Becoming a Data-Driven Organization: Journey to HIMSS EMRAM Stage 7

Session 69, Tuesday, Mar 6 2018, 2:30 PM - 3:30 PM

Dr. Damian Jankowicz, PhD, VP Information Management, Chief Information Officer and Chief Privacy Officer, CAMH

Dr. Tania Tajirian, MD, Medical Head of Hospitalist Service, CAMH
Conflict of Interest

Dr. Damian Jankowicz, PhD

And

Dr. Tania Tajirian, MD

Have no real or apparent conflicts of interest to report.
Agenda

• CAMH Overview
• I-CARE Journey to HIMSS EMRAM Stage 7
• Data-Driven Organization
• Data-Driven Care
• Paradigm Shift in Brain Science
• I-CARE and Research
• Future of I-CARE
Learning Objectives

1. Identify specific strategies to enable data-driven care and summarize the importance of incorporating research into clinical enterprise

2. Describe the objective and methods of the project to understand the importance of engaging in standardized risk protocols for patient taking Clozapine

3. Summarize key outcomes and/or results and describe the extent to which the initiative has demonstrated an impact on health outcomes or health care system performance

4. Share implications which may be derived from the results of this study with other healthcare organizations

5. Identify the requirements of HIMSS Stage 7
Centre for Addition and Mental Health
CAMH is Transforming Lives

• Largest Mental Health & Addictions Hospital

• University of Toronto affiliated teaching hospital

• World Leader in Brain Science
Background

- 30+ locations
- 550 beds
- 3000 staff
- 400 physicians
- 30,000 unique clients
- 500,000 ambulatory visits
- Provincial and National reach
I-CARE Journey

Transformation Readiness & System Purchase
Fall 2010 – Aug 2012

CIS Project Design, Build & Test
Aug 2012 – April 2014

Training & Launch
April – May 2014

Transition to Operations
May 2014 - Sep 2014

Optimization & Maintenance

Stakeholder Engagement, Communications, Change Management
Past VS. Current State: What is our EHR?

**Historical:**
- Registration System
- Workload Measurement Systems
- Pharmacy System
- Hybrid: System + Paper
- Patient Scheduling
- Medication Processing
- Lab System
- Document Imaging System
- Dietary System
- Consent & Authorization
- Legal Documents
- Paper
- Bottom 15%

**Current: I-CARE**
- Data Warehouse
- I-CARE
- Registration
- Medication Mgmt
- Patient Scheduling
- Interactive and reporting tools
- Order & Results Mgmt
- Clinical Reporting
- Laboratory Processing
- Medication Processing
- Clinical Documentation
- Document Imaging
- Legal Documents
- Collaborative Communication Tools
- Pharmacy Management
- Consent & Authorization
- Alerts & Notifications

Top 0.2% HIMSS Stage 7
### Key HIMSS EMRAM 7 Requirements

**Canada EMR Adoption Model℠**

<table>
<thead>
<tr>
<th>STAGE</th>
<th>2017 Q3</th>
<th>Cumulative Capabilities</th>
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<tr>
<td>Stage 7</td>
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**n=646**

- Demonstrated use of clinical data to improve quality of care and patient safety over a 1 year period
- Paperless clinical environment (<1% documentation created on paper)
- Closed Loop Medication Administration and CPOE rates sustained above 95% and 90% respectively
- Demonstrated use of data to achieve financial savings
- Advanced clinical decision support
- All external documentation scanned within 24h

CAMH achieved: June 21, 2017

Source: Healthcare Information and Management Systems Society, 2017
Data-Driven Organization
Case Study: Closed Loop Medication Administration
What is CLMA?

“An environment where the medication process is electronic from initial entry by physicians using CPOE, to pharmacies for order validation and bar coding the medications, to the automatic dispensing machines, to the actual administration of the medication at point of care by the nurse – where the nurse scans the patient’s bar code and the medication bar code which initiates clinical decision support for the five rights of medication administration.

People
- Training
- Accountability
- Reinforcement

Process
- Standardized workflows
- Patient identification
- Medication verification & availability

Technology
- Device reliability
- Connectivity
- Troubleshooting

Leveraged data to inform interventions
Leveraging Data to Inform Interventions

<table>
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<tr>
<th>High-Level Information</th>
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<tr>
<td>CLMA rates included in weekly Key Priorities Dashboard sent to Unit Managers</td>
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<table>
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<tr>
<th>Detailed Information</th>
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<tr>
<td>Detailed CLMA Weekly Communication sent to Unit Managers</td>
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Screenshot Source: Centre for Addiction & Mental Health, 2016
The Results: Overall Weighted Scanning Rates

Interventions resulted in improved scanning rates. Reported data was further refined to include scanning rates for high alert, high volume, and patient’s own meds, resulting in corresponding improvements.

Data Source: Centre for Addiction & Mental Health, 2016
The Results: High Alert/Volume Medications

Data focused on high alert / high volume scanning rates, resulting in improvements.

Data Source: Centre for Addiction & Mental Health, 2016
The Results: Patient Mismatch Alerts

Increased scanning rates correlate with increased patient mismatch alerts and thus prevention of patient mismatch errors.

Over time, volume of patient mismatch alerts decrease, likely reflecting increased awareness of correct practice.

Data Source: Centre for Addiction & Mental Health, 2016
CLMA Results: Patient Impact

Average potential patient identification errors / month prevented before data sharing:

483

Average potential patient identification errors / month prevented after data sharing:

954

Decrease of SCORE reports for preventable medication errors from 36 to 12 when comparing 6 months prior and after interventions

Empowers patients to be part of the safe medication administration process

Analysis of data pertaining to CLMA processes allows for ongoing improvement initiatives and helps identify sources of potential medication errors
Case Study: Care Planning
Care Planning Alerts/ Reminders

1. Complete Suicide Risk Assessment documentation
2. Documented suicide risk result level of Moderate or High
3. Triggers task to complete the Suicide Risk IPOC

IPOCs triggered based on assessment results:

**Tasked**
- Suicide Risk
- Metabolic Health Promotion / Illness Prevention
- Aggressive / Violent Behaviour

**Suggested**
- Fall Prevention and Management
- Substance Use Withdrawal
- Pain
- Impaired Swallowing
- Housing
- Impaired Skin Integrity

Screenshot Source: Centre for Addiction & Mental Health, 2016
Strategic Priorities Dashboard – SRA Summary

Summary allows managers to have a weekly view of areas to monitor with regards to at risk clients.

By integrating dashboards into team discussions, managers are able to discuss performance and action improvement.
Strategic Priorities Dashboard – SRA Completion

A single view monitoring the completion and compliance rates for suicide risk assessments and identification of clients who are high or moderate risk.

Encounter level details are available to action uncompleted assessments.

Data Source: Centre for Addiction & Mental Health, 2016
Strategic Priorities Dashboard – IPOC Completion

For high or moderate risk clients, this view helps monitor the ordering and documentation of appropriate care plans.

Looking at the care pathway for high or moderate risk clients, additional views monitor other factors such as events and other order types.

Data Source: Centre for Addiction & Mental Health, 2016
Suicide Risk Assessment & Care Planning: Patient Impact

Interventions:
- Creation of SRA dashboard (May – Aug ’16)
- Education (May – Aug ’16)
- Streamlined SRA & Guidelines (Jun ’16)
- Tasked Reminder to Create Care Plan (Jun ’16)
- Enhanced SRA Dashboard (Jan ’17)

Data Source: Centre for Addiction & Mental Health, 2016
Case Study: Clozapine
Clozapine and Side Effects

Clozapine-induced Myocarditis is a potentially fatal yet likely under diagnosed complication of Clozapine therapy

- True incidence is around 3%
- Hypersensitivity reaction with a fatality rate 10%
- Develops within the first 4 weeks of Clozapine initiation and titration
- Risk factors: Rapid titration, concomitant sodium valproate use

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Prevalence</th>
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<tbody>
<tr>
<td>Agranulocytosis</td>
<td>Rare (&lt;1%)</td>
</tr>
<tr>
<td>Constipation</td>
<td>60%</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

25-30% of all individuals with schizophrenia meet criteria for treatment resistance

Source: Remington, 2010

Clozapine-induced Myocarditis is a potentially fatal yet likely under diagnosed complication of Clozapine therapy.
Interventions

1. Included Myocarditis monitoring protocol into Clozapine policy (Oct. 2014)

Cardiac Troponin Positive  C-Reactive Protein > 50

Screenshot Source: Centre for Addiction & Mental Health, 2016
Interventions

1. Included Myocarditis monitoring protocol into Clozapine policy (Oct. 2014)

2. Integrated Myocarditis monitoring protocol into I-CARE order sets (Dec. 2014)
Interventions

1. Included Myocarditis monitoring protocol into Clozapine policy (Oct. 2014)

2. Integrated Myocarditis monitoring protocol into I-CARE order sets (Dec. 2014)

3. Reinforced education with cardiology expert (Apr. 2015); monitoring protocol elements made mandatory within I-CARE order sets (Jun. 2015)
Clozapine Care

New Clozapine patients receive:

**Pre-initiation**
- Baseline ECG, CRP, and Troponin
- Identification of pre-existing cardiac disease

**Post-initiation**
- Weekly clinical assessments
- CRP and Troponin monitoring x 4 weeks
- Regular Agranulocytosis monitoring

[Diagram showing the process with notes: Troponin lab test, CRP lab test, 4 week duration]
Order Set Compliance

Mandatory monitoring added into Clozapine policy (Oct '14)
Myocarditis monitoring added to Clozapine order sets (Dec '14)
Education reinforced by cardiology expert (Apr '15)
Myocarditis monitoring order set components made mandatory (Jun '15)

Clozapine-Eligible Patients with Monitoring Protocol

100% of Clozapine-eligible patients receive monitoring protocol

*237 total patients

Data Source: Centre for Addiction & Mental Health, 2016
Myocarditis Onset by Week

15 of 237 (6.3%) Clozapine eligible patients identified showing Myocarditis signs, most often in weeks 2 and 3.

Data Source: Centre for Addiction & Mental Health, 2016
Myocarditis Prevalence

>50% of patients showing early warning signs of Myocarditis were 21-32 years of age; 41% were young males.

Data Source: Centre for Addiction & Mental Health, 2016
Patient Impact

Discontinued Clozapine for 15 patients with confirmed myocarditis, which could lead to death.

- Able to measure the true incidence (6.3%) of Clozapine-induced myocarditis; 15 patients removed from Clozapine due to warning signs.
- Clinicians are able to more easily screen for Clozapine associated Myocarditis.
- Developed guidelines for Clozapine cessation and reintroduction.
- CAMH is locally leading the way for Clozapine-induced myocarditis monitoring and we expect uptake on a regional and national level after publishing.
Performance Improvement

Enterprise Reporting Platform

Personalized Medicine

Clinical Information System

Patient Data

Neuroinformatics Platform

Neuroinformatics

Brain Imaging

Genomics

Incident Data

Finance/HR Data

LAWSON

Finance/HR Data

Genomics

Incident Data

#HIMSS18
Paradigm Shift
The Future of Mental Health

1. Genetics/Epigenetics
   - Genes
   - Brain
   - Behaviour

2. Electronic Medical Record
   - Precision Medicine
   - Targeted Prevention
   - Brain Imaging
Importance of Data & Computation

1. Patient Data
2. Neuroinformatics

- Behaviour
  - Brain
  - Genes
Research Data: Variety - Imaging

MRI

- Structural
- Functional
- Diffusion

Subjects: 3000 + 1000/yr  1-10Gb / Scan

Electroencephalography

Image Source: Centre for Addiction & Mental Health, 2016
Research Data: Variety – ’Omics

Image Source: Centre for Addiction & Mental Health, 2016
“The current age of big data, with the ability to acquire and manipulate extremely high-dimensional, multimodal data sets, including clinical, genetic, epigenetic, cognitive, neuroimaging and other data types holds great promise to uncover complex [neuropsychiatric] relations, but poses formidable data-analytic challenges [...] insurmountable without powerful computational tools”
Paradigm Shift in Brain Science

Brain Science is increasingly driven by computation, algorithms and big data.

Neuroinformatics is concerned with application of computational techniques and algorithms to high-volumes of neuroscience data.

CAMH has the complete vision to lead this paradigm shift:
- I-CARE Electronic Medical Record
- High-performance computing infrastructure
- Large amounts of multi-dimensional data
- Scientist development in scientific computing
- Critical mass of computational scientists
I-CARE and Research
CAMH’s Neuroinformatics Strategy
I-CARE offers us an ability to guide advanced clinical care and facilitates patient recruitment for clinical research.
# GeneSight Canada Psychotropic Results

**Patient, Sample**

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<th>Reference: 110099</th>
<th>Order Number: 90099</th>
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<tbody>
<tr>
<td>Clinician: Sample Clinician</td>
<td>Report Date: 2016/06/24</td>
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## Antidepressants

**USE AS DIRECTED**
- desvenlaxine (Pristiq®)

**USE WITH CAUTION**
- bupropion (Wellbutrin®)
- serotonergic (Zoloft®)
- trazodone (Desyrel®)

**USE WITH INCREASED CAUTION AND WITH MORE FREQUENT MONITORING**
- amitriptyline (Elavil®)
- olanzapine (Zyprexa®)
- desipramine (Norpramin®)
- doxepin (Sinequan®)
- duloxetine (Cymbalta®)
- escitalopram (Cipralex®)
- fluoxetine (Prozac®)
- fluvoxamine (Luvox®)
- imipramine (Tofranil®)
- mirtazapine (Remeron®)
- nortriptyline (Pamelor®)
- paroxetine (Paxil®)
- venlafaxine (Effexor®)

## Antipsychotics

**USE AS DIRECTED**
- aripiprazole (Abilify®)
- olanzapine (Zyprexa®)
- haloperidol (Haldol®)
- clozapine (Geodon®)
- quetiapine (Seroquel®)

**USE WITH CAUTION**
- olanzapine (Zyprexa®)

**USE WITH INCREASED CAUTION AND WITH MORE FREQUENT MONITORING**
- olanzapine (Zyprexa®)
- pimozide (Orap®)

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[1]: Serum level may be too high, lower doses may be required.
[2]: Genotype may impact drug mechanism of action and result in reduced efficacy.
[3]: Use of this drug may increase risk of side effects.
[4]: Health Canada product monograph identifies a potential gene-drug interaction for this medication.

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All psychotropic medications require clinical monitoring. Drug therapy is prescribed in a stepwise manner. The use of an approved drug is not meant to imply that the drug listed are approved for the same indication or that they are comparable in safety or efficacy. The prescribing physician should review the prescribing information for the drugs being considered and make treatment decisions based on the patient’s individual needs and the characteristics of the drug prescribed.

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Source: GeneSight Canada
Data Collection and Integration

I-CARE is a critical source of longitudinal, phenotypic data which can be integrated with other data types.
The Future of I-CARE
Integration of Care, Research and Education

I-CARE

CARE

RESEARCH

EDUCATION
Thank You.

Image Source: Harris, 2012
Questions

Dr. Damian Jankowicz
Damian.Jankowicz@camh.ca

Dr. Tania Tajirian
Tania.Tajirian@camh.ca

Please complete the online evaluation for this session and reach out to the speakers should you have any questions or feedback.