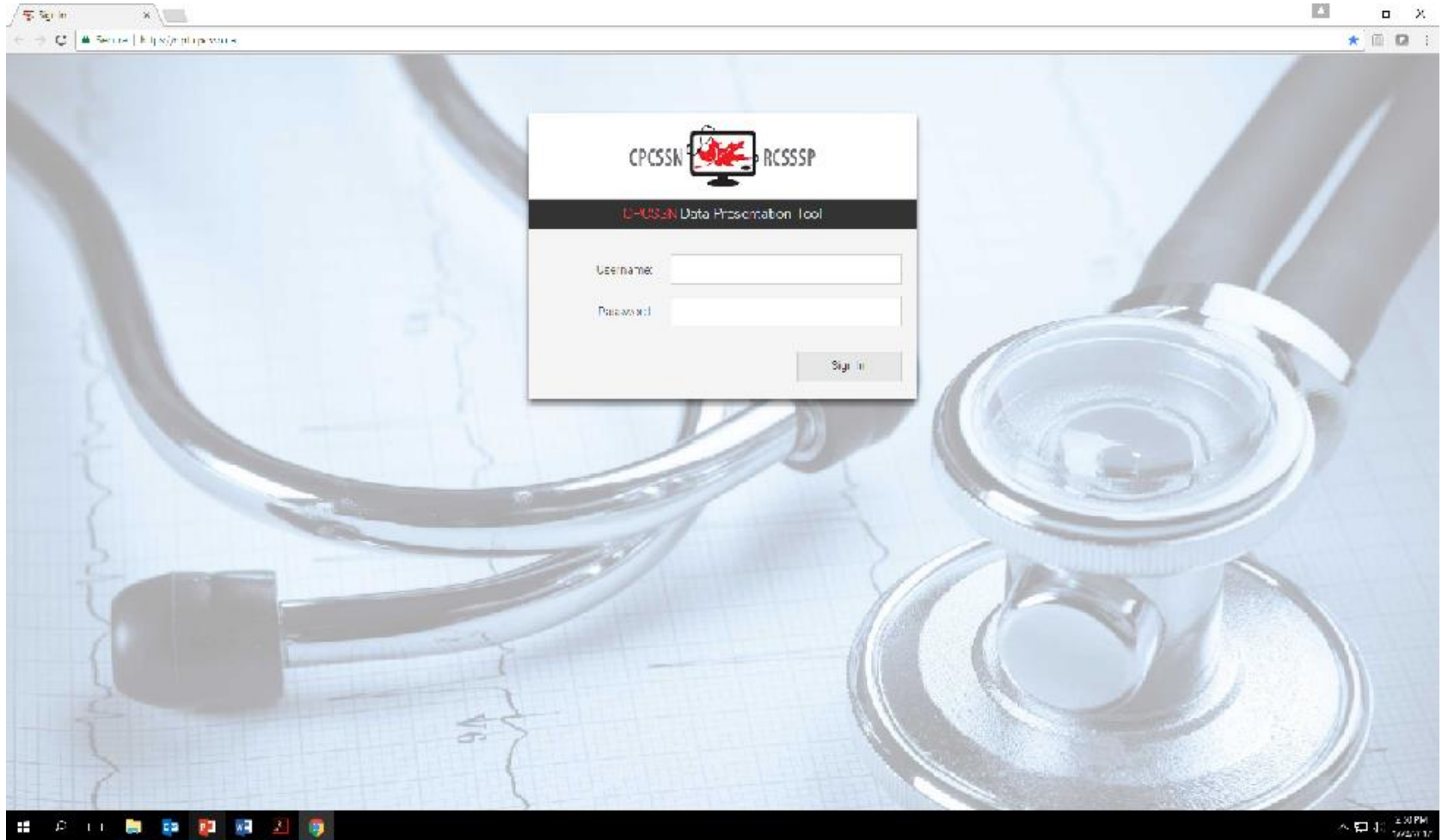


- **Multiple Data Sources**
- **Natural language processing (NPL)**
- **Machine learning**

Practice Quality Improvement



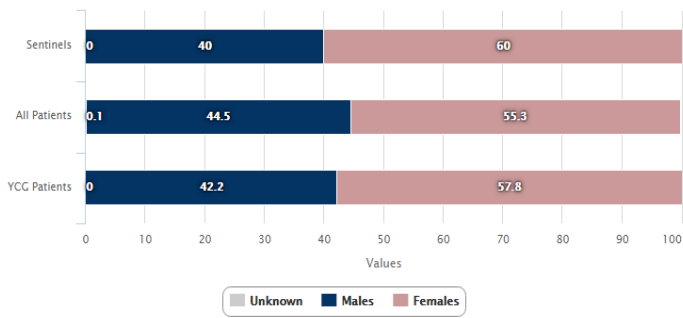
CPCSSN Data Presentation Tool



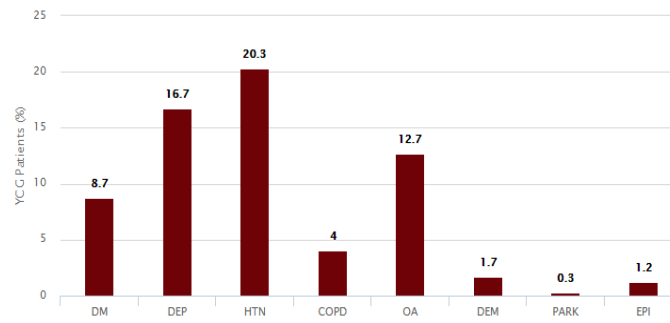
DEMO 2015-Q4 | Dashboard | Search | Reports | rbirtwhistle

10 SENTINELS | 49,813 PATIENTS | Entire Network | All Patients: 49,813 | YCG Patients: 25,754 | Total Active Sentinels: 10 (Ave Age: 44.2) | Pts Per Sentinel: 4,981 (Ave Age: 43.8) | Pts Per Sentinel: 2,575

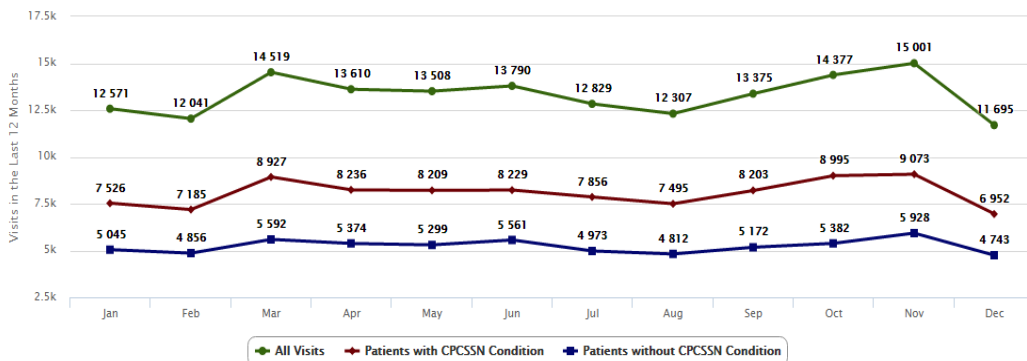
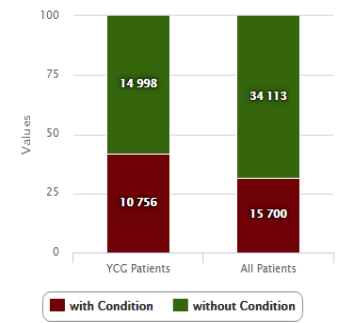
Gender Distribution (%)



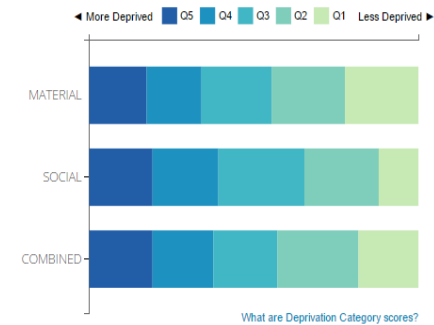
Condition Proportion (%) - YCG



Condition Ratio



Deprivation Scores





Name:

[FIND](#)
[VIEW CASES](#)
[UPDATE DISEASECASE TABLE](#)
[NEW](#)
[DELETE](#)
[PDF](#)

General Patient Rules:
 Gender:
 Age Range: -

Time Since Last Visit:
[Export Definition](#)
[Import Definition](#)
[Findings Log](#)

+ Clinical Criteria (Each line represents an OR search)

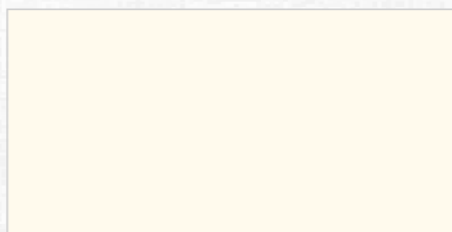
<input type="radio"/>	Criteria Set Name:	HC Texts - Overactive Bladder; Urge; Frequency	1	+		
<input type="radio"/>	Criteria Set Name:	Billing Texts - Overactive Bladder; Urge; Frequency	2	+		
<input type="radio"/>	Criteria Set Name:	Encounter Texts - Overactive Bladder; Urge;	3	+		
<input type="radio"/>	Criteria Set Name:	HC Texts - Nocturia, Polyuria, Other	4	+		
<input type="radio"/>	Criteria Set Name:	Billing Texts - Nocturia, Polyuria, Other	5	+		
<input type="radio"/>	Criteria Set Name:	Encounter Texts - Nocturia, Polyuria, Other	6	+		
<input type="radio"/>	Criteria Set Name:	HC ICD9 Codes - 596 variations	7	+		
<input type="radio"/>	Criteria Set Name:	Billing ICD9 Codes - 596 variations	8	+		
<input type="radio"/>	Criteria Set Name:	Encounter ICD9 Codes - 596 variations	9	+		
<input type="radio"/>	Criteria Set Name:	HC ICD9 Codes - 788 variations	10	+		
<input type="radio"/>	Criteria Set Name:	Billing ICD9 Codes - 788 variations	11	+		
<input type="radio"/>	Criteria Set Name:	Encounter ICD9 Codes - 788 variations	12	+		
<input type="radio"/>	Criteria Set Name:	Medications - ATC Codes G04BD04	13	+		
<input type="radio"/>	Criteria Set Name:	Medications - ATC Codes G04BD07	14	+		
<input type="radio"/>	Criteria Set Name:	Medications - ATC Codes G04BD11	15	+		

Encounter ICD9 Codes - 788 variations (Each line represents an AND search)

Table: Search Type: Field Type:

Description: AND Type:

Search Text(s):



Other Case Definitions

- Chronic Non-Cancer Pain
- Fecal Incontinence
- IHD
- Mechanical Valve
- Other PFD
- Speech Disorders: Aphasia
- Stress Urinary Incontinence

Table Criteria/Rules: +

<input checked="" type="checkbox"/>	Table:	<input type="text"/>	Count:	<input type="text"/>
<input type="checkbox"/>	Exception Table:	<input type="text"/>	Count:	<input type="text"/>

Select Denominator:

Denominator - Total Pts:

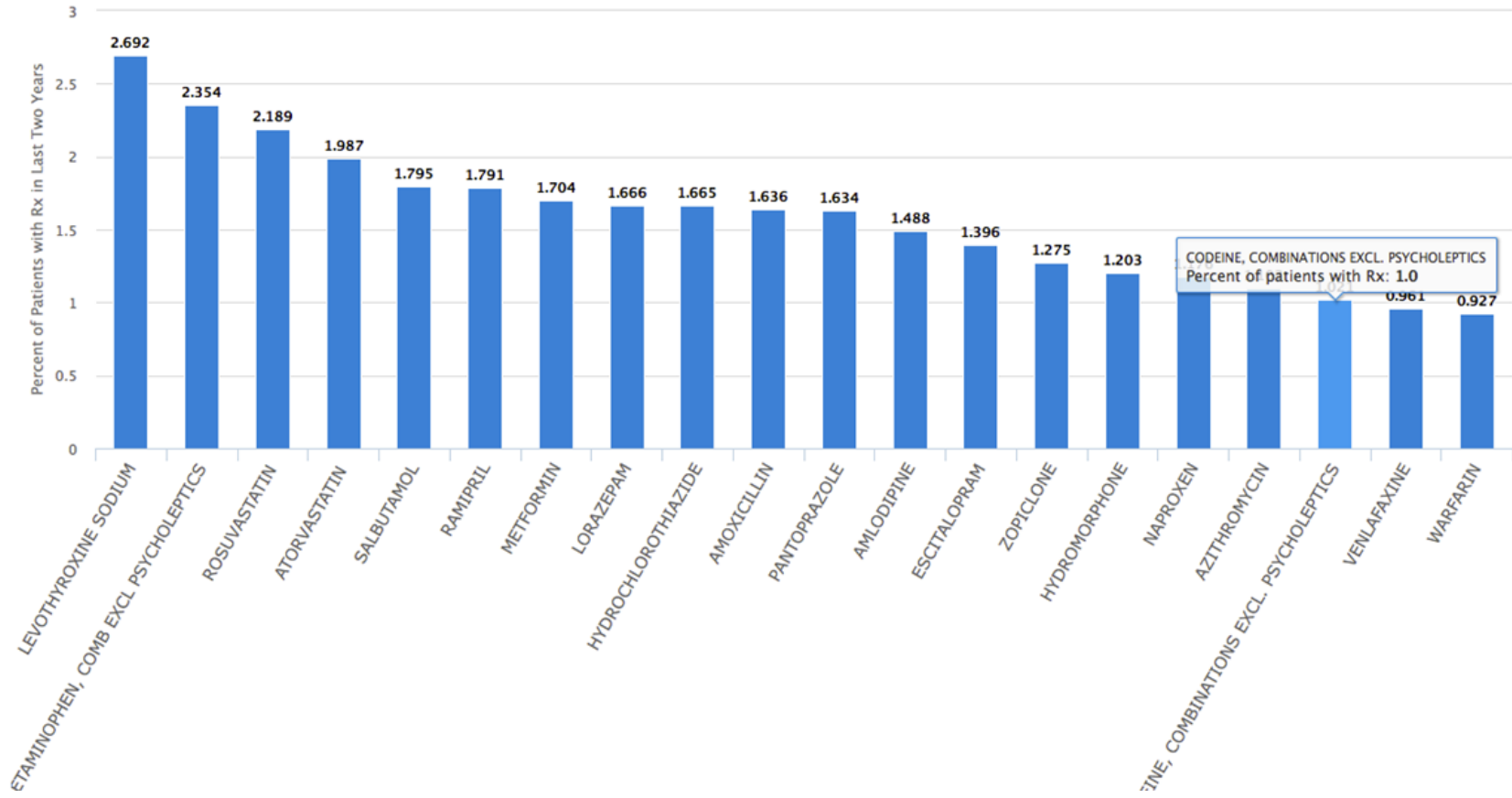
Total Processing Time:

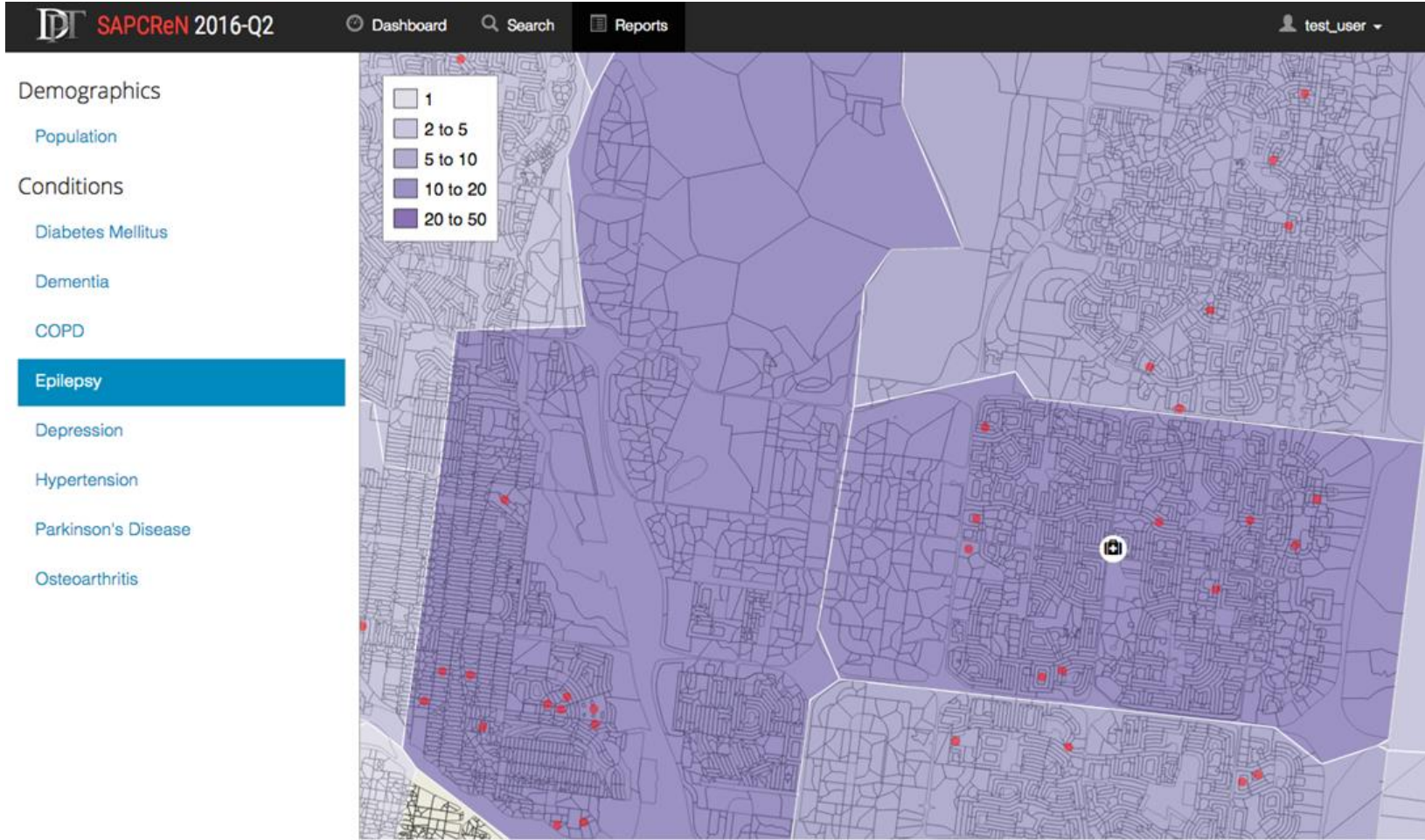
Algorithm Results - Total Pts:

Prevalence:

Top 20 Medications

By Unique Patients and Based on ATC Coding





CPCSSN Partner Universities



a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA





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<http://www.cpcssn.ca>