



Exploring analytics technologies for the detection of adverse events

On behalf of Pirkanmaa Hospital District, Finland
Camille Poulin PT, B.Sc.P.T., CPHIMS-CA, PMP
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Session Objectives

- Understand how trigger tools can improve patient safety and the patient experience
- Describe recent experiences implementing automated trigger search tools
- Explain how organisations can measure patient safety in the hospital environment
- Explore the impact of data analytics technologies on the automation of the tool as it seeks triggers from unstructured patient data
- Review the triggers defined for Neurosurgery
- Describe how the cloud based service (SaaS) was developed using the latest analytics tools from SAS Institute



We know the stats

1 in 10 patients experience harm while receiving care in developed countries

Surgical safety problems account for 50% of avoidable adverse events

7 – 10% of hospitalized patients will acquire health care-associated infections



And more stats

\$1.1B

Estimated **economic burden** of adverse events in Canada
(2009-2010)

Traditional voluntary reporting systems detect only **10-20 % of adverse events**, of which **90-95 % are harmless**

Canada - higher risk of experiencing AEs for **home care clients** within 30 days of **hospital discharge**



Home > News & Events > CPSI News > Let's Celebrate Safe Care - Have you got a good story to tell?

Safe care... accepting no less

Let's Celebrate Safe Care - Have you got a good story to tell?

Safe care... accepting no less

News & Events

- CPSI News
- News Releases
- Event Calendar
- Canadian Patient Safety Week (CPSW)
- Canada's Virtual Forum on Patient Safety and Quality Improvement
- Patient Safety Crosswalk
- Celebrating Safe Care
- The Stories**
- Patient Safety Power Plays
- Champion Awards
- Researcher in the Room

Home > News & Events > Celebrating Safe Care > The Stories

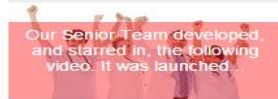


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The Stories

SHARE YOUR STORY!

The St. Joseph's Hand Hygiene Angels



Our Senior Team developed and starred in the following video. It was launched...

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Patient relations and patient safety go hand in hand



Patients play a role in helping to stop the spread of germs that can cause...

READ MORE

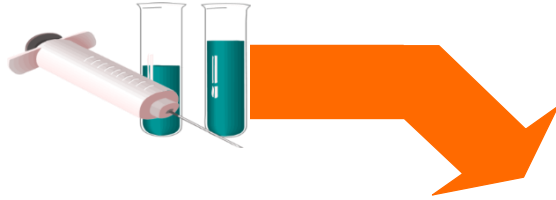
Hand Hygiene Key Moments for Patients



Patients play a role in helping to stop the spread of germs that can cause...

READ MORE

Focus on the individual and family



So what's the problem?

HOSPITAL INCIDENT REPORTING SYSTEMS DO NOT CAPTURE MOST PATIENT HARM

Staff only reported 14% of adverse events

Reasons why hospital staff did not report harm events:

- No perceptible medical error
- Little harm or harm ameliorated quickly
- Event not on mandatory reporting list
- Event occurs frequently in hospitals
- Patient had history of similar events

Daniel R. Levinson, Inspector General,
US Department of Health and Human Services
January 2012 OEI-06-09-0091



Here's help

- The IHI Global Trigger Tool for Measuring Adverse Events
 - Retrospective review of randomly sampled inpatient hospital records
 - Triggers identify possible adverse events
 - Easy-to-use method measures the rate of harm over time
 - Generally based on manual review



Innovation Series 2009

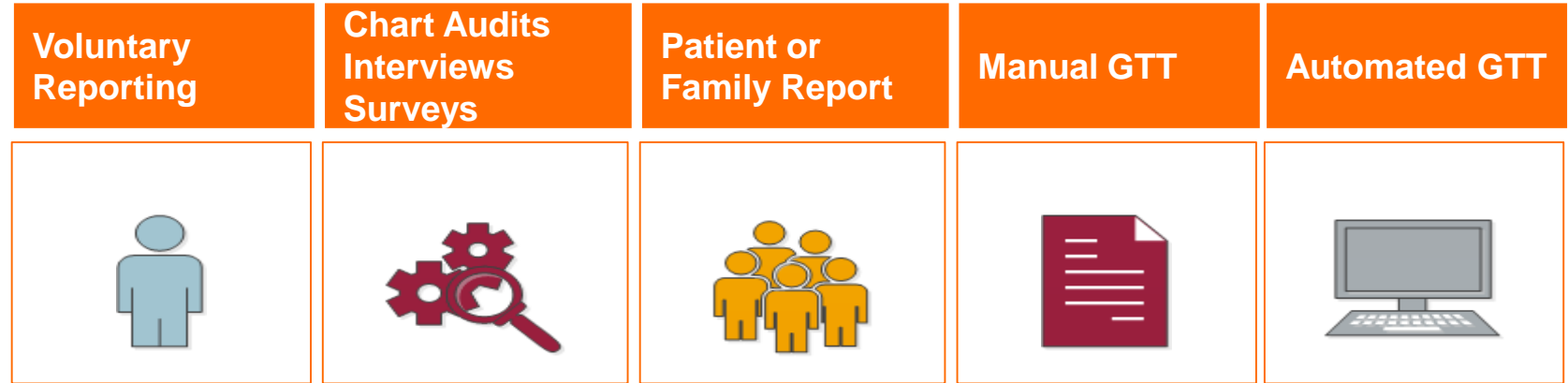
IHI Global Trigger Tool for Measuring Adverse Events

Second Edition



Where does GTT fit?

Detection



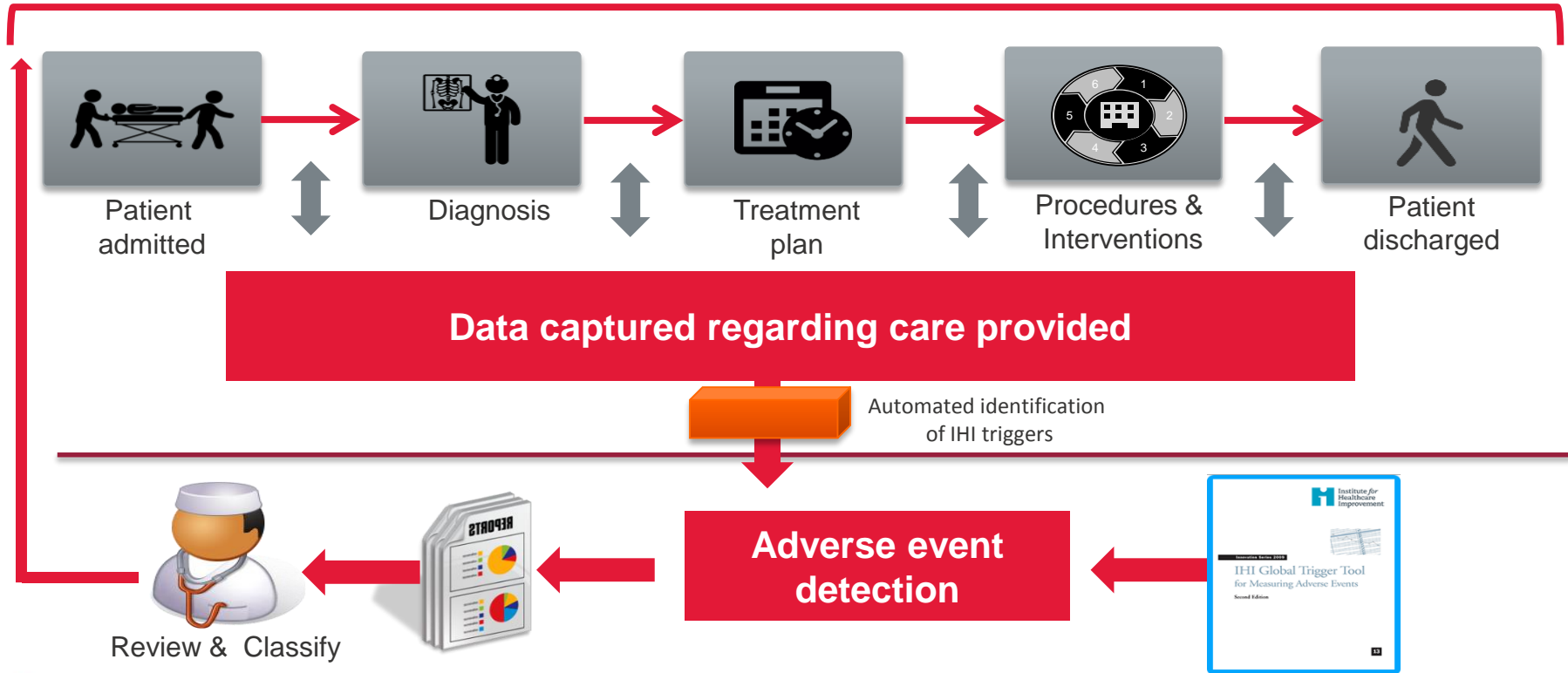
As planned? How do you know?



Care is provided

Unknown events

AE awareness and prevention



Safety improvement strategies

Understand

- Types of adverse events



Analyze

- System factors contributing to adverse events



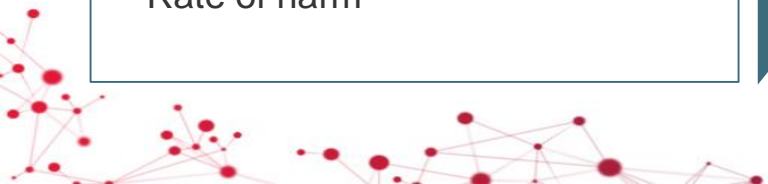
Focus

- Where improvements are needed and will be most beneficial

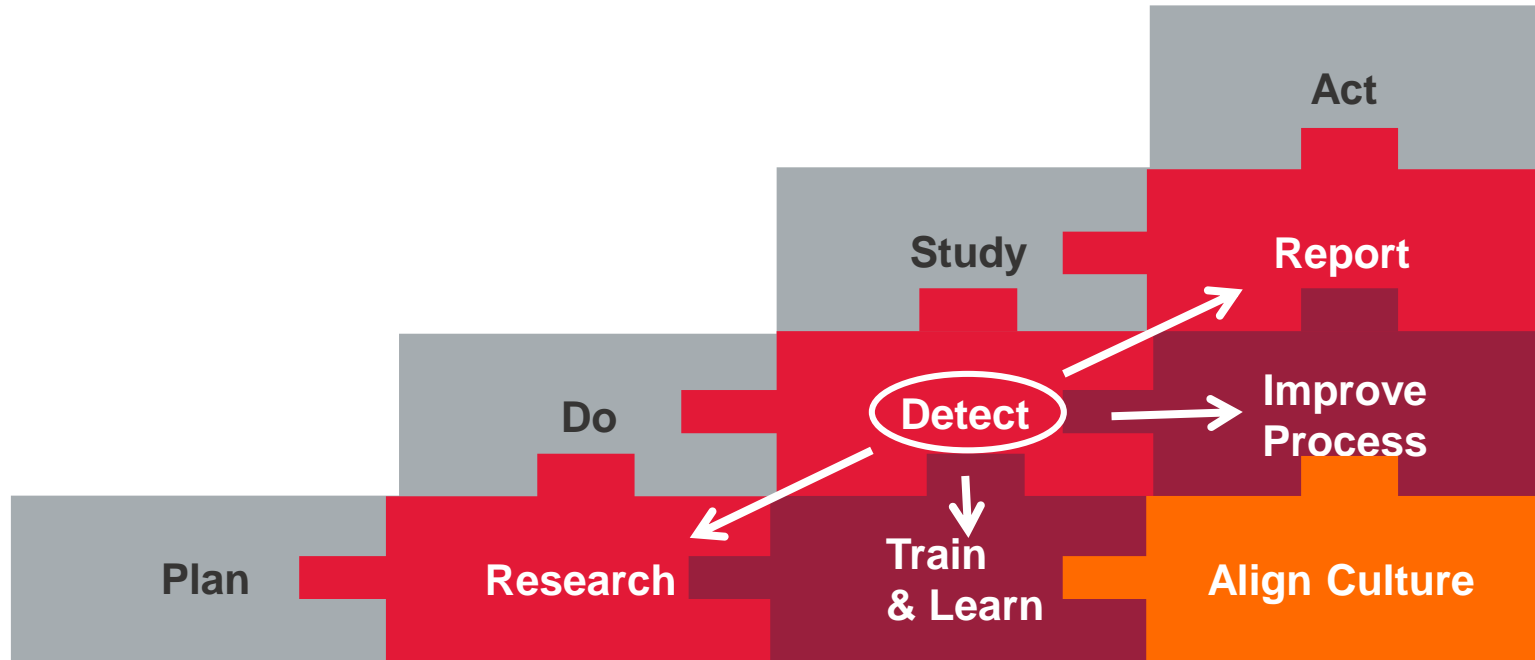


Measure

- Rate of harm



Part of the patient safety answer



Pirkanmaa Hospital District

The Pirkanmaa Hospital District is a joint municipal authority of 23 municipalities.

Its mission is to provide health care services that promote health and functional capacity and to promote scientific research and training to support this goal.



Neurosurgery

- brain injuries ✓
- cerebral haemorrhage ✓
- hydrocephalus ✓
- brain tumours ✓
- cervical/lumbar disc herniation ✓
- other degenerative diseases ✓
- cervical fractures ✓
- tumours of the spinal canal ✓
- acute spinal cord injuries ✓
- trigeminal neuralgia ✓
- chronic nerve root pain ✓

Taysissa tietokone etsii vaaroja

Tietokoneohjelma voi seuloa vaaran merkkejä yli 10 000 potilaskertomuksesta päivässä.

TM ilkka Jauhiainen

 Kirjanmerkki  Jaa



VAATIVAA HOITOA. Taysin hanke keskittyy neurokirurgiaan. Kuvassa Parkinson-potilas saa DBS eli deep brain stimulation -hoitoa Oysissa.

Triggers



- 58 IHI triggers in 6 modules
 1. Cares Module Triggers
 2. Medication Module Triggers
 3. Surgical Module Triggers
 4. Intensive Care Module Triggers
 5. Perinatal Module Triggers
 6. Emergency Department Module Triggers
- SAS
 - Automation of the process to reveal triggers for identifying potential adverse events
 - Automation aligned with GTT methodology
 - SAS Content Categorization
 - SAS Data Integration Server
 - SAS Enterprise BI server
 - SAS Enterprise Guide

Neurosurgery Triggers

1. Neuroworsening
 - GCS down 3 points (3-15 points)
 - Decreased consciousness
2. Unplanned radiological examination
3. Procedure due to change in clinical condition
 - Angiography (therapeutic)
 - Reoperation
4. Treatment complication
 - Pneumothorax
 - Catheter-Cystofix etc.
5. Wound problem
6. Hydrocephalus (CSF)
7. Infection
 - Severe (pneumonia etc.)
 - Mild (UTI etc.)
8. Readmission within 30 days
 - Readmission to the ICU
 - Readmission to University Hospital
9. Prolonged intensive care for non-neurological causes
10. Re-intubation
11. Disturbances in fluid balance
 - Electrolyte disturbance requiring treatment
 - Fluid balance disturbance requiring treatment
12. Hypertension/Hypotension

Deterioration of neurological condition



(e.g. decrease of 3 or more points on GCS)

Initial Keywords:

GCS, Altered consciousness, Decreased consciousness, Decreased response, Neurological worsening

Description:

- Level of consciousness / response / glasgow points, etc. fall / deteriorate / worsen / decline / collapse / alter, etc., excluding the cases where this is the initial state or just an anticipation.
- Spasm, neurological deficit, nausea, clumsiness, Ativan, disoriented, unconsciousness, aphasia, no movement, developed quickly...
- Or Death



Infection



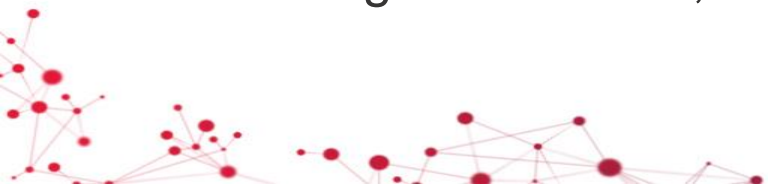
(e.g. any nosocomial infections: central line infection, surgical site infection, or urinary tract infection either serious or mild)

Initial Keywords:

Infection, Aspiration, Pneumonia, Meningitis, Urinary tract, Bacteria, Staphylococci, High leukocyte count, Septicemia

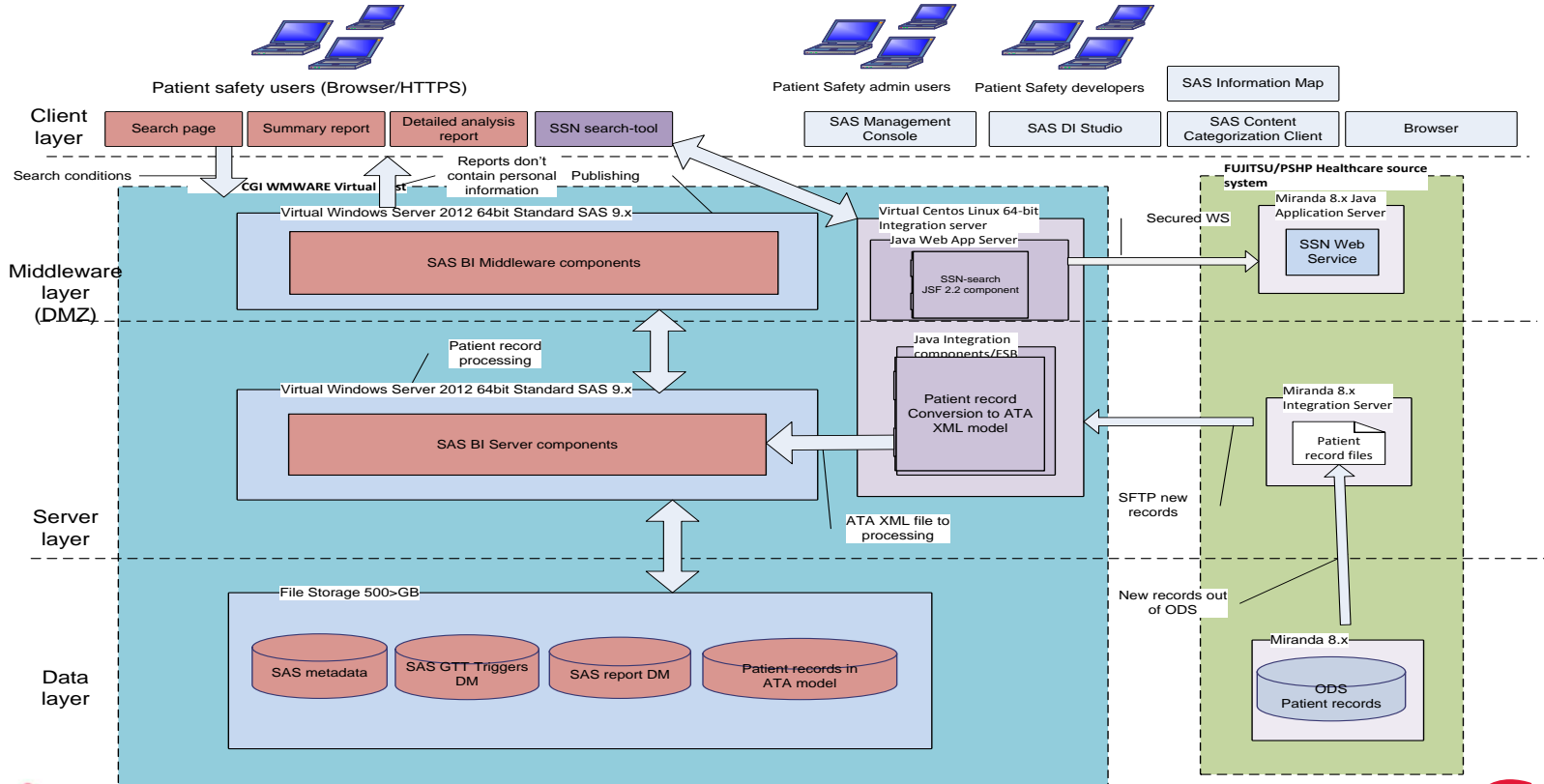
Description:

- Retrieving all infections
- excluding those cases, where it was the case at the time of entry



Patient Safety Service CGI/Miranda/SAS

CGI BI GTT Patient Safety service for PSHP



How does it work?

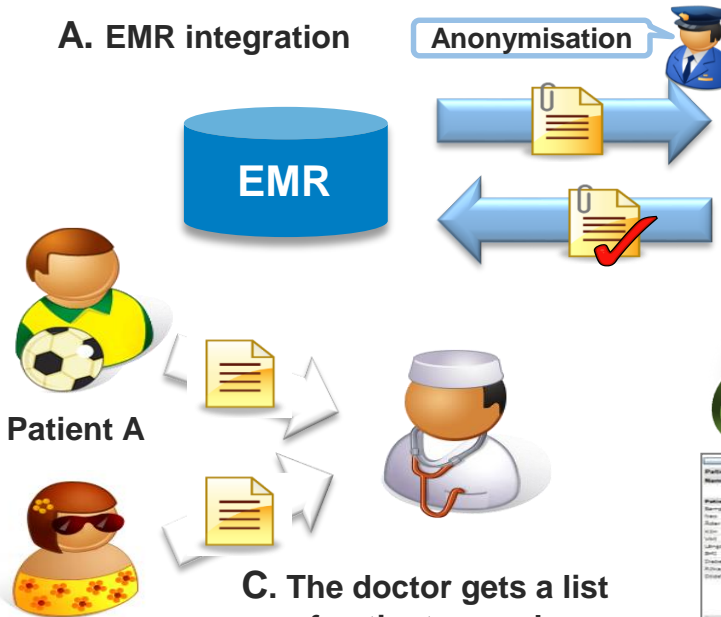
1. Electronic patient record data

2. Search for triggers (Natural Language Processing)

3. Analysis and adverse event recognition

4. Summary and statistics

A. EMR integration



Patient A

Patient B

C. The doctor gets a list of patient records including adverse events.

D. The results are used as a basis for clinical process development

Anonymisation

B. Easy-to-use interface

The screenshot shows a complex clinical interface with multiple columns and rows of data, including patient information and medical history.

Personal Information	Medical History	Diagnosis	ICD-10 Diagnosis
Name: Müller, Hans	Diagnosis: Myocardial infarction	Myocardial infarction	I25.0
Age: 65	Diagnosis: Hypertension	Hypertension	I10
Sex: Male	Diagnosis: Diabetes mellitus	Diabetes mellitus	E11.0
Address: Müllerstr. 123, 10115 Berlin	Diagnosis: Chronic kidney disease	Chronic kidney disease	N18.2
Phone: +49 30 12345678	Diagnosis: Asthma	Asthma	J45.0
Insurance: GKV	Diagnosis: Depression	Depression	F32.0
Referral: Dr. Müller	Diagnosis: Anxiety disorder	Anxiety disorder	F41.1
Referral date: 2023-10-27	Diagnosis: Alcohol use disorder	Alcohol use disorder	F10.2
Referral reason: Routine check-up	Diagnosis: Schizophrenia	Schizophrenia	F20.0
Referral type: Outpatient	Diagnosis: Bipolar disorder	Bipolar disorder	F31.0
Referral status: Active	Diagnosis: Borderline personality disorder	Borderline personality disorder	F63.0
Referral contact: Dr. Müller	Diagnosis: Post-traumatic stress disorder	Post-traumatic stress disorder	F41.1
Referral contact phone: +49 30 12345678	Diagnosis: Obsessive-compulsive disorder	Obsessive-compulsive disorder	F42.0
Referral contact email: h.mueller@cgilab.com	Diagnosis: Tic disorder	Tic disorder	F95.0
Referral contact address: CGILab, Berlin	Diagnosis: Conduct disorder	Conduct disorder	F91.0
Referral contact postal code: 10115	Diagnosis: Attention deficit hyperactivity disorder	Attention deficit hyperactivity disorder	F90.0
Referral contact city: Berlin	Diagnosis: Intellectual disability	Intellectual disability	F70.0
Referral contact country: Germany	Diagnosis: Personality disorder	Personality disorder	F60.0
Referral contact phone: +49 30 12345678	Diagnosis: Substance use disorder	Substance use disorder	F10.0
Referral contact email: h.mueller@cgilab.com	Diagnosis: Self-harm	Self-harm	6A02.0
Referral contact address: CGILab, Berlin	Diagnosis: Suicide	Suicide	6A03.0
Referral contact postal code: 10115	Diagnosis: Suicide attempt	Suicide attempt	6A04.0
Referral contact city: Berlin	Diagnosis: Suicide completion	Suicide completion	6A05.0
Referral contact country: Germany	Diagnosis: Suicide ideation	Suicide ideation	6A06.0
Referral contact phone: +49 30 12345678	Diagnosis: Suicide risk	Suicide risk	6A07.0
Referral contact email: h.mueller@cgilab.com	Diagnosis: Suicide history	Suicide history	6A08.0
Referral contact address: CGILab, Berlin	Diagnosis: Suicide warning	Suicide warning	6A09.0
Referral contact postal code: 10115	Diagnosis: Suicide prevention	Suicide prevention	6A10.0
Referral contact city: Berlin	Diagnosis: Suicide intervention	Suicide intervention	6A11.0
Referral contact country: Germany	Diagnosis: Suicide support	Suicide support	6A12.0
Referral contact phone: +49 30 12345678	Diagnosis: Suicide counseling	Suicide counseling	6A13.0
Referral contact email: h.mueller@cgilab.com	Diagnosis: Suicide education	Suicide education	6A14.0
Referral contact address: CGILab, Berlin	Diagnosis: Suicide research	Suicide research	6A15.0
Referral contact postal code: 10115	Diagnosis: Suicide prevention program	Suicide prevention program	6A16.0
Referral contact city: Berlin	Diagnosis: Suicide intervention program	Suicide intervention program	6A17.0
Referral contact country: Germany	Diagnosis: Suicide support program	Suicide support program	6A18.0
Referral contact phone: +49 30 12345678	Diagnosis: Suicide counseling program	Suicide counseling program	6A19.0
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Referral contact country: Germany	Diagnosis: Suicide support program	Suicide support program	6A30.0



Data analyst



Text mining with patient safety analysis models

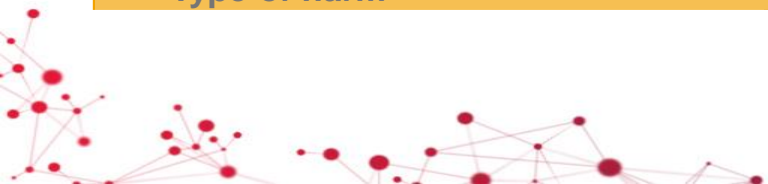


GTT automation – lessons learned

	Fine-tuning the triggers	Implementing the technology	Managing change
Schedule	<ul style="list-style-type: none">• 2 – 3 months to plan	<ul style="list-style-type: none">• 4 months to implement	<ul style="list-style-type: none">• Healthcare is messy
Resources	<ul style="list-style-type: none">• Patient safety team• Administrators• Physicians• Informatics specialists• Technology specialists	→ ✓	<ul style="list-style-type: none">+ Patient safety team+ Patient/family liaison+ Clinical liaison
Scope	<ul style="list-style-type: none">• One unit in a hospital	→ ✓	<ul style="list-style-type: none">+ Hospital+ Community

Patient safety service benefits

Manual GTT processes <ul style="list-style-type: none">• 26 hours per month• 0.15 FTE	1	Automated GTT processes <ul style="list-style-type: none">• No staff time• No FTEs	↓
Number of charts reviewed bi-monthly <ul style="list-style-type: none">• 20	2	Thousands of charts reviewed as needed	↑
Triage <ul style="list-style-type: none">• 40 charts direct patient safety efforts	3	Thousands of charts allow for additional adverse event analysis	↑
Accuracy <ul style="list-style-type: none">• Identification of triggers	4	Comparable to manual review	✓
Rate of patient harm <ul style="list-style-type: none">• Adverse events• Type of harm	Future	Adverse events & harm to patients	↓



What's next?



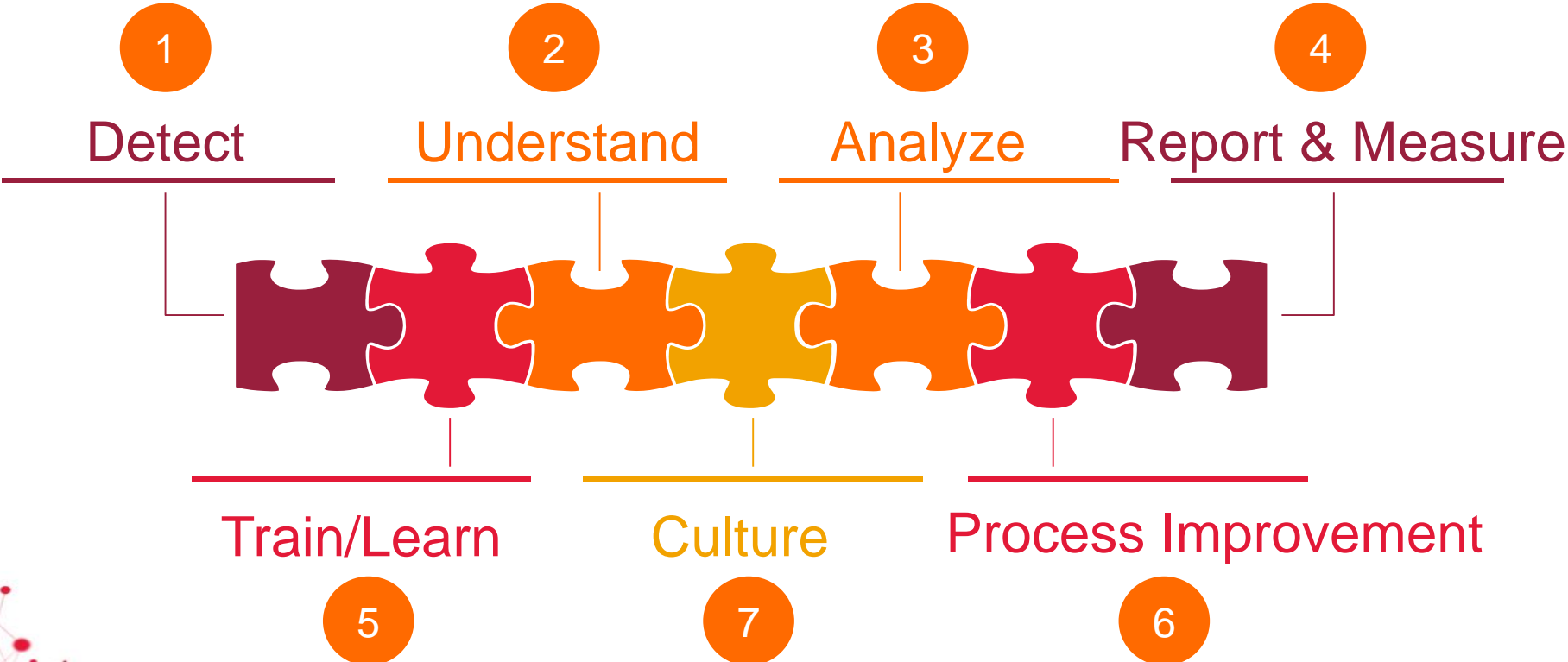
What might this mean?

- Real time identification of triggers
- Prevention of adverse events
- Improved care and outcomes



- Legal implications
- Care assignments
- Liaison and communication
 - With patients and families
 - With clinicians

The value of automation



Thanks

- Pirkanmaa Hospital District
- Tampere, Finland
- CGI teams in Finland, India, US and Canada



Questions?



Contact information



Camille Poulin
Senior Healthcare Consultant

camille.poulin@cgi.com
780-409-5522



Stephen Saunders
Chief Architect, Global Health

stephen.saunders@cgi.com
613-464-0848



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