Mining for data gold: How to recycle imperfect EMR data into useful information

AFHTO conference
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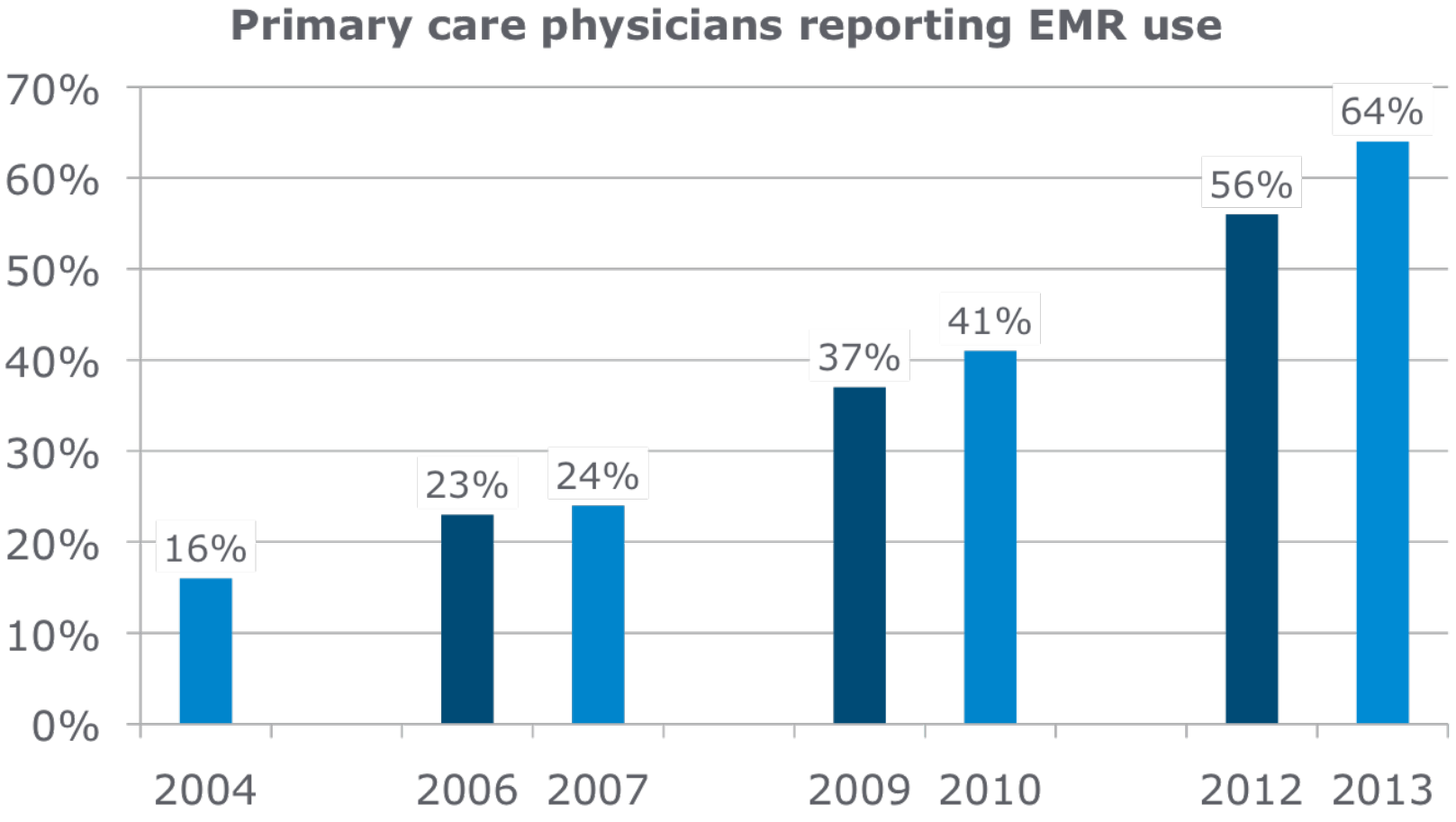
CPCSSN RCSSSP

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

Agenda

- **What is known?**
  - EMRs are increasingly used, BUT
  - Data quality is highly variable;
  - This may make mining data (getting usable and useful information) difficult
  - Lack of information may **impede efforts to improve care** (you can't improve what you don't measure)
- **What are we adding?**
  - An overview of tools and resources to access and use existing data: "mining for gold"
  - Some suggestions for improving the data in your EMR to make it more useful and usable

Primary care growth of EMR use – Canada



Data from Commonwealth Fund (2006, 2009 & 2012) and National Physician Survey (2004, 2007, 2010 & 2013)

Value of EMRs

- EMRs are now used by the majority of primary care physicians.
- $$$ and time spend on subsidizing, buying, implementing, certifying EMRs.

- Evidence that this has **made difference in care or outcomes** for patients?
- Meaningful use of EMRs or of EMR data?
- Measurement and use of information in primary care teams?

MSc Thesis

- Was there a **difference** in the change in **preventive services** targeted by Ontario's P4P incentives between community-based family physicians **implementing EMRs** and those using paper-based records?

0.7% less increase in services in EMR group (p=0.55, 95% CI -2.8 , 3.9)

NO difference between EMR and paper

Greiver M, Barnsley J, Glazier RH, Moineddin R, Harvey BJ. Implementation of electronic medical records: effect on the provision of preventive services in a pay-for-performance environment. *Canadian Family Physician* 2011.

Results

- **Data quality poor**

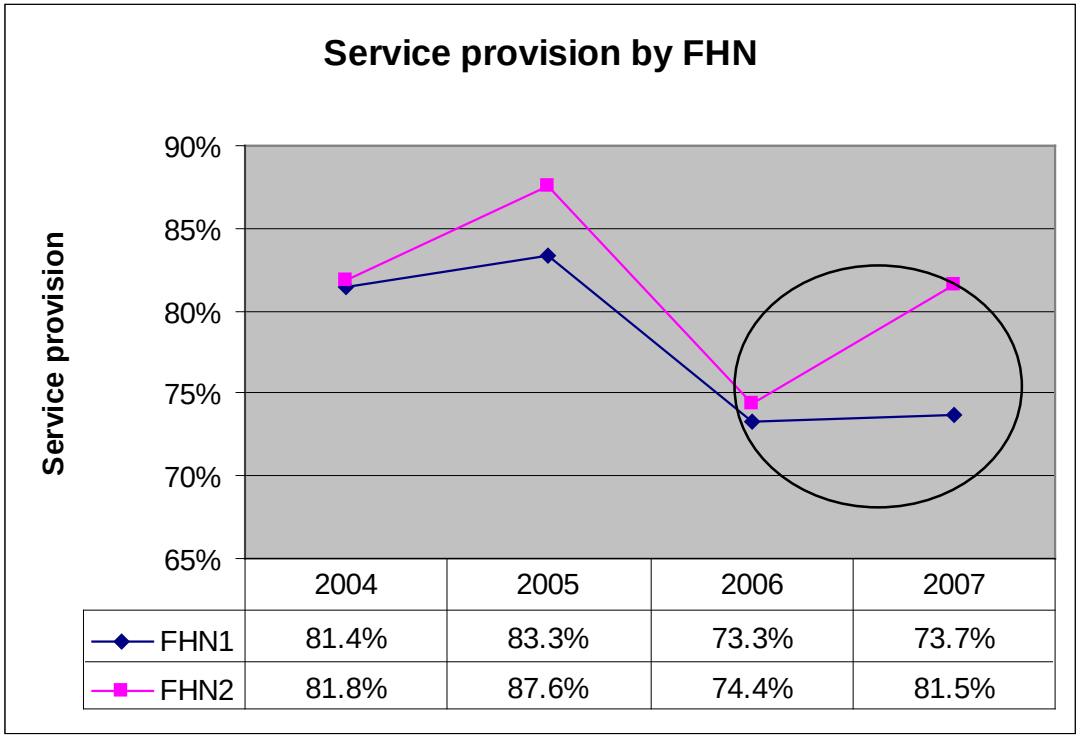
Greiver M, Barnsley J, Glazier RH, Harvey BJ, Moineddin R Measuring data reliability for preventive services in electronic medical records. BMC Health Serv Res. 2012 May 14

Smoking status as extracted from EMR:

"A FEW
smoked
past
stoped
somker"

We don't know who smokes!

Preventive services for 2 groups implementing at the same time



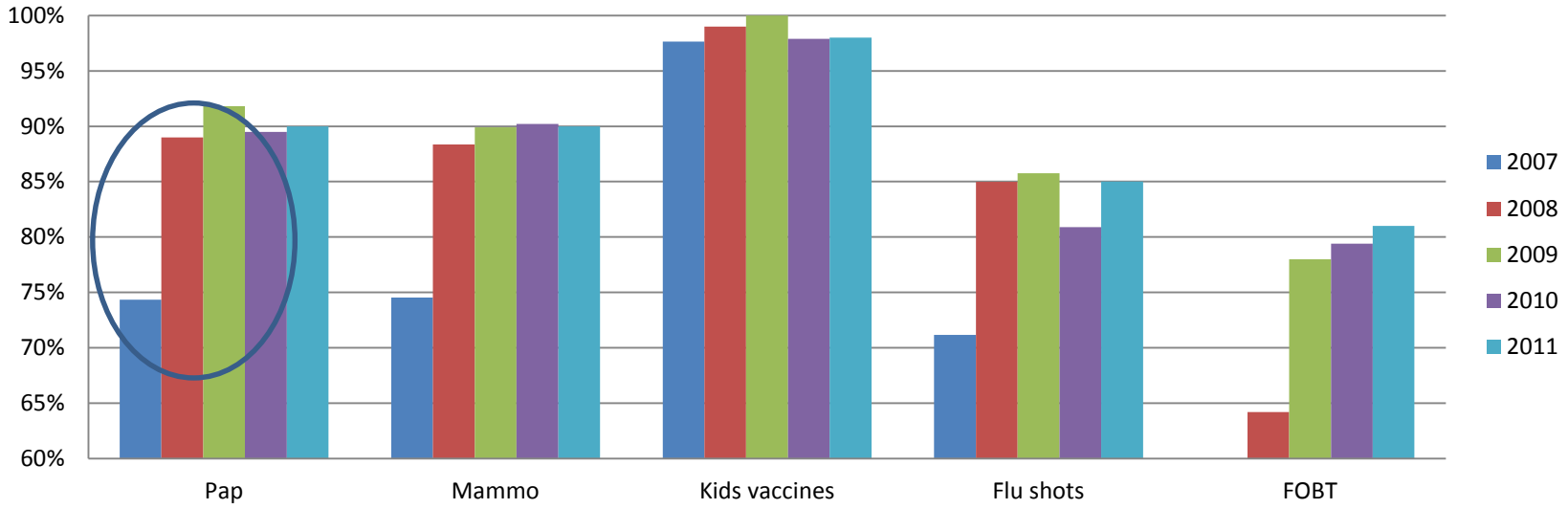
	2004	2005	2006	2007
FHN1	81.4%	83.3%	73.3%	73.7%
FHN2	81.8%	87.6%	74.4%	81.5%

Organization and EMR use at group level for preventive services: standardized processes and data

- **Hire group administrator** to run program.
- "**Clean up**" EMR database for the whole group
  Active patients, roster status
  Improve data: enter data in consistent manner and in consistent field
- Consistent group processes: **point of care alerts** for group, **standardized reminder mailings** to patients every 3 months

From Individuals to Teams

- QI traditionally targeted at **individual physician.**
- Need **Team-based standardized data and processes** to obtain **larger, systematic, sustained improvement.**
- Six sigma: **minimize variability, improve processes**



North York
Family Health Team

Example: North York FHT

- 71 physicians
- 40 Allied Health Providers
- Over 220 EMR users

- **2 EMRs** (Nightingale, Practice Solutions)
- **6 servers, 6 databases**
- 18 sites

- 70,000 patients

Where we started

- **Individual** cases of Excellent Care in some practices, BUT:

  Nearly every physician had **their own way** of entering data and doing things:

  - **No consistent reminders or alerts** across many offices;
  - Very **difficult to build disease registries** (example, diabetes).

- Allied Health Providers had to learn **different** ways of **doing the same thing:**
  - Difficult to plan consistent programs or implement consistent approaches to care.

North York
Family Health Team

Reflections On Our FHT

- Are we truly working as a **Team**?
- Are we using **EMR to its full potential** or as an electronic paper chart??

North York
Family Health Team

Organizational Level

Team-based Approach

Information Management Infrastructure

Privacy Infrastructure

Organizational level

Information management infrastructure

- Technical working groups
- Data standards
- Data Warehousing
- Analytic software

- Reports to FHT, Ministry, others
- Information for Board

North York
Family Health Team

Data standards
Step 1: **Agree** on standardized data

- Example: consistent, **coded** data, so we could identify patients with chronic diseases
  - **Diabetes ICD9 250**
  - **Hypertension 401**
  - **COPD 496**
  - **Asthma 493**
  - **Depression 311**
  - **CHF 428**

Data standards

Step 2: **Implement** data standardization

- Data entry clerks
- Train everyone
  - EMR education (Lunch and Learn)
- Manuals (posted on Dropbox)
- Communication:
  - Emails, emails
  - All FHT meeting

Improving data to improve care

What are your FHT's goals?

- Improving access/quality of care?
- Do you think having accurate and standardized data is needed to meet your goals?

It takes work to improve data

- Decide if you want to improve and standardize your data for your FHT
- Then take advantage of the processes and tools available

Tools available

- CPCSSN Data Presentation Tool (**DPT**)
- University/academic projects (various)
- Data projects (Example, ALIVE)
- Local projects and processes

Primary Care Practice Based Research Networks

11 PCPBRNs, 12 EMR vendor products*, serving 7 provinces and 1 territory

British Columbia
- BCPCReN, Vancouver-*Wolf, OSCAR*

Alberta
- SaPCReN, Calgary – *MedAccess, Wolf*
- NaPCReN, Edmonton & Yellowknife – *MedAccess, Wolf*

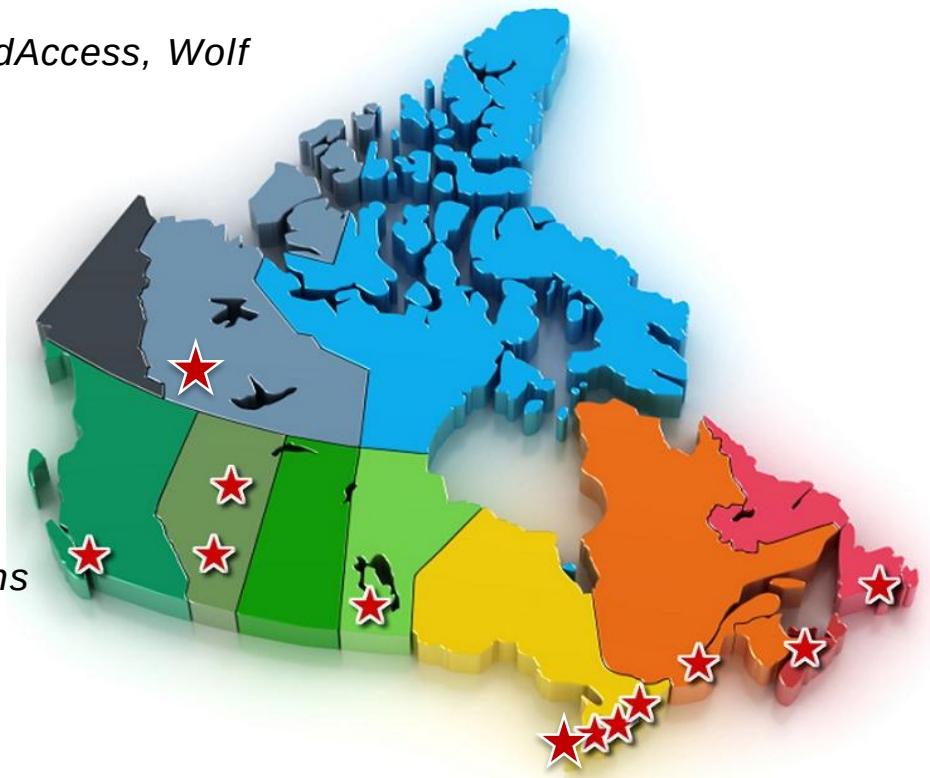
Manitoba
- MaPCReN, Winnipeg–*Jonoke*

Ontario
- UTOPIAN, Toronto– *Practice Solutions, Bell EMR, Nightingale*
- DELPHI, London– *Healthscreen, OSCAR, Optimed*
- EON, Kingston– *P&P, OSCAR, Bell EMR, Nightingale*
- CPCSSN@Mac, Kitchener & Hamilton
  - *OSCAR, Practice Solutions*

Québec
- RRSPUM, Montréal–*Da Vinci, Purkinje*

Nova Scotia
- MARNet-FP, Halifax–*Nightingale*

Newfoundland
- CPCSSN-NL, St. John's–*Wolf, Nightingale*



Clinicians and Researchers collaborating on a national project

***As of 2 October 2014**

Data back to primary care

What if:

We could **send cleaned data back** to a primary care organization?

Along with data mining software (DPT)

So they can produce reports

Using **their own data**

Demonstration Project

Implementing a Scalable Tool for Quality of Care Improvement in Primary Care

- Partners: CFPC, CPCSSN, University of Victoria, Canada Health Infoway (as strategic investor) and NYFHT
- Return CPCSSN **cleaned, transformed and merged** data to NYFHT
- **Provide software (DPT) to FHT**, in order to give FHT ability to generate own reports

Project Objectives

1. Develop a standardized **Quality Dashboard** for front line providers.
2. Improve **data quality** at the practice level.
3. Develop a process to safely **re-identify patients** within the circle of care for tracking and follow-up.
4. Develop **scalable processes** to enable the active use of data for QI projects.

Data Quality Improvement in EMRs

- 5 Chronic diseases: Diabetes, Hypertension, COPD, Dementia, Heart Failure
- Use CPCSSN validated case definitions; use billing + SNOMED CT for Heart Failure.

CPCSSN Data Presentation Tool

Canadian Primary Care Sentinel Surveillance Network | English

DATA PRESENTATION TOOL (2.7)

North York FHT | SITES **17** | PROVIDERS **61** | PATIENTS **93,540**

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Réseau canadien de surveillance sentinelle en soins primaires

CYCLE 2013-Q1

Data up to Mar 31, 2013

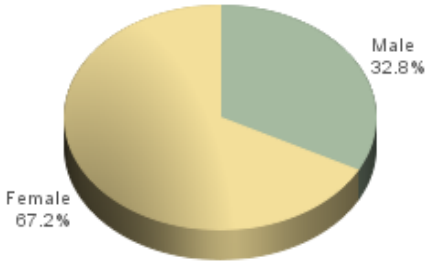
Dashboard Filter:

- All Data
- Search Patient Data
- Raw Data Viewer
- Data Reports

PROVIDERS | ALL PATIENTS | YCG PATIENTS

ALL DATA

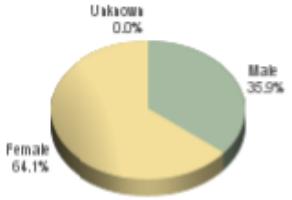
Total Providers: **61**

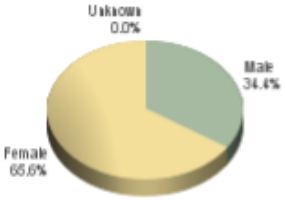


All Data Patients: **93,540** (Ave Age: **45.0**)
Patients Per Provider: **1,533**

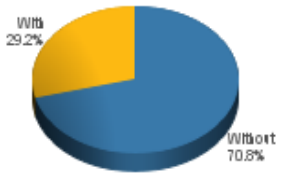
YCG Patients: **49,721** (Ave Age: **45.3**)
Patients Per Provider: **815**

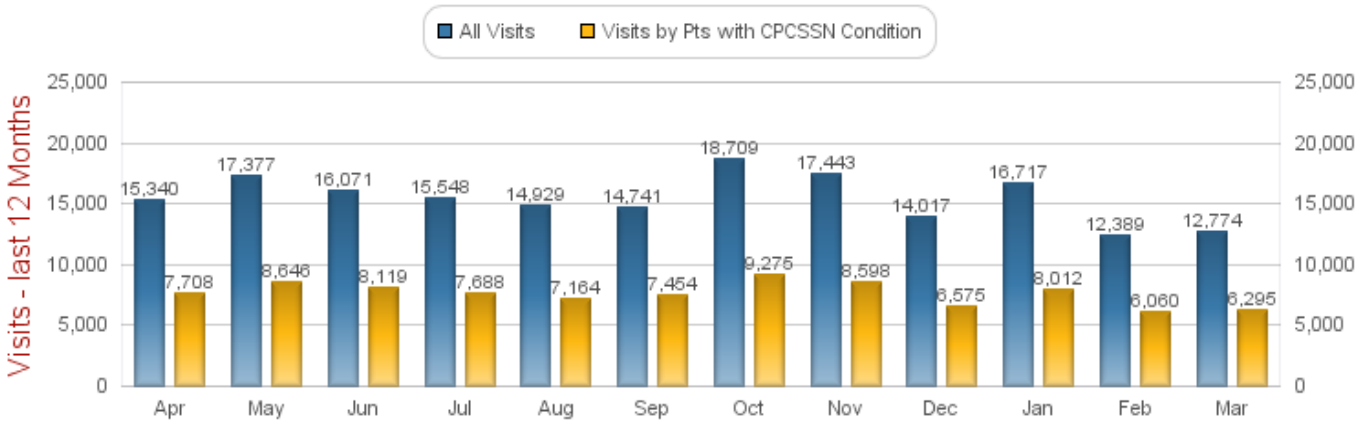
Gender Distribution





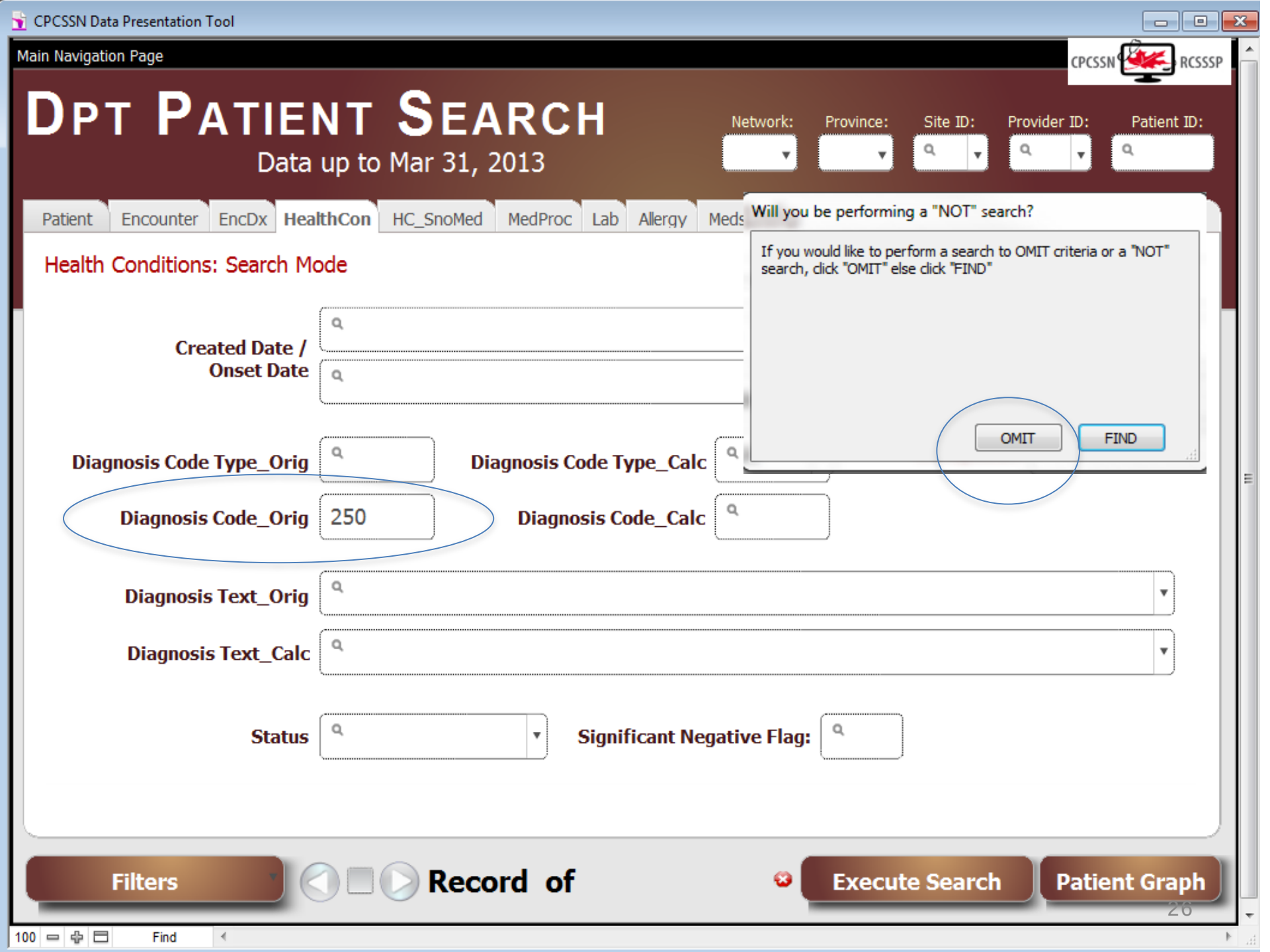
% Pts with CPCSSN Condition





100 | Browse

CPCSSN Data Presentation Tool
Main Navigation Page
CPCSSN
RCSSSP
DPT PATIENT SEARCH
Data up to Mar 31, 2013
Network:
Province:
Site ID:
Provider ID:
Patient ID:
Patient
Encounter
EncDx
HealthCon
HC_SnoMed
MedProc
Lab
Allergy
Meds
Exam
Risks
Referral
Billing
Vaccine
DiseaseCase
General Patient Info
Physician Name
First Name
Last Name
Phone Number
Age
Ethnicity
Housing Status
Gender
Language
Highest Education
Residence FSA
Occupation
Patient Activity
Rostered:
Last Visit in the last...
Current EMR Status
Active
Current EMR Status_orig
6 Months
12 Months
18 Months
2 Yrs
3 Yrs
Yes
Index Disease
Diabetes Mellitus
Yes
Depression
Osteoarthritis
COPD
Hypertension
Dementia
Parkinson's
Epilepsy
Total Indexed Diseases
Filters
Record of
Execute Search
Patient Graph
Find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Patient
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HC_SnoMed
MedProc
Lab
Allergy
Meds
Health Conditions: Search Mode
Will you be performing a "NOT" search?
If you would like to perform a search to OMIT criteria or a "NOT" search, click "OMIT" else click "FIND"
OMIT
FIND
Created Date / Onset Date
Diagnosis Code Type_Orig
Diagnosis Code Type_Calc
Diagnosis Code_Orig
250
Diagnosis Code_Calc
Diagnosis Text_Orig
Diagnosis Text_Calc
Status
Significant Negative Flag:
Filters
Record of
Execute Search
Patient Graph
26
100
Find

DPT SEARCH RESULTS

Age / Gender / Disease Case

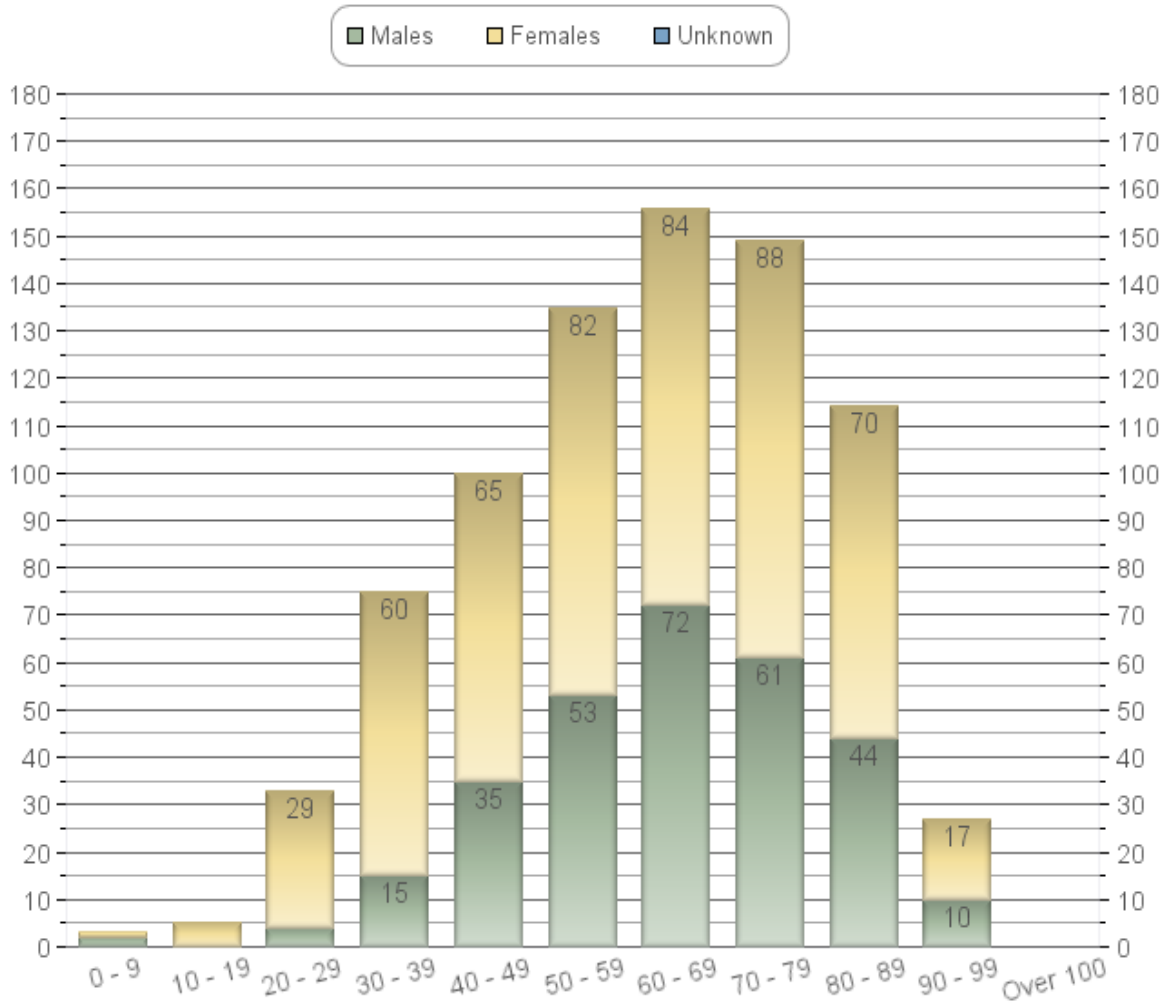
Diabetics that do not have 250 in CPP (n: 797)

Total Pts: 797

		Male	Female
0 to 9	3	2	1
10 to 19	5		5
20 to 29	33	4	29
30 to 39	75	15	60
40 to 49	100	35	65
50 to 59	135	53	82
60 to 69	156	72	84
70 to 79	149	61	88
80 to 89	114	44	70
90 to 99	27	10	17
Over 100			

Total Patients includes sum of Male, Female and Unknown gender

Diabetes Mellitus	797	-	100.0%
Depression	156	-	19.6%
Hypertension	301	-	37.8%
COPD	49	-	6.1%
Osteoarthritis	127	-	15.9%
Dementia	43	-	5.4%
Parkinsons	8	-	1.0%
Epilepsy	10	-	1.3%



Baseline results

- Physicians verify data (has diabetes yes/no)
- Data clerks add code to EMRs
- Patients: Active, at least 1 visit past 3 years.

  N = **60,652**
- Results (baseline), missing, uncoded or unstandardized data in CPP:
  - Diabetes: **19%** (797 / 4271)
  - Hypertension: **37%** (3762 / 10,246)
  - COPD: **83%** (1092 / 1318)
  - Dementia: **71%** (711 / 1000)
  - Heart Failure: **43%** (180 / 415)

Results

Overview of verification for 59 providers

Condition	# verified	% verified	# +ve for condition	Already coded in CPP
Diabetes	641	80%	217	3474
Heart failure	133	74%	74	235
HT	2392	64%	1494	6484
COPD	929	85%	336	226
Dementia	610	86%	276	289
Total	4705	72%	2397	10708

Percentage increase in coding: **22%**

2014

- In 2014, we coded:
  - 9 health conditions
  - 3 Cancers
- Total coded: **2,007** conditions

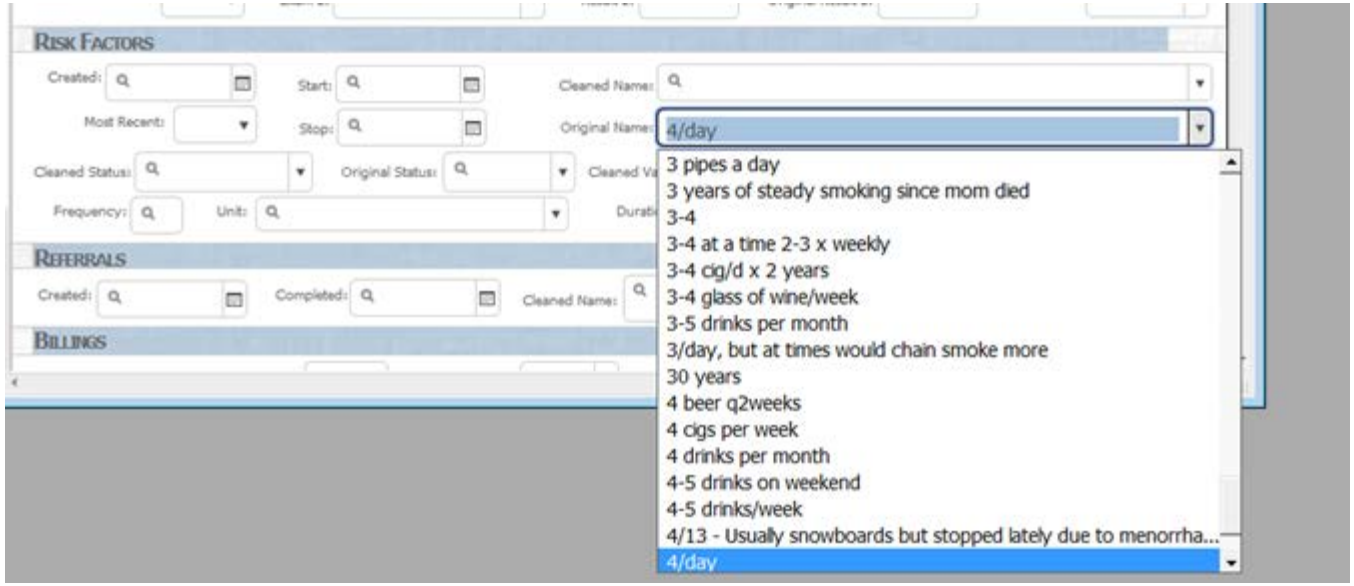
- Family history for 3 cancers (breast, colorectal, ovarian)
- Total coded: **7,166** family history problems

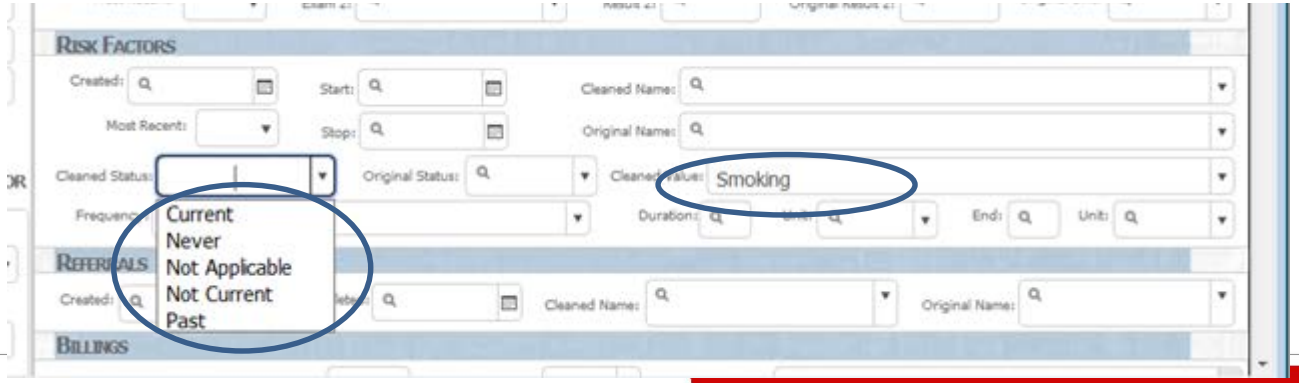
- We mailed **5,055** reminder letters for preventive services, roster invitations, diabetes overdue services

- **Manual available**

Using imperfect data

- Does this patient smoke?





4,390 Patients Found

Current smoker - 4,390 patients

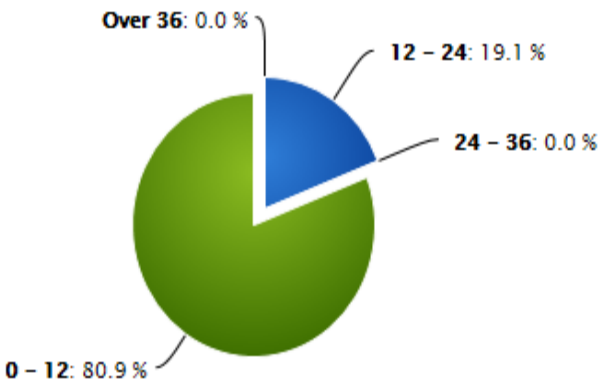
Current smoker - 4,390 patients

Ave Age: **45.9** Ave BMI: **26.9** % Rural: **0.0%**

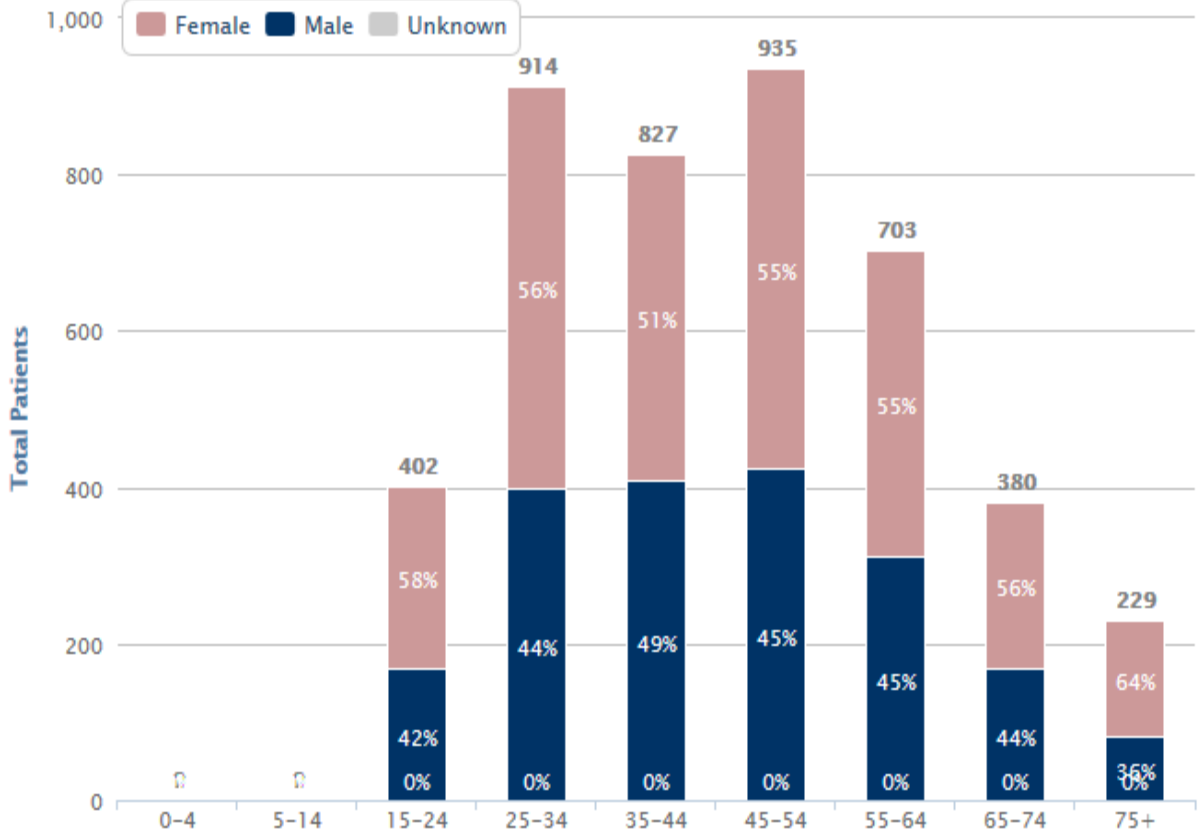
View Results

New Search | OTHER REPORTS | Export / Print | Home

Time Since Last Visit – Months



Age Gender Distribution



Condition Prevalance

Diabetes	404	-	9.2%
Depression	1,076	-	24.5%
Hypertension	862	-	19.6%
COPD	405	-	9.2%
Osteoarthritis	384	-	8.7%
Dementia	55	-	1.3%
Parkinson's	10	-	0.2%
Epilepsy	65	-	1.5%

1 Condition	1,323	-	30.1%
2 Conditions	565	-	12.9%
3 Conditions	191	-	4.4%
4 Conditions	50	-	1.1%
Over 4 Conditions	7	-	0.2%

Privacy Infrastructure

- Privacy Impact Assessment
- Threat Risk Assessment
  - Contractual Safeguards (i.e., MoA for data use)
  - Protect workstation containing Personal Health Information
  - Encryption
  - Security and Privacy training

What is available to you

- **Privacy Impact Assessment documents**
  - Provided to AFHTO, available in member's area of website
- **Handbook of Data Cleaning activities**
  - Summer student manual
  - For Practice Solutions EMR, Nightingale EMR
  - Available on demand and from AFHTO
- Manual for **preventive services management**

- **No Charge**

Conclusions

1. **Data quality** can be improved at the practice level
2. Patients can be safely **re-identified** within the circle of care for tracking and follow-up
3. **Scalable processes** can be implemented to enable the active use of data for QI projects

Healthcare Analytic Adoption Model

Level 8	Cost per Unit of Health Reimbursement & Prescriptive Analytics	Contracting for & managing health
Level 7	Cost per Capita Reimbursement & Predictive Analytics	Taking more financial risk & managing it proactively
Level 6	Cost per Case Reimbursement & Data Driven Culture	Taking financial risk and preparing your culture for the next levels of analytics
Level 5	Clinical Effectiveness & Population Management	Measuring & managing evidence based care
Level 4	Automated External Reporting	Efficient, consistent production & agility
Level 3	Automated Internal Reporting	Efficient, consistent production
Level 2	Standardized Vocabulary & Patient Registries	Relating and organizing the core data
Level 1	Data Integration – Enterprise Data Warehouse	Foundation of data and technology
Level 0	Fragmented Point Solutions	Inefficient, inconsistent versions of the truth

Conclusions

- We **demonstrated** that returning data to a FHT for QI, reporting and improving data quality **was feasible:**

“You can’t improve what you don’t measure”

- DPT has now been provided to **QIDSS** for **clusters of FHTs**.

- **Current** data in EMRs are **good enough** to mine; use what is available to you, **and**
- **Improve your data**

- **Better data = Better care**

Thank you!

QUESTIONS?

Canadian Primary Care Sentinel Surveillance Network

Réseau canadien de surveillance sentinelle en soins primaires

http://www.cpcssn.ca

CPCSSN RCSSSP

Thanks to all Funders, Stakeholders, Partners AND Sentinel Physicians

Public Health Agency of Canada / Agence de la santé publique du Canada

THE COLLEGE OF FAMILY PHYSICIANS OF CANADA / LE COLLÈGE DES MÉDECINS DE FAMILLE DU CANADA

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InfoClin

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HSU Demonstration Project
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