



**Health System Sustainability**  
NHMRC Partnership Centre



**MACQUARIE**  
University

# Using shared health information to improve the appropriateness, quality and effectiveness of care

Professor Johanna Westbrook & Dr Teresa Anderson



Inaugural Symposium – 16<sup>th</sup> March 2017

# Research Problem

- ❖ Exceptional opportunities to harness information technology (IT) to share and transfer information
- ❖ EHR information can reduce lost, incomplete or inaccurate information as patients move within and between health care organisations
- ❖ Goals are to support improvements in decision-making and deliver cost-effective outcomes
- ❖ Substantial gaps in our knowledge as to how to realise these benefits



## **Two big problems which should benefit from shared health information:**

**Medication errors and inappropriate therapy**

**Diagnostic testing**

# Sharing electronic medication information within organisations reduces medication errors



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Electronic medication information to reduce errors & improve decisions

NHMRC Project Grant

# Effects of Two Commercial Electronic Prescribing Systems on Prescribing Error Rates in Hospital In-Patients: A Before and After Study

Johanna I. Westbrook<sup>1\*</sup>, Margaret Reckmann<sup>1</sup>, Ling Li<sup>1</sup>, William B. Runciman<sup>2</sup>, Rosemary Burke<sup>3</sup>, Connie Lo<sup>1✉</sup>, Melissa T. Baysari<sup>4</sup>, Jeffrey Braithwaite<sup>5</sup>, Richard O. Day<sup>6</sup>

January 2012 | Volume 9 | Issue 1 | e1001164



**Sample:** 3200 patient admissions; >17,000 prescribing errors

Prescribing errors declined by >50% ( $p<0.0001$ )

44% ( $p=0.0002$ ) reduction in serious prescribing error rate

**25/100** admissions → **14/100** admissions

(95%CI 21-29)

(95%CI 10-18)

No significant change on the control wards ( $p=0.4$ )



# New Errors !

Available at JAMIA.BMJ.Com

Research and applications

## The safety of electronic prescribing: manifestations, mechanisms, and rates of system-related errors associated with two commercial systems in hospitals

Johanna I Westbrook,<sup>1</sup> Melissa T Baysari,<sup>2</sup> Ling Li,<sup>1</sup> Rosemary Burke,<sup>3</sup>

Katrina L Richardson,<sup>4</sup> Richard O Day<sup>5,6</sup>

*J Am Med Inform Assoc* 2013;

### Incorrect selection from drop-down menus

Order sentences for: metformin

(None)

500 mg, Oral, Tab, daily after food, Administration time is a guide only: MUST taken with meal  
500 mg, Oral, Tab, BD after food, Administration time is a guide only: MUST taken with meals  
500 mg, Oral, Tab, TDS after food, Administration time is a guide only: MUST taken with meal  
1,000 mg, Oral, Tab, daily after food, Administration time is a guide only: MUST taken with me  
1,000 mg, Oral, Tab, BD after food, Administration time is a guide only: MUST taken with meal  
1,000 mg, Oral, Tab, TDS after food, Administration time is a guide only: MUST taken with me  
850 mg, Oral, Tab, daily after food, Administration time is a guide only: MUST taken with meal  
850 mg, Oral, Tab, BD after food, Administration time is a guide only: MUST taken with meals  
850 mg, Oral, Tab, TDS after food, Administration time is a guide only: MUST taken with meal  
500 mg, Oral, Tab, SR, evening, Administration time is a guide only: MUST taken with meals.  
1,000 mg, Oral, Tab, SR, evening, Administration time is a guide only: MUST taken with meals  
1,500 mg, Oral, Tab, SR, evening, Administration time is a guide only: MUST taken with meals  
2,000 mg, Oral, Tab, SR, evening, Administration time is a guide only: MUST taken with meals



# Leveraging electronic data in aged care to improve appropriateness and quality



# Extract medication data from 71 RACFs to obtain a 24 hour snapshot of medication

- ❖ Polypharmacy ( $\geq 5$  medicines) 84.62% (95%CI 82.11-87.19)
- ❖ Hyper-polypharmacy ( $\geq 10$  medicines) 43.39% (95%CI 41.60-45.24)
- ❖ 3.78% (95%CI 3.26-4.35) of residents used 20 or more medicines.

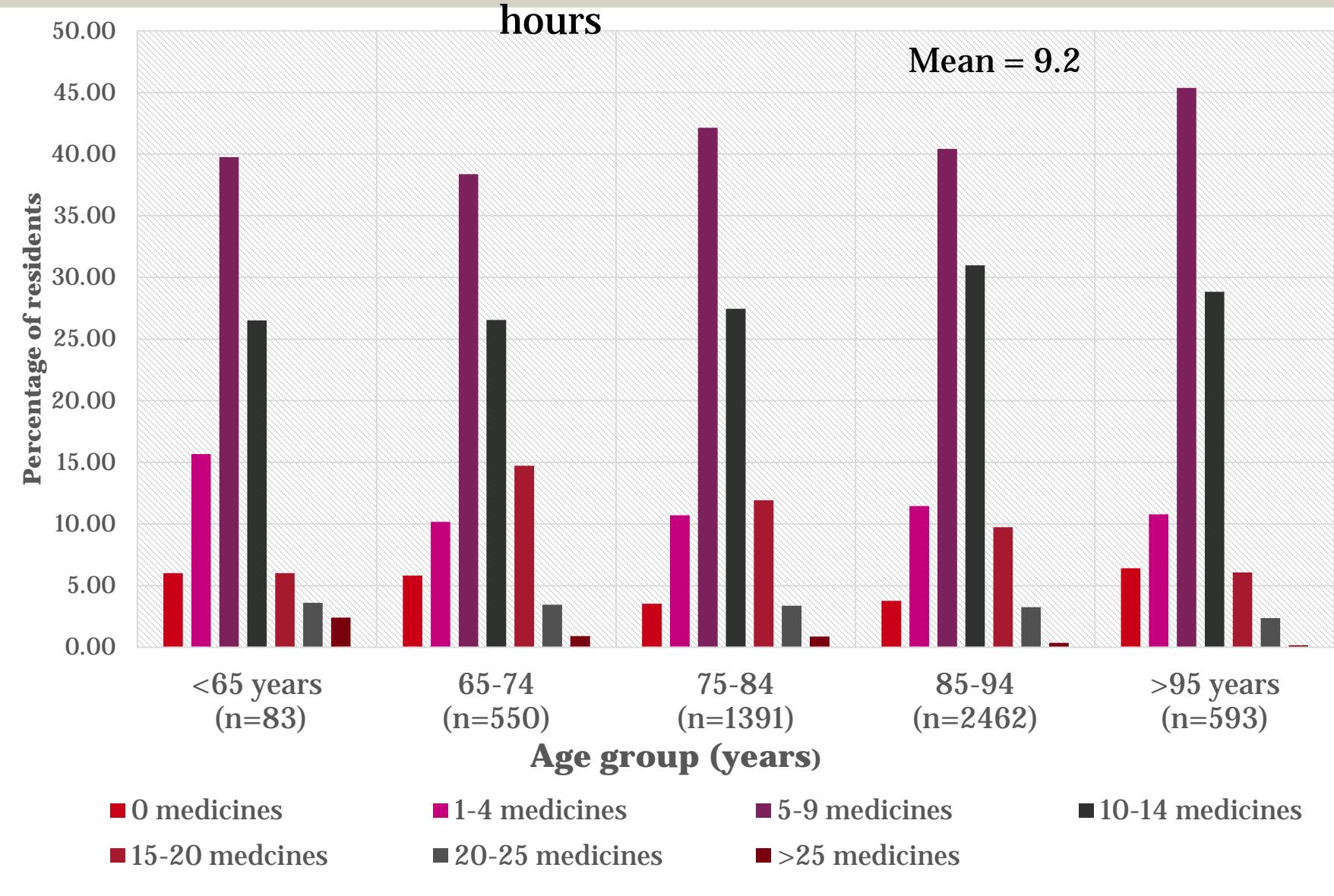


# Number of medicines by age

95.7% of residents received 1 or more medication in 24 hours



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# Diagnostic Testing

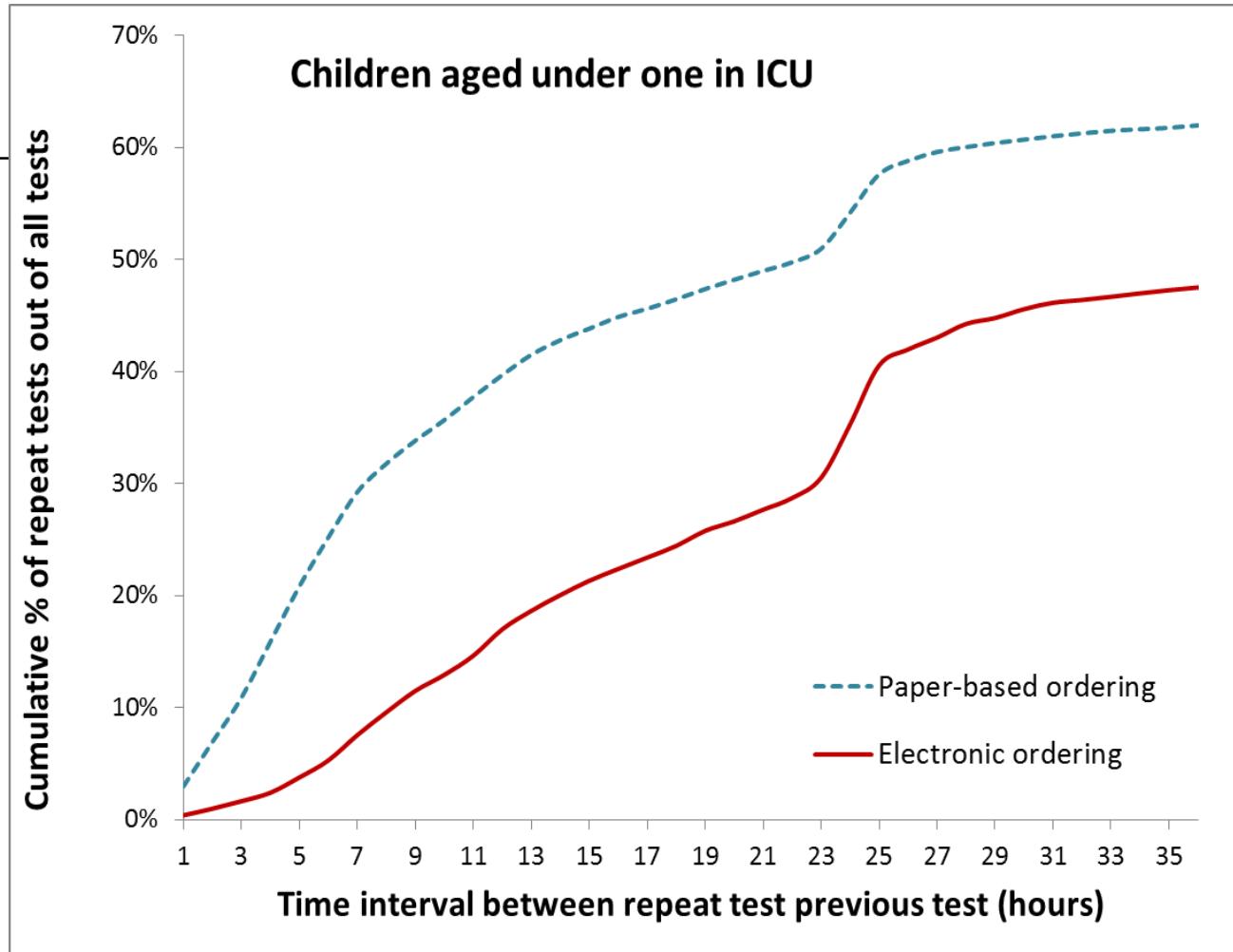
Increased use of pathology testing & variations in testing

Data linkage and sharing of electronic data to understand variation, and link test use with patient outcomes

Test results which are not reviewed

Tests repeated because of lack of access to results

Even simple decision-support can improve prescribing and test ordering behaviours



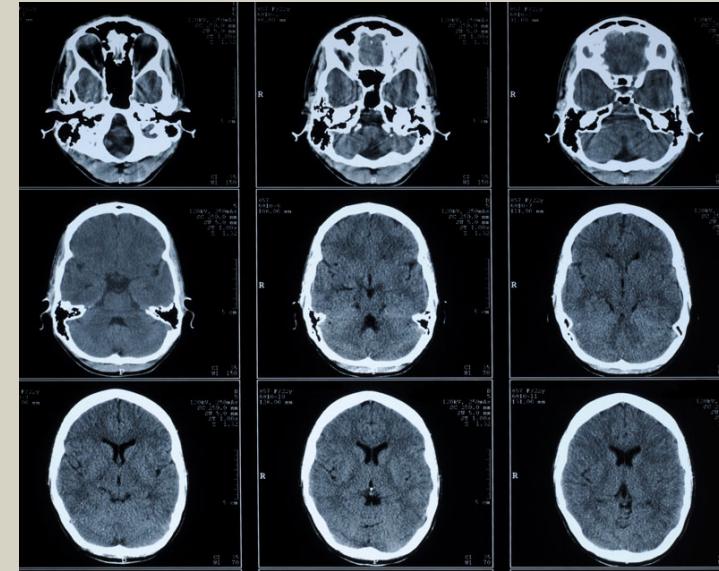
Repeat testing for children under 1 year in four ICUs significantly declined following the introduction of electronic test ordering (Li et al 2014)

# Effects of integrating information systems

To assess the impact of linking:

- ❖ Order Entry;
- ❖ Radiology Information System
- ❖ PACS

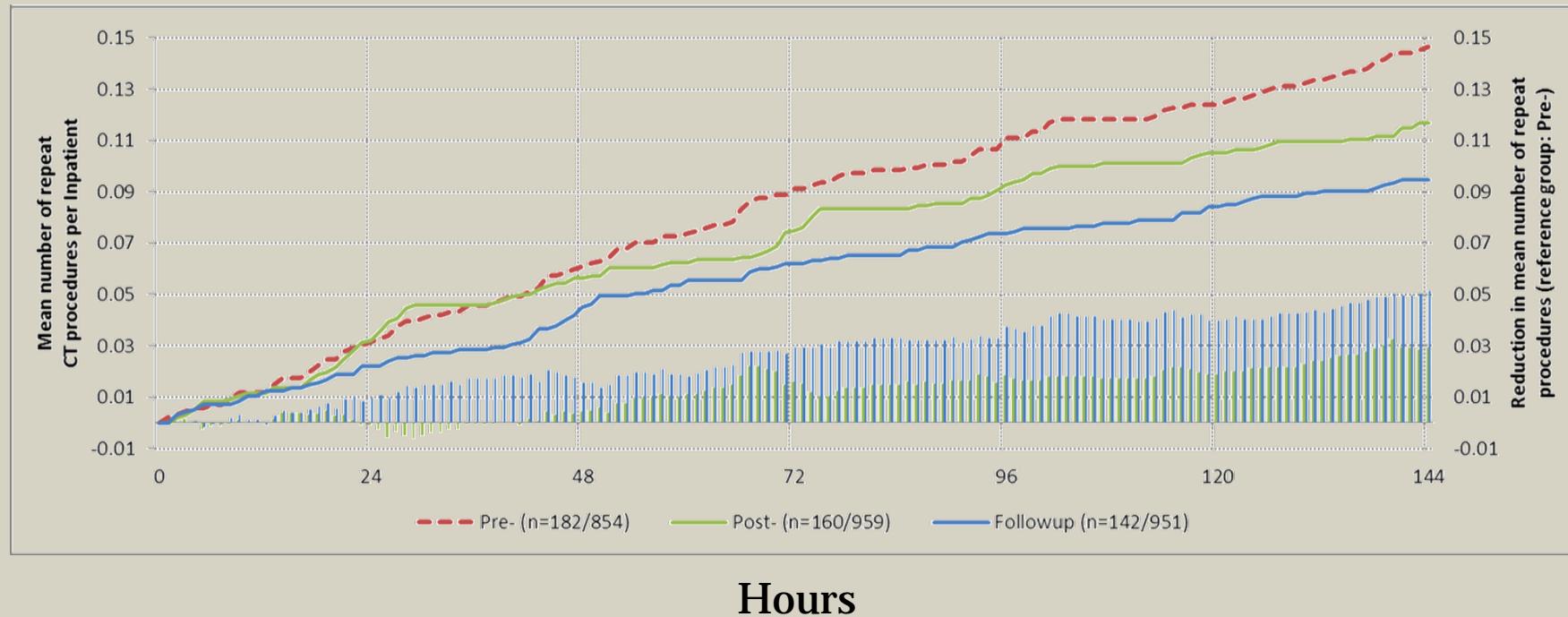
on the number of x-ray and CT scans for inpatients



# Changes in rates of repeat CT scans per patient post IT integration



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30% reduction in repeat CT scans within 72 hours of original scan

40% reduction in repeat CT scans within 6 days

## **FMU 1-1 FOCUS QUESTIONS:**

- 1.** How can shared health information improve appropriate, effective and cost-effective medication management, and reduce errors and adverse drug events in acute, community and aged care settings?
  
- 2.** How can shared health information improve appropriate ordering, followup of diagnostic tests and consumer engagement?



# Work Plan

**Year 1** Conduct expanded reviews focusing on - mechanisms and models for shared health information to impact care across settings, support improved medication management and diagnostic testing and reduce adverse events.

**Year 1-2** Case studies of the impact of shared electronic health information: acute, primary and aged care settings. This work will draw upon the experiences of our System Based Lead Investigators.

Investigations will identify core indicators of impact and contextual factors which influence adoption, use and effectiveness of shared health information to impact diagnostic testing, improve medication management and reduce errors.

# Electronic Medication Management a case study in collaboration

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# Building the foundations for an integrated medications solution

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**Governance** – Governance at State, District and Facility level with extensive multi-disciplinary representation.

**Change management** – Engagement of local clinicians to drive organisational change and to embed an integrated medications solution.

**Collaboration** – Sharing with our colleagues in St Vincents, POW, Westmead Children's Hospital

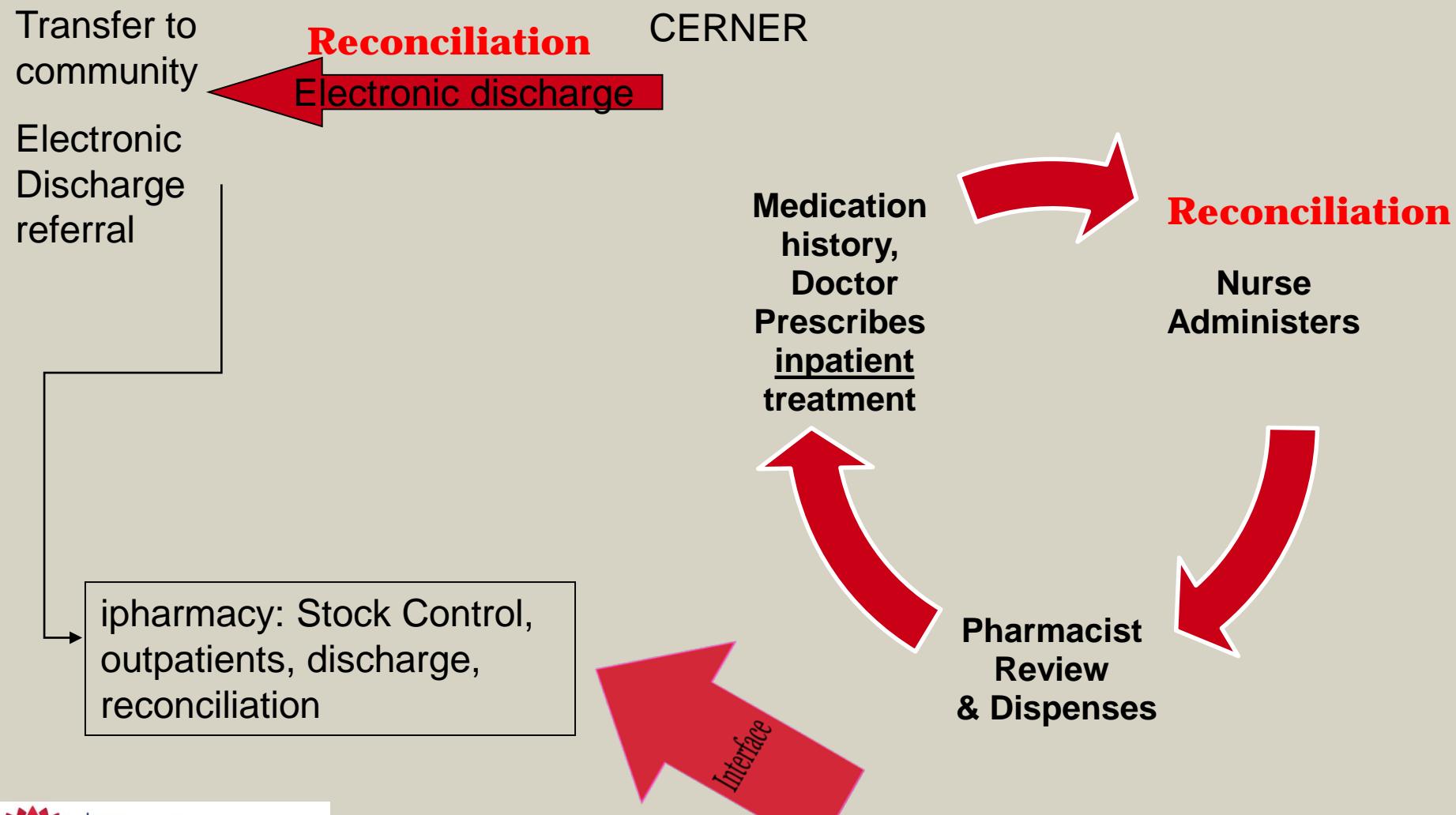
**Training and Support** – Resources and flexible training models combined with targeted support to meet the needs of health professionals.

**Infrastructure** – Hardware, software, network resources and services required for the operation and management of core clinical information systems.

**Research** – Undertaking research to improve the system and evaluate its impact



# eMEDS: Our Model



# Medication Reconciliation

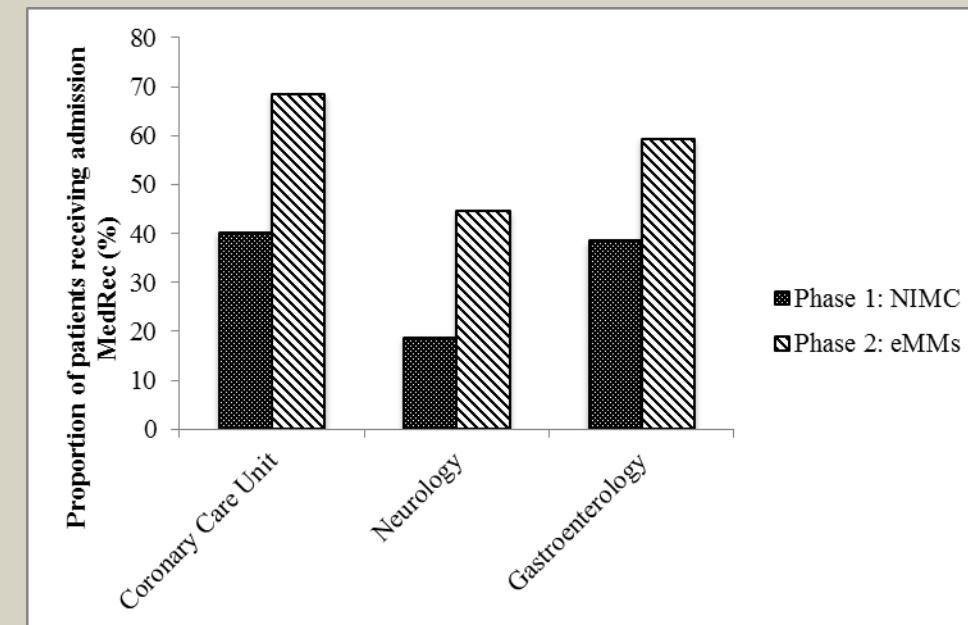
Community to HOSPITAL TO COMMUNITY



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- Goal to enable seamless data transfer between the hospital and community sectors.
- Failing to do this can lead to increased LOS, increased risk of readmissions and increased morbidity.
- Discharge Medication Reconciliation (eMeds to GP Letter (Feb 2017 discharges showed 75% had complete electronic discharge reconciliation).

## Admission Medication Reconciliation August 2014 & August 2015



Sardaneh AA, Burke R, Ritchie A, McLachlan AJ,  
Lehnbom EC. Int J Informatics 2017.  
<http://dx.doi.org/doi:10.1016/j.ijmedinf.2017.02.001>

# Sharing information to drive improvements in care

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## **Sharing information about our system and how it works –**

- HealthPathways, HERO and National Health Service Directory collaboration.

## **Sharing personal health information**

- Clinician to patient communication – limited now but likely to expand
- Clinician to clinician communication – electronic delivery of discharge documents outbound (discharge summaries), inbound (eReferrals)
- Clinician to ‘cloud’-based platforms e.g. HealtheNet, My Health Record growing and this is a sustainable pathway to sharing more information with primary care.



Health

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# STARS

- SLHD's TARGETED ACTIVITY & REPORTING SYSTEM

- STARS was launched in SLHD in March 2013 as an interactive platform designed to explore opportunities for increasing efficiencies within the strategic and operational landscape of the District.
- STARS is used as a collaborative tool for both clinicians and managers, and brings a new levels of analysis, insight and value to existing data stores with user interfaces that are simple and straightforward.
- Utilising multiple data sources the system is used across all levels of the organisation, applications have been designed for a range of purposes and areas such as:
  - Quality and Safety
  - Clinical Information
  - Management and Finance



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# STARS

- SLHD's TARGETED ACTIVITY & REPORTING SYSTEM



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- The STARS interface allows users to interrogate performance, financial and operational data in order to:
  - Identify clinical variation and reduced unwarranted clinical variation
  - Strengthen and assist in the implementation of best-practice models of care
  - Improve clinical outcomes
- Applications such as clinical variation app provide linkage across a number of measures including readmission rates, complications and length of stay to assist in the surveillance and reduction of unwarranted clinical variation.

	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017						
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
<b>Top 20 Medical DRGs</b>												
<b>DRG</b>												
F62B - Heart Failure and Shock, Minor Complexity	159											
F76B - Arrhythmia, Cardiac Arrest and Conduction ...	155											
Z63B - Other Follow Up After Surgery or Medical Ca...	132											
F62A - Heart Failure and Shock, Major Complexity	124											
F76A - Arrhythmia, Cardiac Arrest and Conduction ...	95											
Z64A - Other Factors Influencing Health Status, Ma...	77											
F74B - Chest Pain, Minor Complexity	65											
F73B - Syncope and Collapse, Minor Complexity	51											
F60A - Circulatory Dsrd, Adm for AMI W/O Invas C...	37											
F75B - Other Circulatory Disorders, Intermediate C...	27											
Z63A - Other Follow Up After Surgery or Medical Ca...	26											
F66B - Coronary Atherosclerosis, Minor Complexity	22											
F73A - Syncope and Collapse, Major Complexity	21											
F74A - Chest Pain, Major Complexity	20											
F72B - Unstable Angina, Minor Complexity	15											
F75A - Other Circulatory Disorders, Major Complexity	15											
F69A - Valvular Disorders, Major Complexity	14											
E62A - Respiratory Infections and Inflammations, M...	10											
F69B - Valvular Disorders, Minor Complexity	10											
E75A - Other Respiratory System Disorders, Major ...	8											
<b>Others</b>	<b>204</b>											
<b>Total Medical DRGs</b>	<b>1,287</b>											

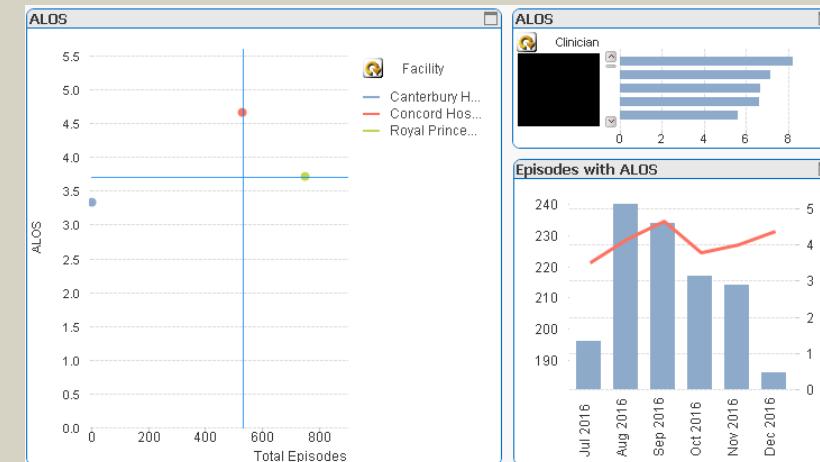
**Bottom 10 Medical DRGs**

DRG	Total Episod...
D66A - Other Ear, Nose, Mouth and Throat Disorde...	1
E65B - Chronic Obstructive Airways Disease, Minor ...	1
E69A - Bronchitis and Asthma, Major Complexity	1
E71A - Respiratory Neoplasms, Major Complexity	1
E73A - Pleural Effusion, Major Complexity	1
F60B - Circulatory Dsrd, Adm for AMI W/O Invas C...	1
F61B - Infective Endocarditis, Minor Complexity	1
F65B - Peripheral Vascular Disorders, Minor Comple...	1
G66A - Abdominal Pain and Mesenteric Adenitis, Ma...	1
I66A - Inflammatory Musculoskeletal Disorders, Mai...	1
<b>Others</b>	<b>1,277</b>
<b>Total Medical DRGs</b>	<b>1,287</b>

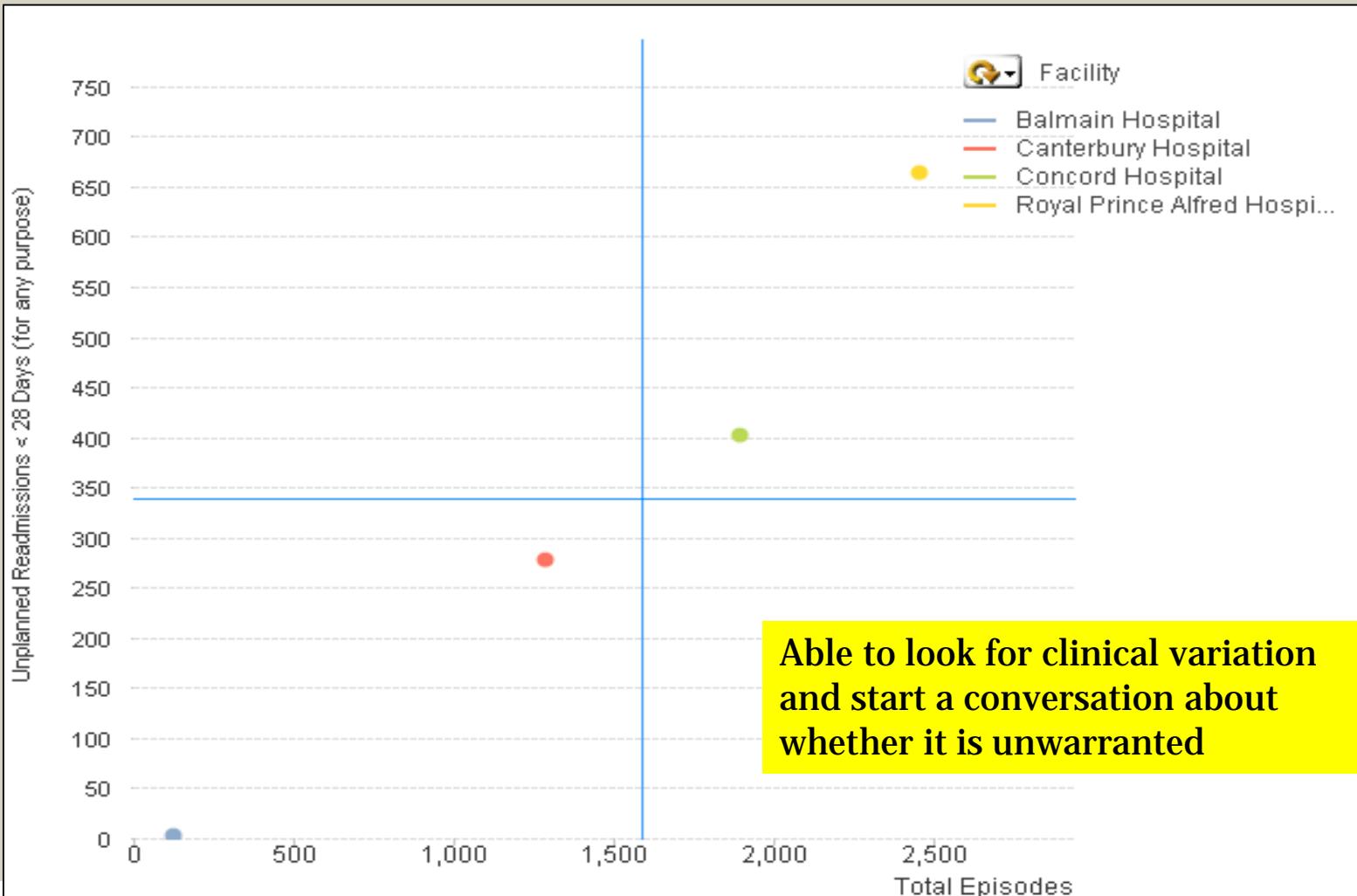
**DRG Type**      **DRG Split**        **LOS Type**

**Measure**

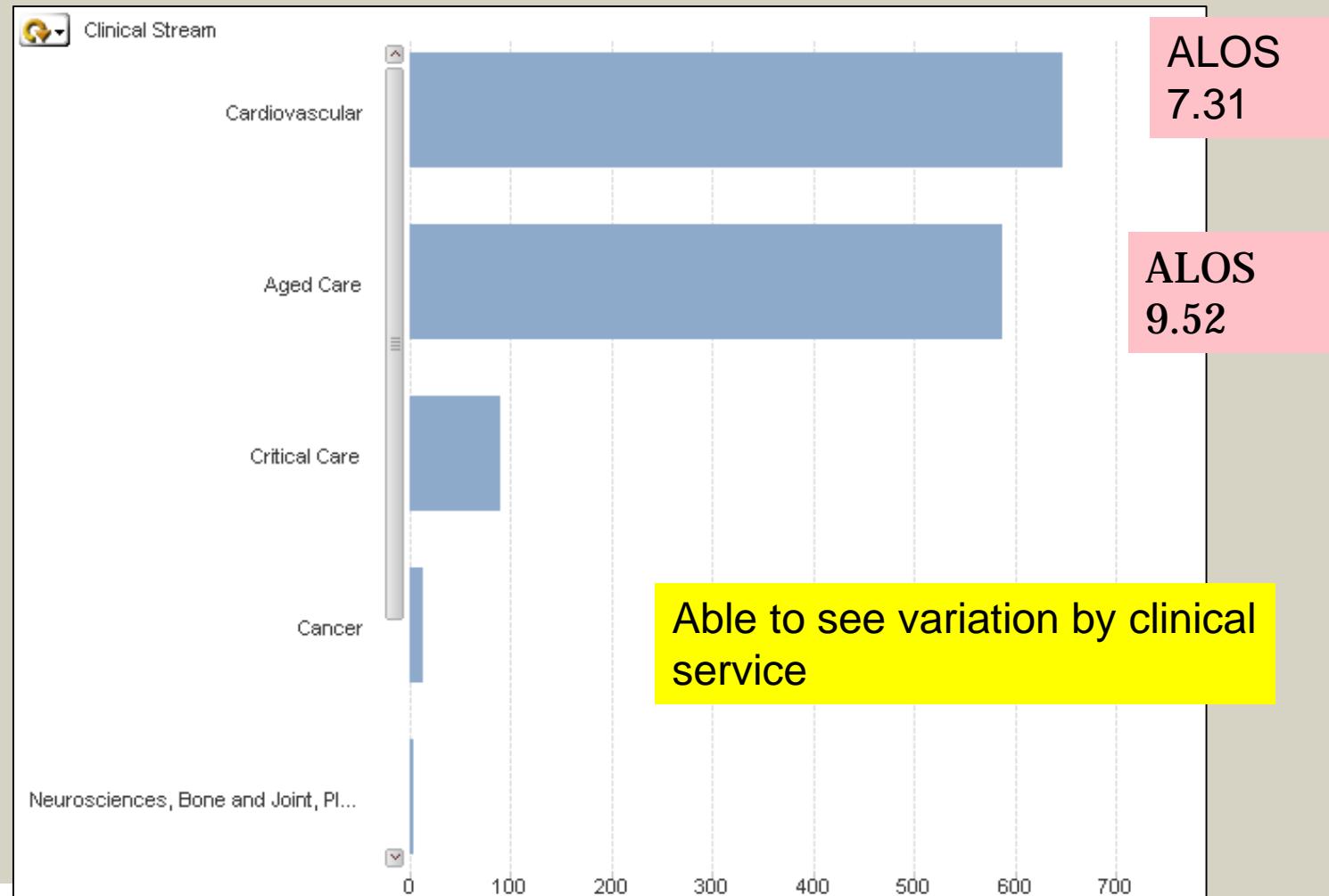
ALOS	Cases > Peer	Overnight Peer...	Complications P...	Complications P...	Condition Arisin...	Unplanned Rea...	Mortality
Episodes							



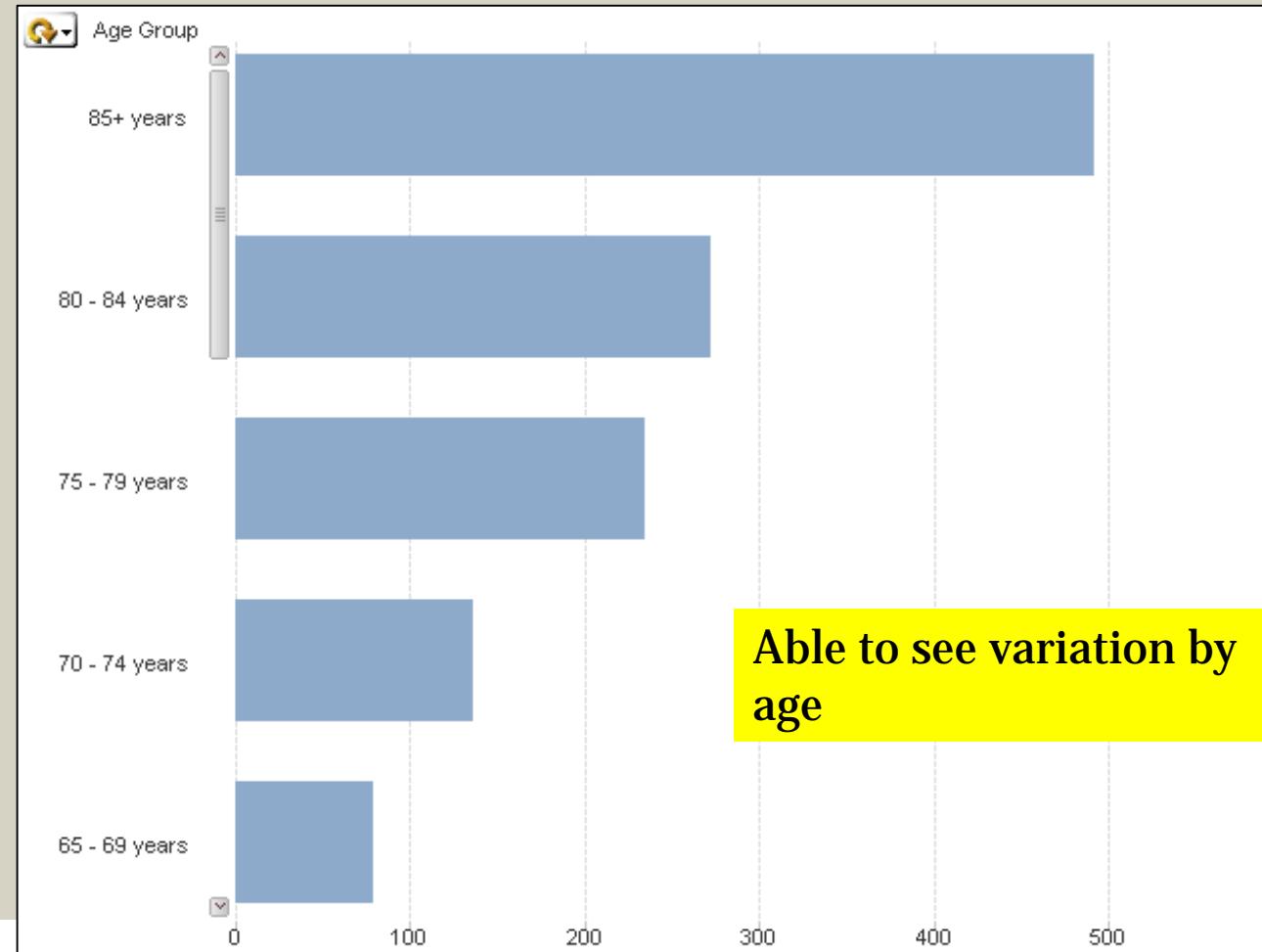
# STARS Clinical Variation App: Unplanned Readmissions in Heart Failure



# Interrogating the Data: Unplanned Readmissions in Heart Failure by Clinical Service



# Interrogating the Data: Unplanned Readmissions in Heart Failure by Clinical Service



# Data shared and used to start a conversation

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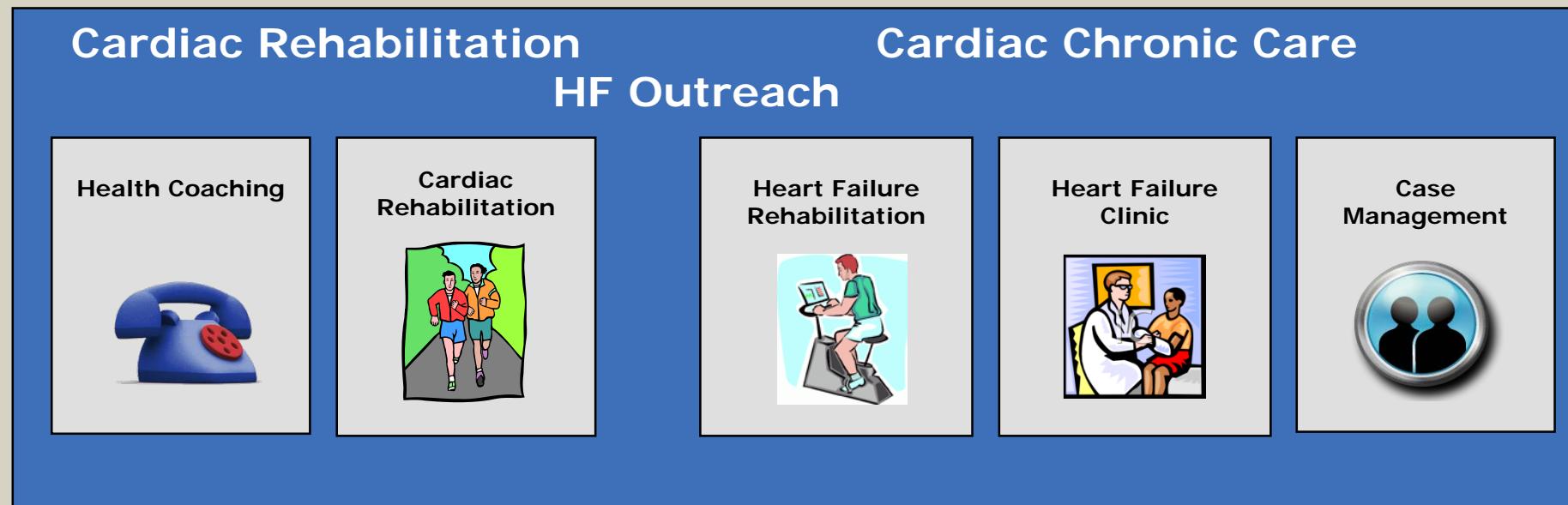
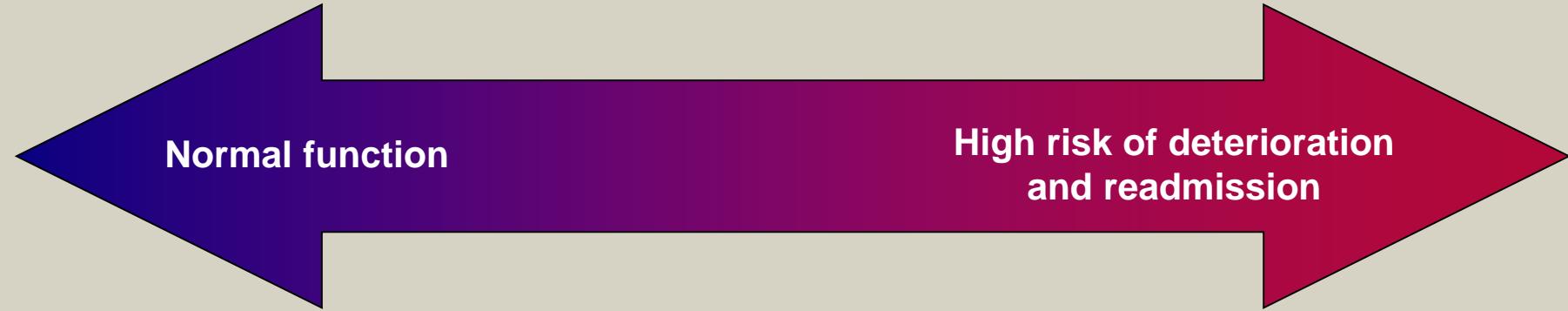
Why is there clinical variation?

- Cardiologists, Geriatricians, nurses, data analysts across the district collaborate and investigate
- Evidence of practice variation
- New protocols developed for aged care
- Investment in Heart Failure Chronic Care program

# Heart Failure Model of Care implemented



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# Stars Used to compare data overtime SLHD Heart Failure 28 Day re-admissions



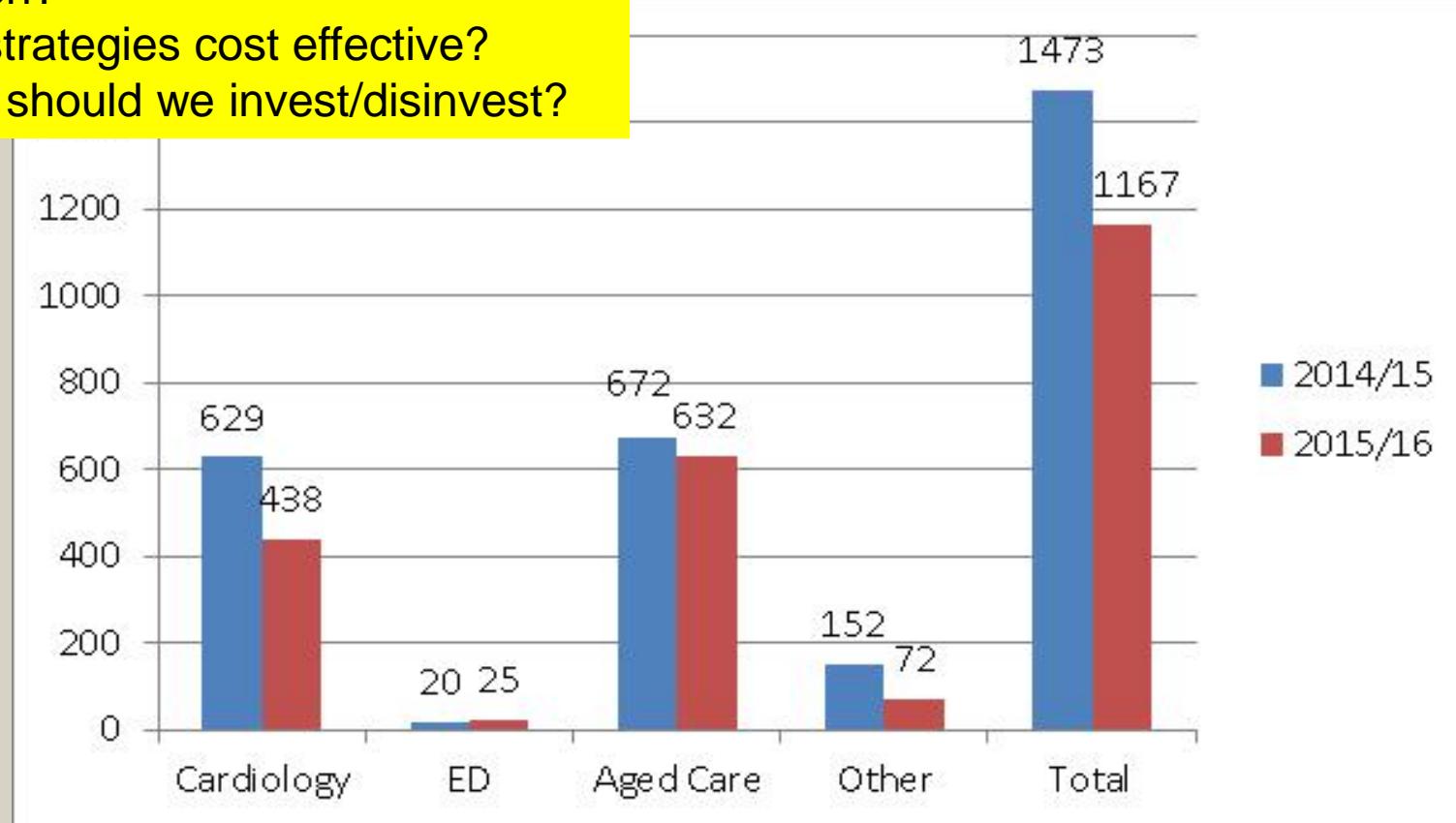
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Are we heading in the right direction?

Were strategies cost effective?

Where should we invest/disinvest?

↓21%



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# Questions for Discussion



Which members of the partnership Centre are interested in participating?

Other potential case study areas for shared health information to improve medication management and diagnostic testing?



# Acknowledgements

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  - Eva Fares
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  - Sara Culhane

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- Rosemary Burke
- Jackie Laurens

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- Tim Sinclair

## **CMIO**

- Angus Richie

## **CNIO**

- Aaron Jones

## **HIU Team**

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- Magnus Blomqvist

Thank You

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