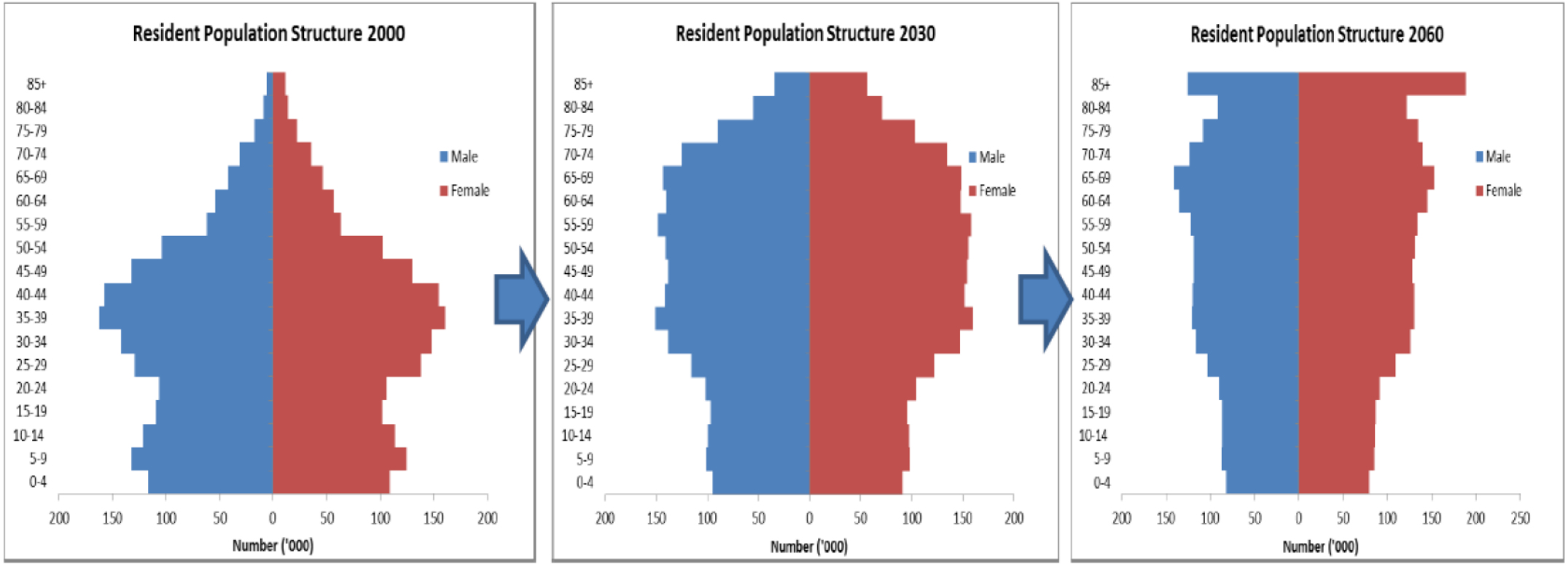
# CS Career Journey Development

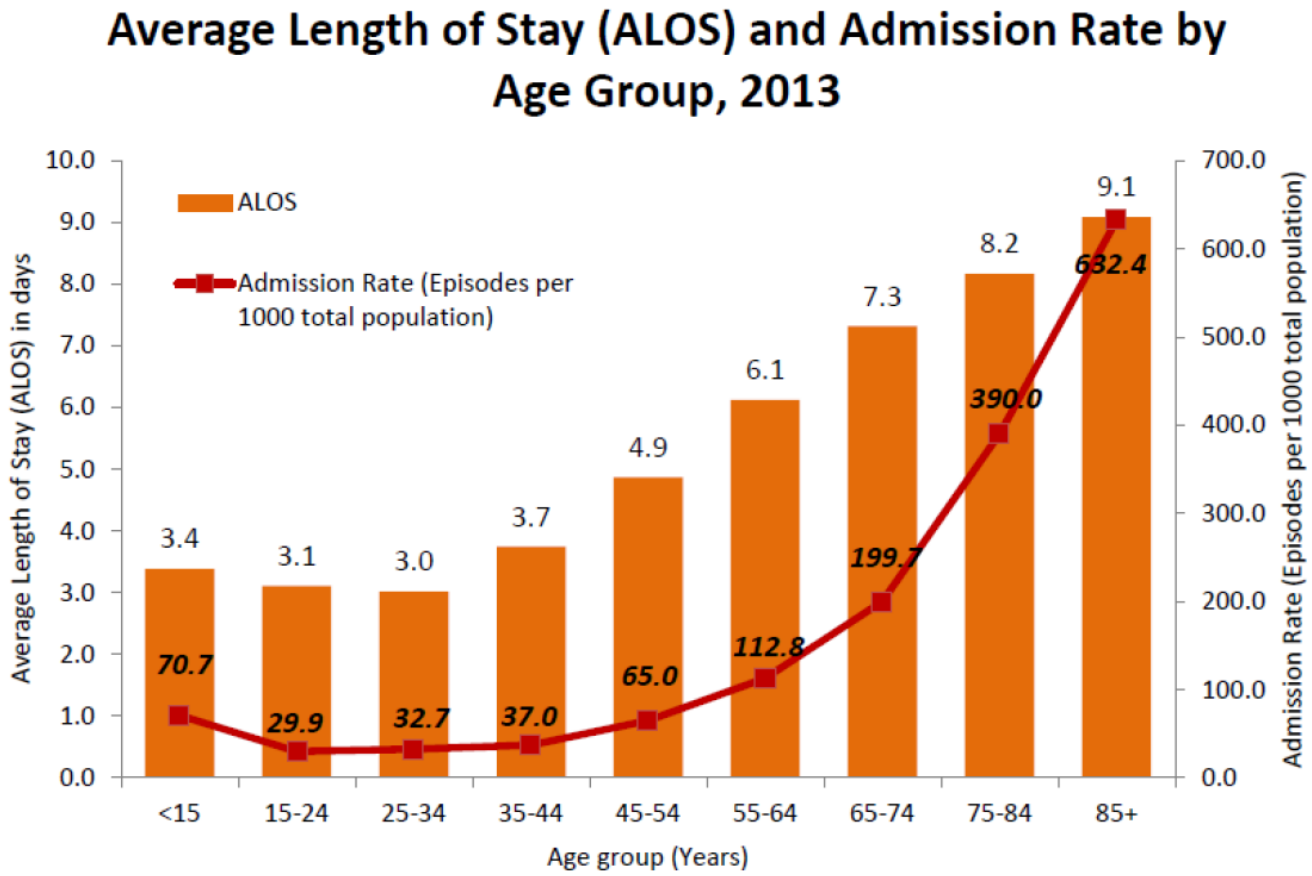
## A contrarian view to clinician scientist careers

NMRC Clinician Scientist Experience Sharing Session
30 June 2016

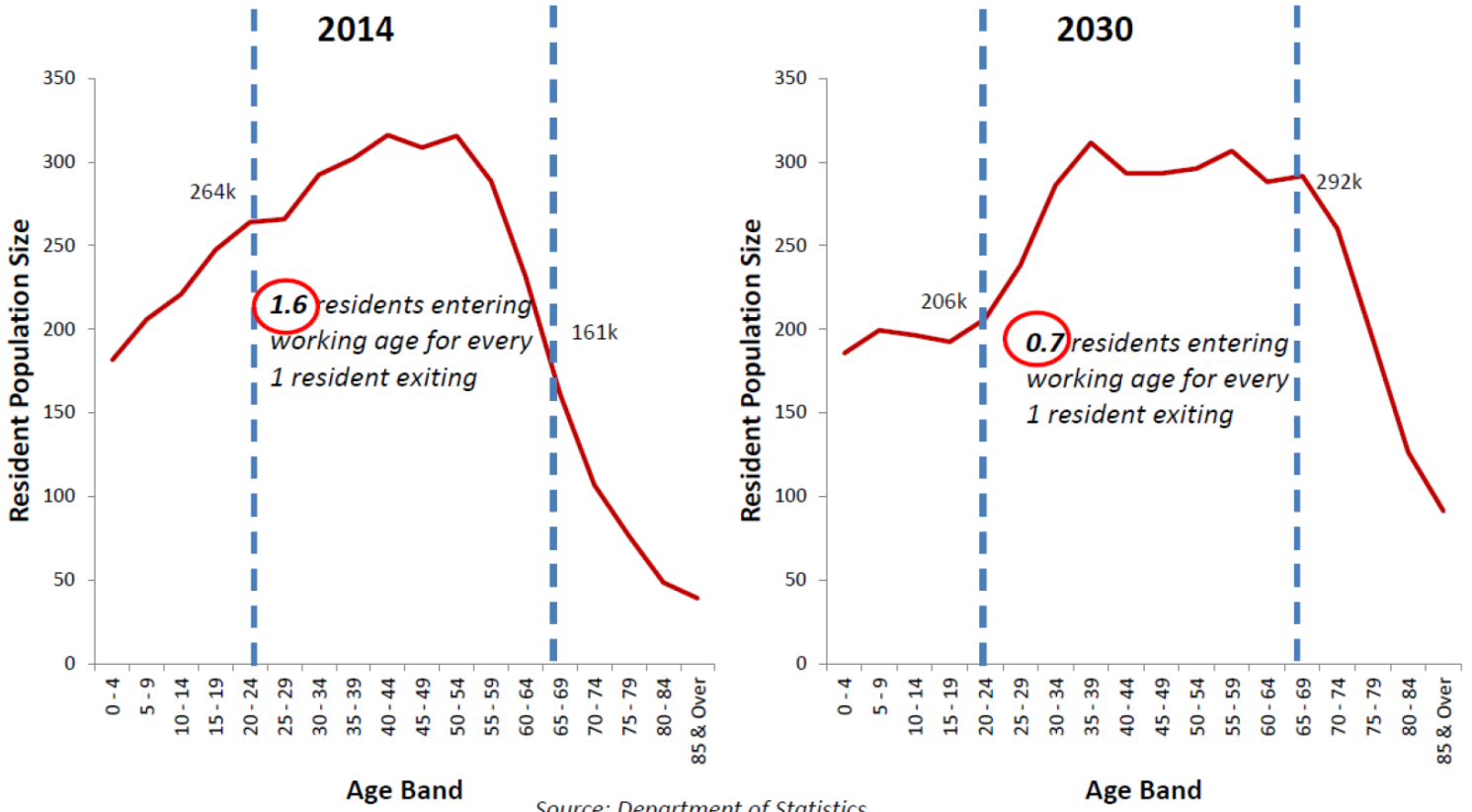
# Age distribution of Singapore population from 2000-2060



# Association between age and hospitalization in Singapore



# Impact of an aging poplation on the workforce




*Source: Department of Statistics*

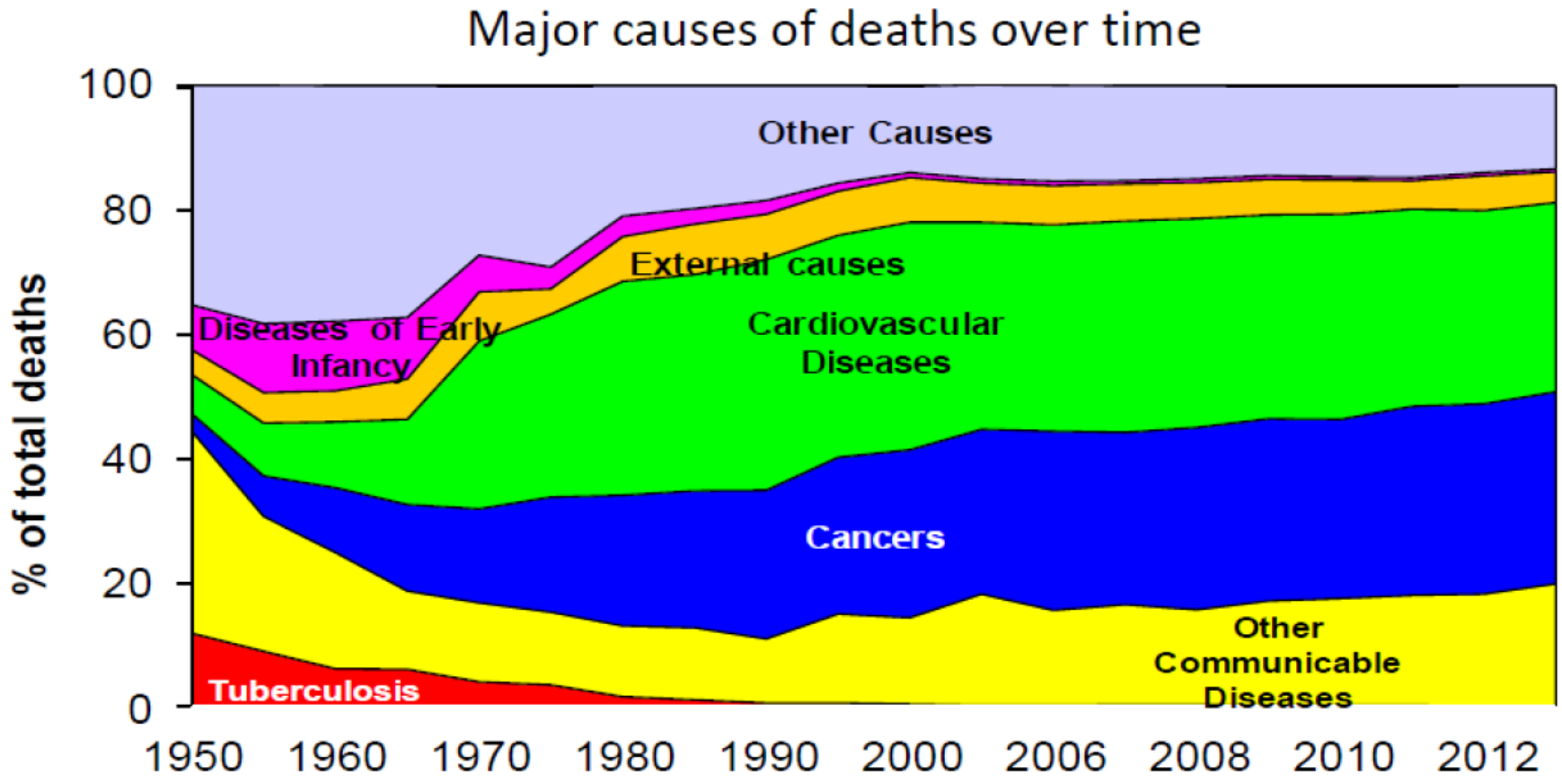
*Note: Projections assume Total Fertility Rate of 1.20 and current immigration, as specified by the National Population and Talent Division*

FOR INTERNAL CIRCULATION ONLY

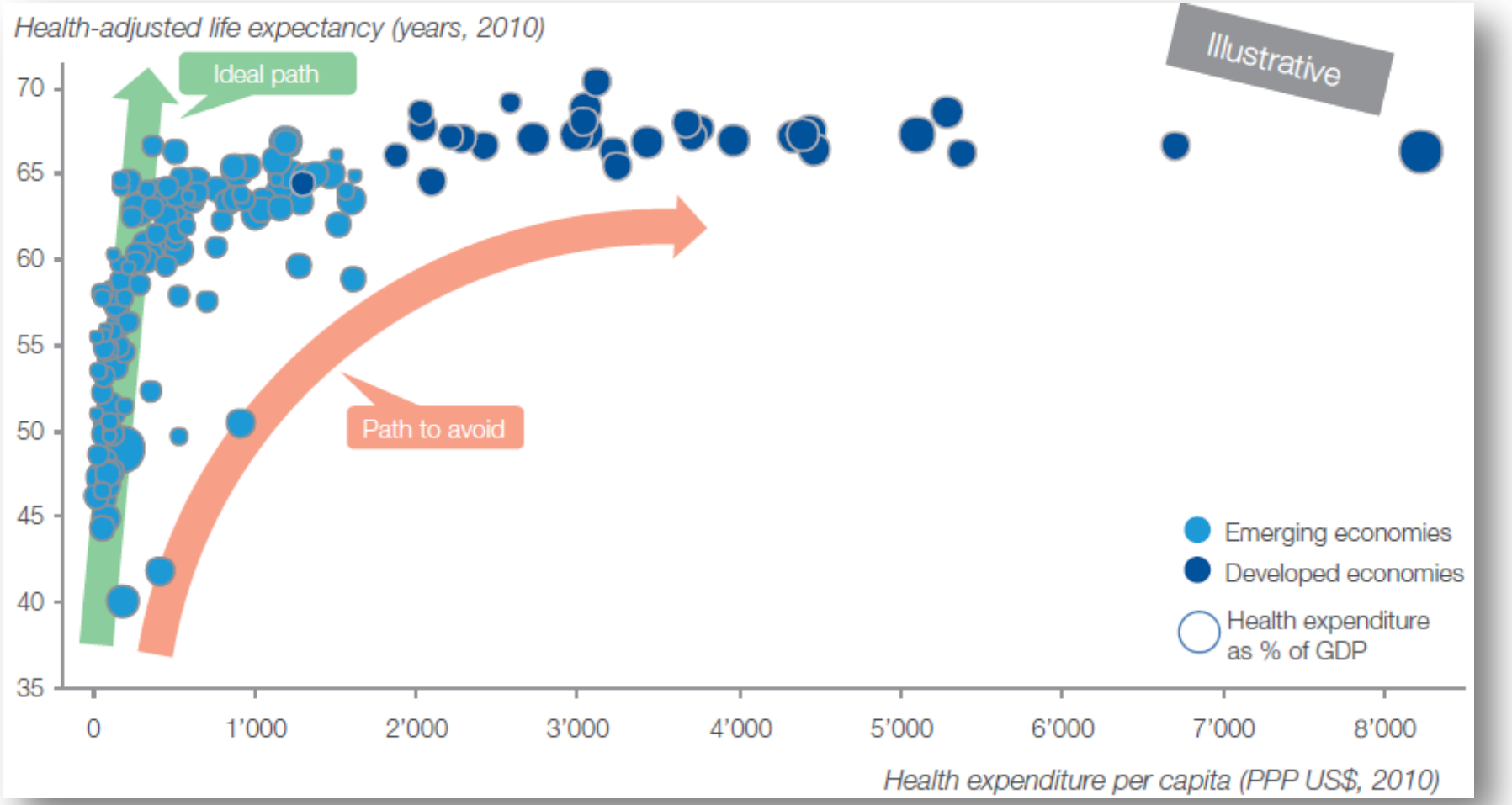
# Sociodemographic shifts put our healthcare system under significant strain

- Greater demand for healthcare in the context of a reduced workforce to deliver this healthcare

# The epidemiologic transition

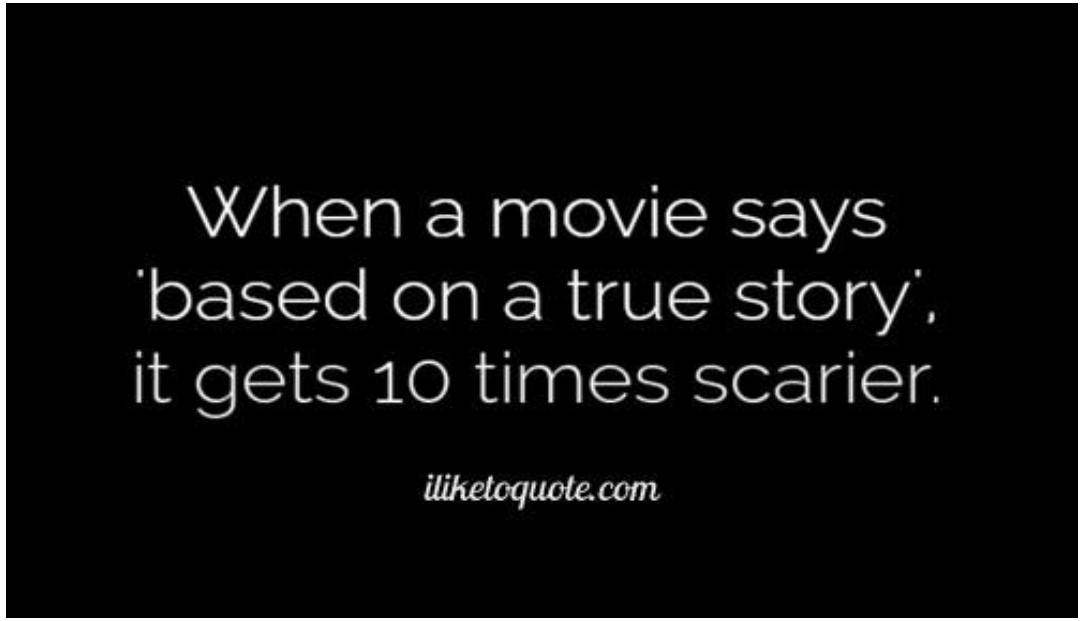


# Transforming healthcare



# Why?

- The current model of healthcare is designed for the treatment of acute conditions that can be cured.
  - The major burden of disease today related to chronic disease that have to be managed over a lifetime
    - Fragmented and uncoordinated
      - Waste
      - Adverse outcomes
    - Reactive and often futile
      - Many of the adverse outcomes associated with chronic disease are irreversible by the time they present
- Largely still limited to the office consult as the means of engagement
- Limited involvement of the patient
    - Management of chronic disease requires patient participation which involves more that taking the medications that we give them
- INNOVATION IS KEY TO OUR ABILITY TO MEET THE HEALTHCARE NEEDS OF OUR POPULATION


When a movie says
'based on a true story',
it gets 10 times scarier.
iliketoquote.com

# Mr B

- 65 year old Chinese man with T2DM
  - Glipizide 10mg BD, metformin 850mg BD
  - A1c 7.0%

- Admitted for right lower limb cellulitis

# Mr B

Sliding Scale

Type MICU Subcutaneous Insulin - Titrate per protocol

| Medication |
| --- |
| Insulin Soluble 1,000unit/10mL Inj |

art Date 19/06/2013 Start Time 10:02

oute SC

End Date 19/06/2013 Duration

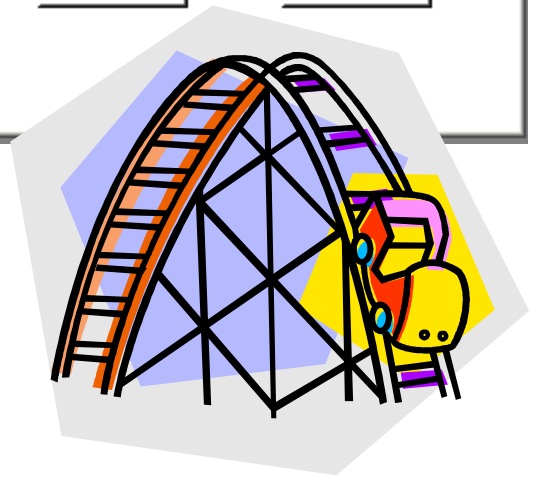
Dosing Freq

BSL Freq

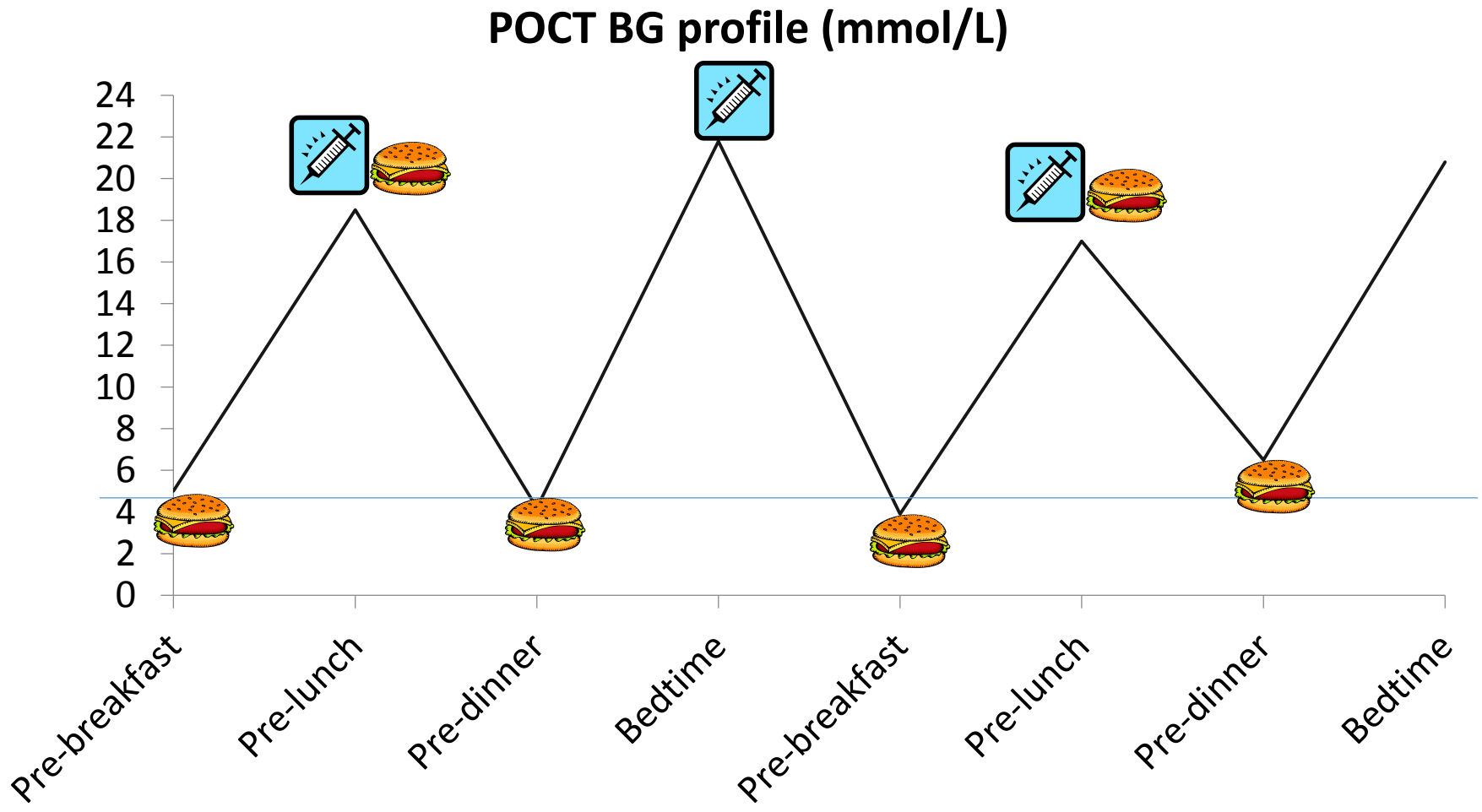
Instructions See Protocol

| Blood Glucose (mmol/L) | | Dose (Units) |
| --- | --- | --- |
| From | To | |
| 3.1 | 10 | 0 |
| 10.1 | 12 | 4 |
| 12.1 | 15 | 6 |
| 15.1 | 18 | 8 |
| 18.1 | | 10 |
| | | |

OK Cancel Delete



# Mr B


POCT BG profile (mmol/L)
24
22
20
18
16
14
12
10
8
6
4
2
0
Pre-breakfast
Pre-lunch
Pre-dinner
Bedtime
Pre-breakfast
Pre-lunch
Pre-dinner
Bedtime

# Cluster of interventions

**Inpatient DM Guidelines**

**IT enhancements: EIMR, electronic alerts**

**Improvements in documentation**

**Re-engineering of ward pharmacist workflow**

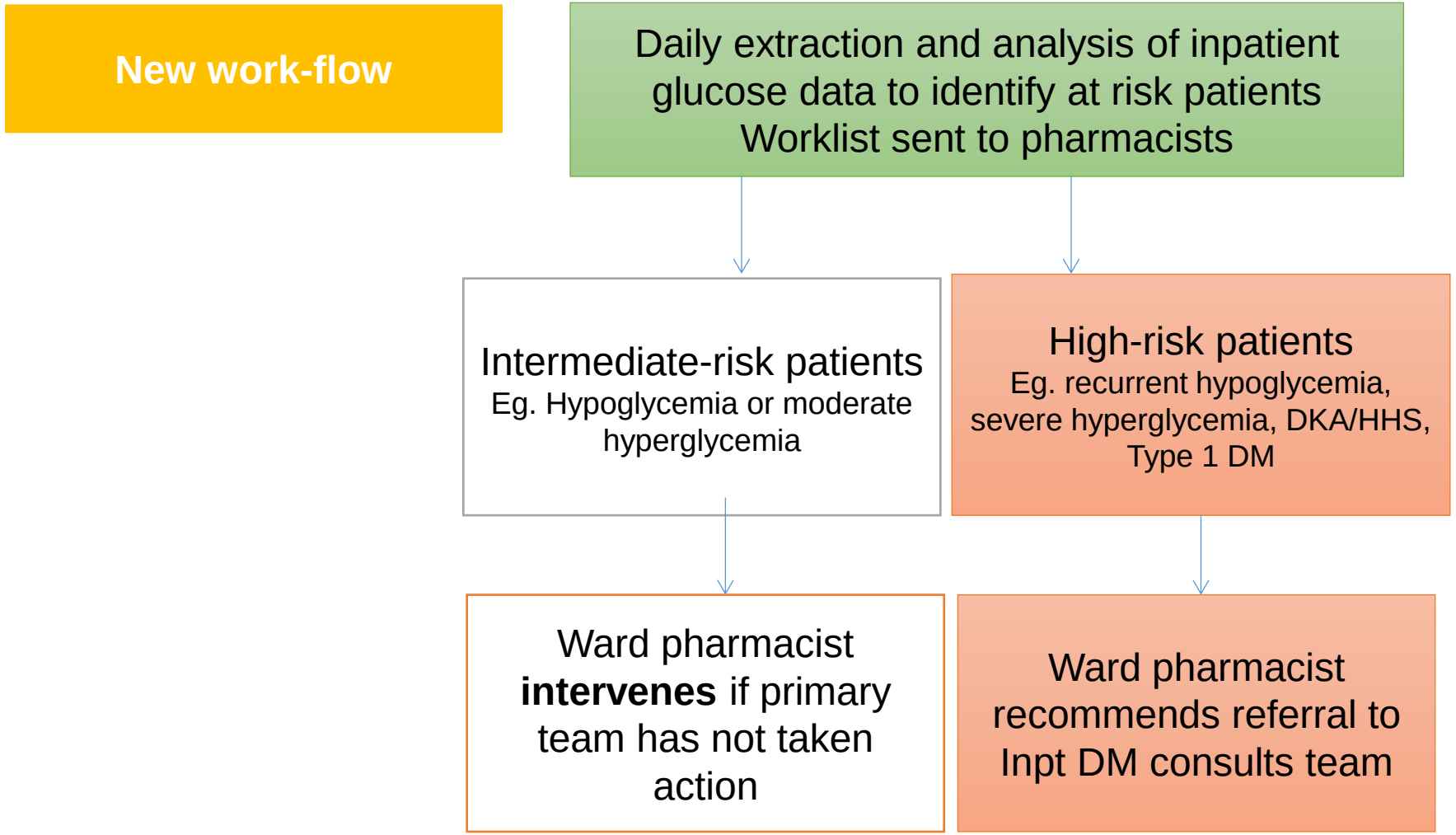
**Education of residents, nurses, pharmacists**

# Ward pharmacists

**Old workflow**

Daily review of inpatient EIMR
Clicking on CPSS2 to review glucose results
May or may not intervene actively

# Ward pharmacists



# Education

Menu
Glossary
1. Introduction
2. Overview of Modules
3. Hyperglycemia Module
4. NBM Module
4.1. Explanation and Learning P...
5. Hypoglycemia Module
The GLU-COURSE
THE GLU-COURSE
An online module on Inpatient DM Management
for NUHS Residents & Pharmacists
LET'S GET STARTED!
Brought to you by Division of Endocrinology 2013

# Day 1 of admission

You are the medical resident and you are asked to clerk a new admission at 1500h.

Mr C is a 75 year old Chinese gentleman with Type 2 DM for 15 years and a recent HbA1c of 7.5%. He is on Mixtard (30/70) 16 units pre-breakfast and 8 units pre-dinner.

He is admitted for infective exacerbation of COPD and will receive prednisolone 30mg OM for the next 5 days. Investigations show normal renal function.

His symptoms have improved with treatment in EMD and he is allowed to take a full diet.

The GLU-COURSE

# Day 1 of ac

You are clerking him at 5pm. His POC
reading in EMD at 3pm was 8.0 mmo
hydrocortisone 100mg was given at 4pm.

What will you order for DM managemen

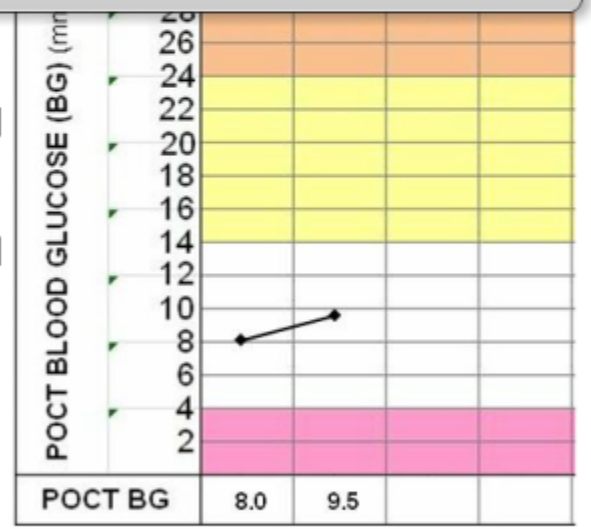
- ✓ Mixtard 16 units pre-breakfast and 8 units pre-dinner, with pre-meal supplemental SCSI
- ✗ Mixtard 20 units pre-breakfast and 12 units pre-dinner, with pre-meal supplemental SCSI
- ✗ Mixtard 10 units pre-breakfast and 4 units pre-dinner with pre-meal supplemental SCSI
- ✗ Stop Mixtard and switch to insulin sliding scale

Submit Answer

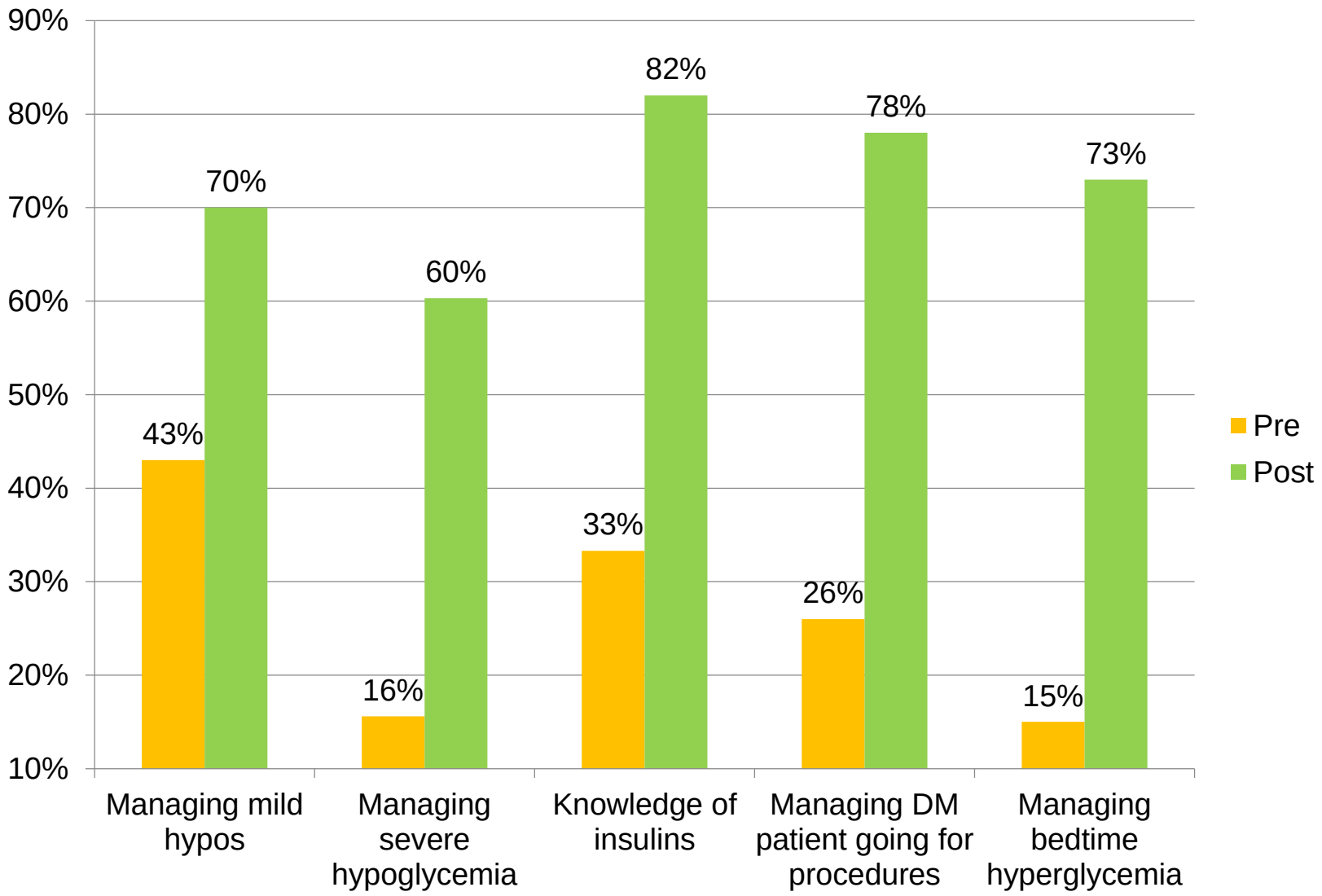
**INCORRECT**

Sorry, you selected the incorrect option.

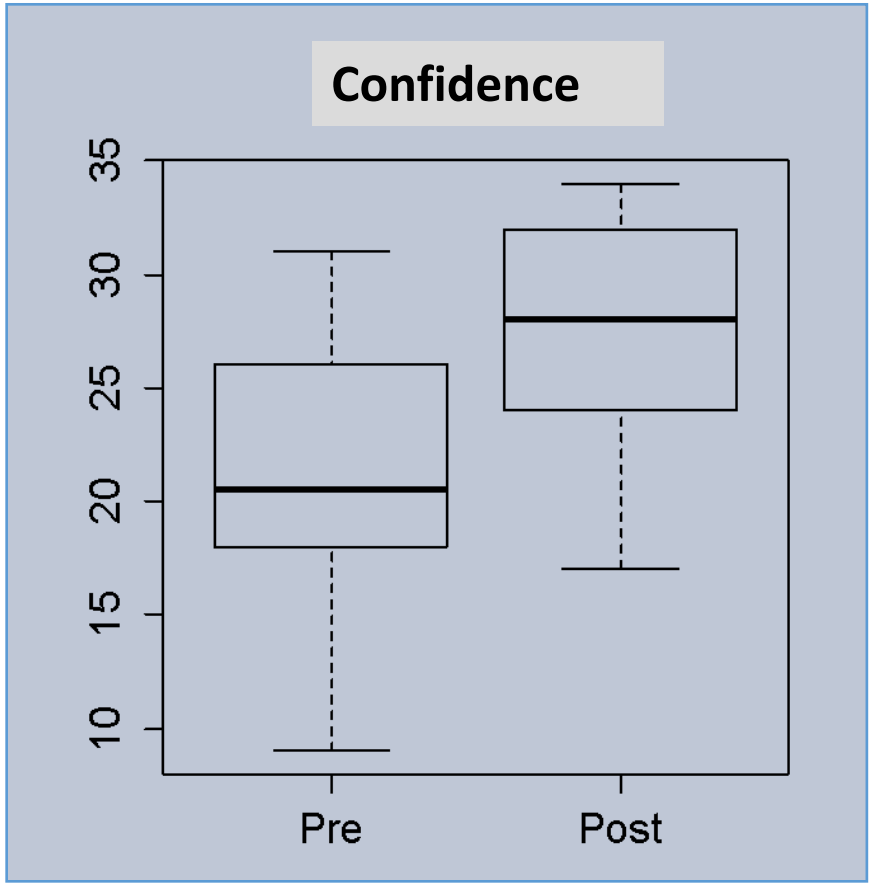
Proceed to Explanation



# Nursing Confidence Level



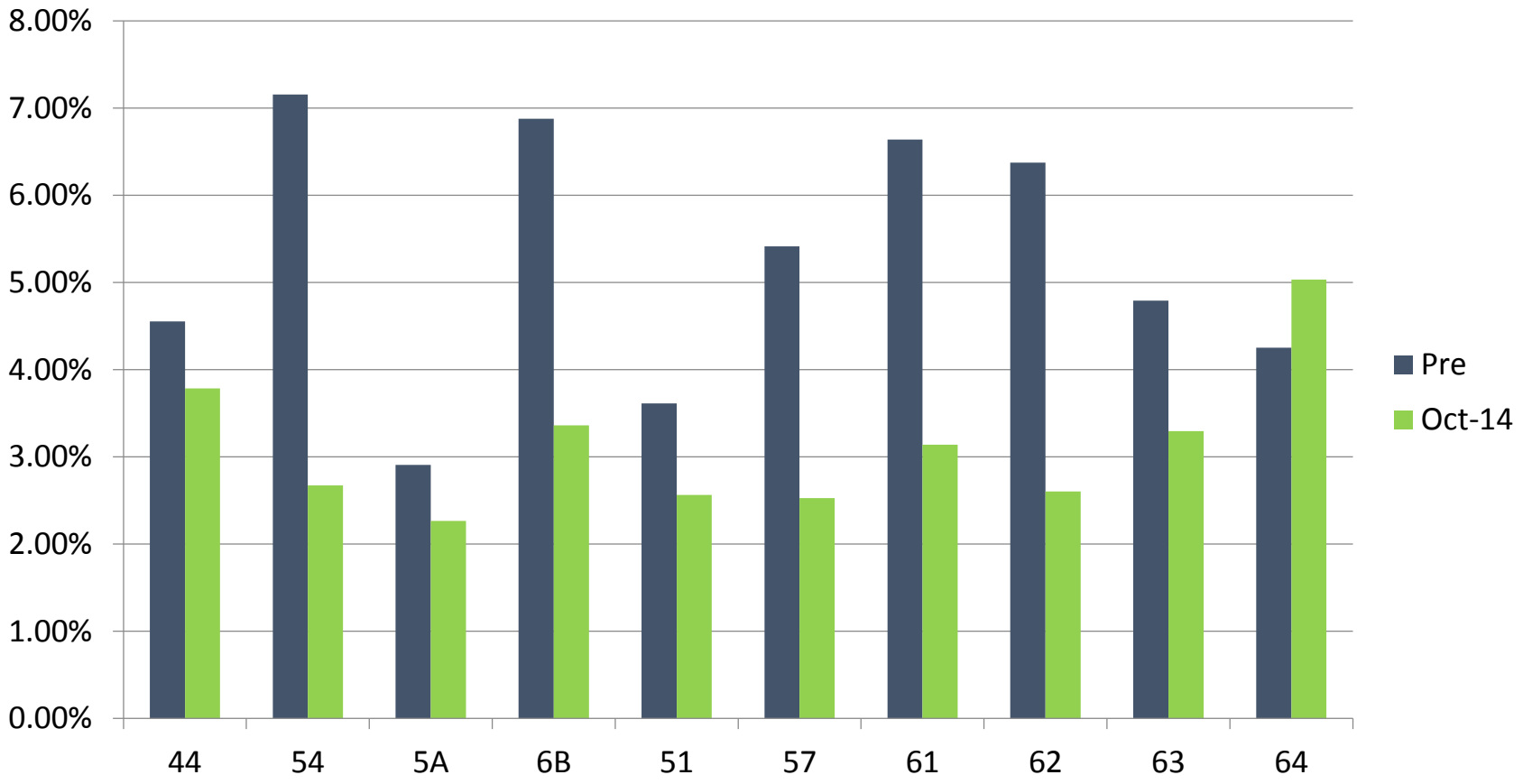
# Resident's confidence level

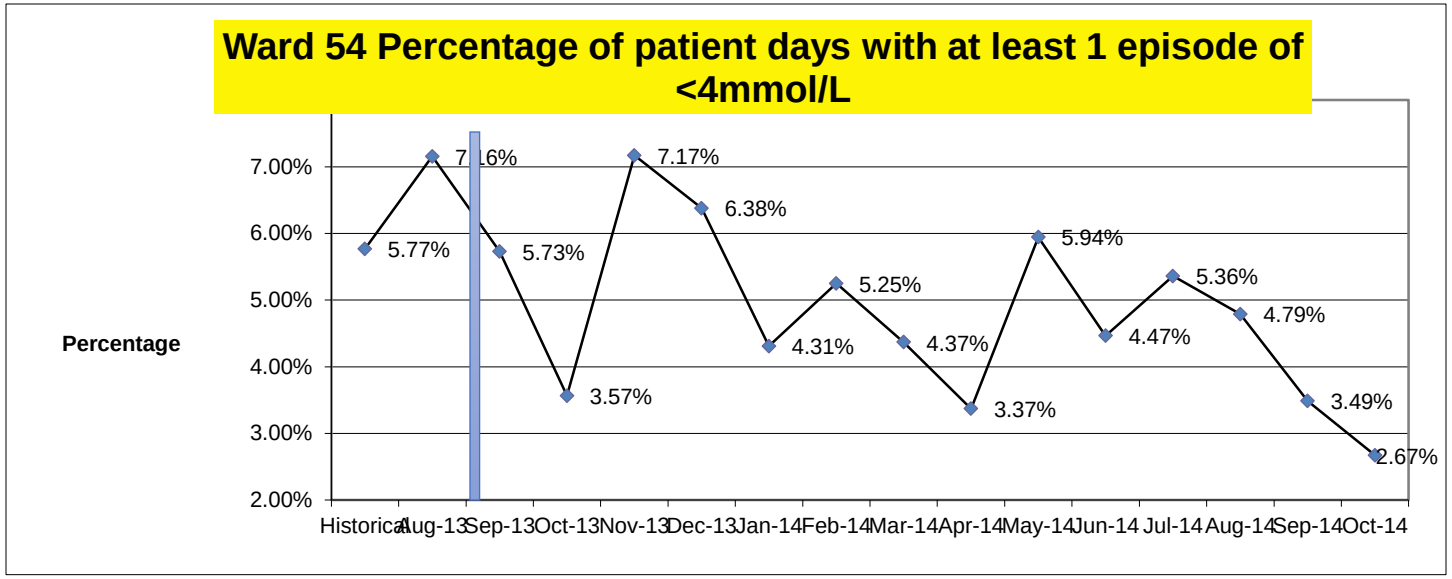


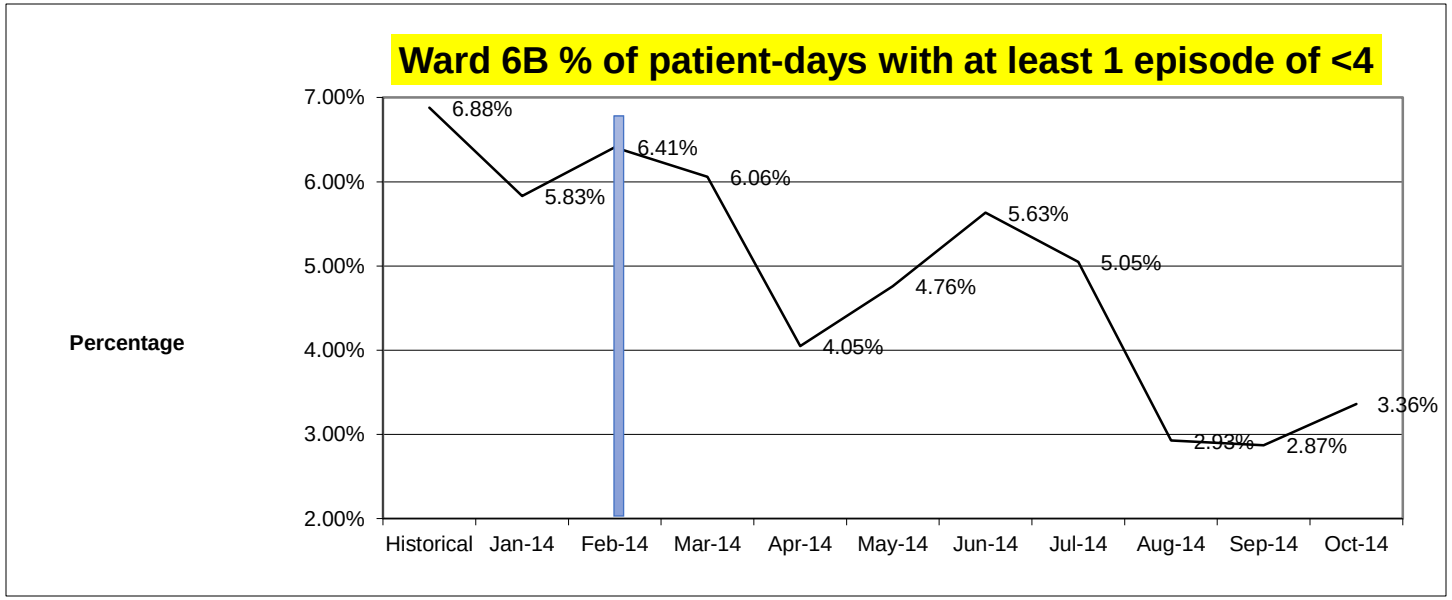

- Mean confidence score (n=21) increased from 21.15 to 27.50 (maximum score = 36), $p < 0.05$

# Hypoglycemia –

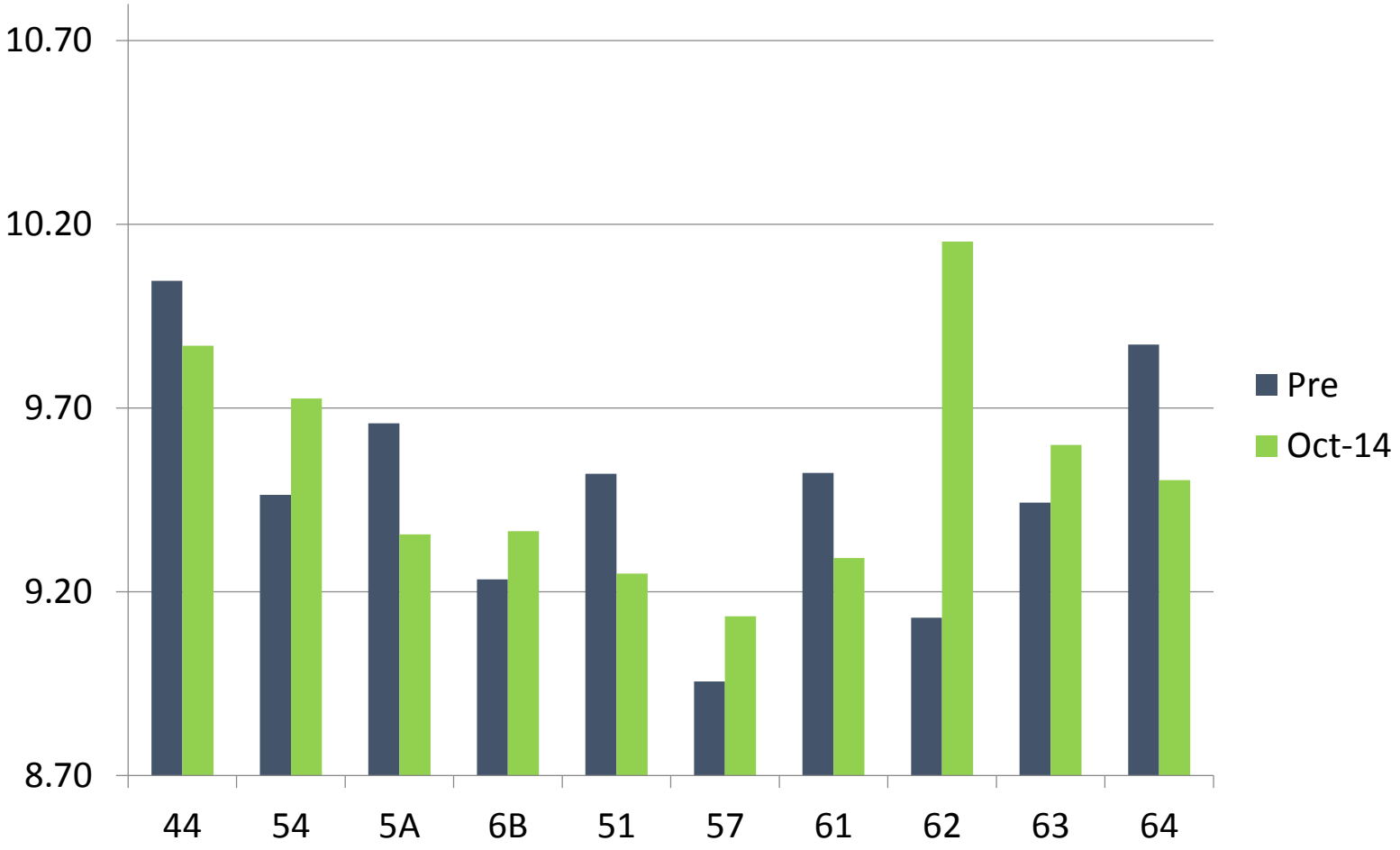
## % of patient-days (on glucose monitoring) with at least 1 episode of hypoglycemia by ward



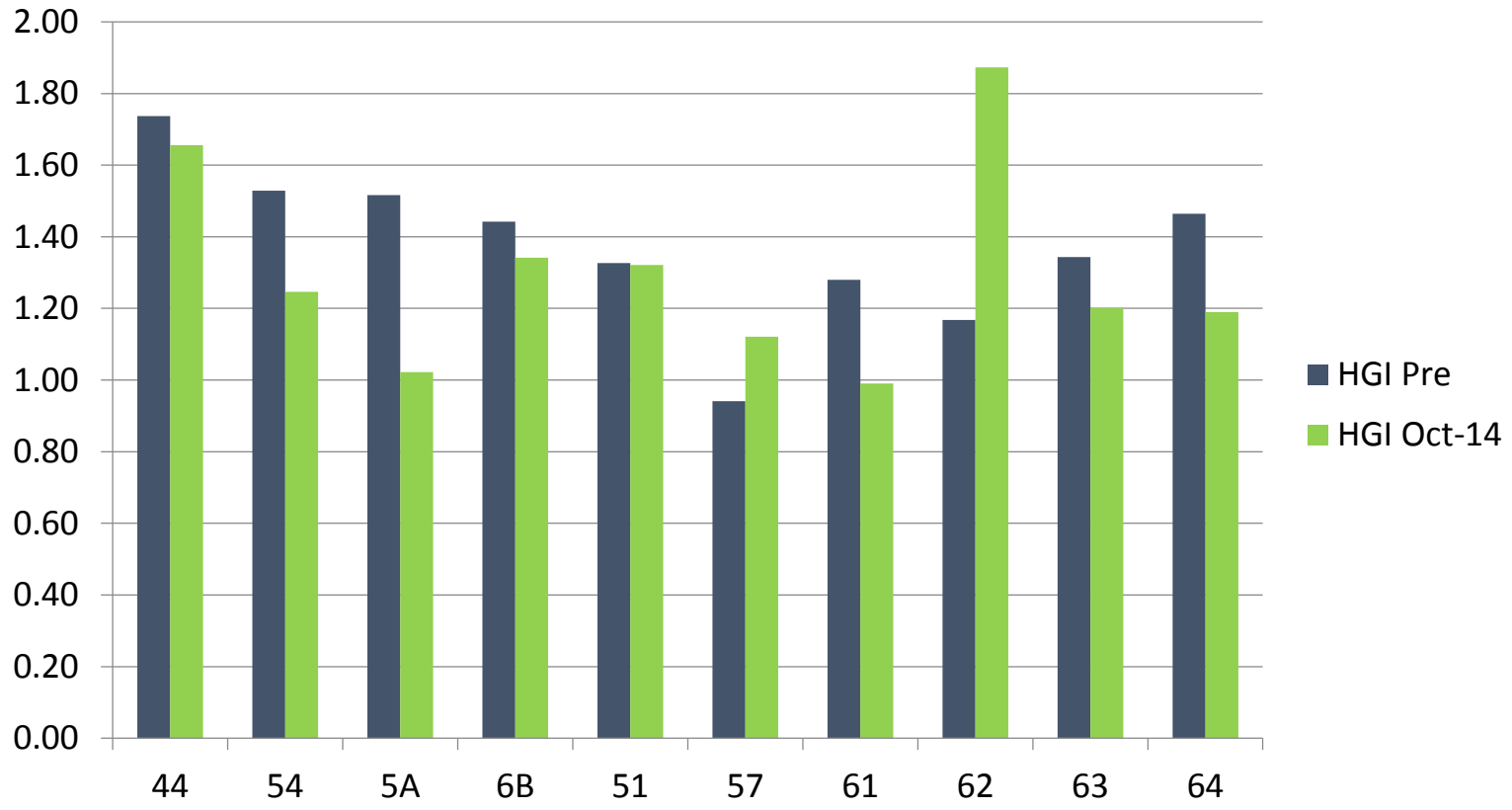

Ward 54 Percentage of patient days with at least 1 episode of <4mmol/L
Percentage
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
5.77%
7.16%
5.73%
3.57%
7.17%
6.38%
4.31%
5.25%
4.37%
3.37%
5.94%
4.47%
5.36%
4.79%
3.49%
2.67%
Historical
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14


Ward 6B % of patient-days with at least 1 episode of <4
Percentage
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
6.88%
5.83%
6.41%
6.06%
4.05%
4.76%
5.63%
5.05%
2.93%
2.87%
3.36%
Historical
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14

# Mean patient -day glucose (mmol/L) by ward



# Hyperglycemic index per admission by ward

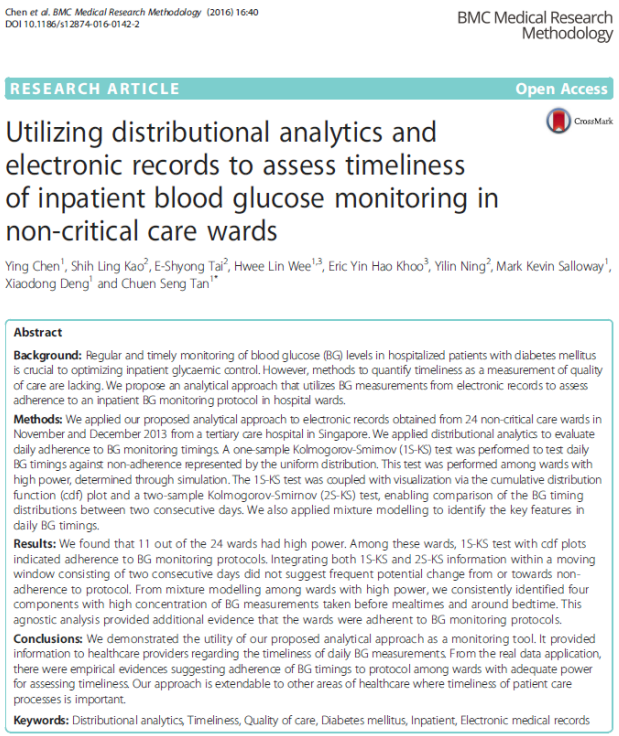


# Why am I telling you this story?

- Not all important innovation involves molecules and cells
- Clinician Scientists are just clinicians who innovate in healthcare
  - Kao Shih Ling who led this project is a current holder of a transition award
  - Her HOD at that time was the holder of a CSA
  - In her division, Dr Khoo Chin Meng (CSA) chaired the National Steering Committee for Diabetes Mellitus;  Dr Yew Tong Wei (current holder of a CS-NIG) is working on patient engagement
- Find an organization that values you as a clinician and values innovation.
- Constantly look for opportunities to innovate and improve the health of your patients.
- If you do that, your career in the healthcare system will follow naturally

# One last thing

- Treat grants as the way to fund your innovative efforts and publications as the way you communicate what you do to others—not as an end in themselves.



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BMC Medical Research Methodology

RESEARCH ARTICLE Open Access

Utilizing distributional analytics and electronic records to assess timeliness of inpatient blood glucose monitoring in non-critical care wards

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**Abstract**

**Background:** Regular and timely monitoring of blood glucose (BG) levels in hospitalized patients with diabetes mellitus is crucial to optimizing inpatient glycaemic control. However, methods to quantify timeliness as a measurement of quality of care are lacking. We propose an analytical approach that utilizes BG measurements from electronic records to assess adherence to an inpatient BG monitoring protocol in hospital wards.

**Methods:** We applied our proposed analytical approach to electronic records obtained from 24 non-critical care wards in November and December 2013 from a tertiary care hospital in Singapore. We applied distributional analytics to evaluate daily adherence to BG monitoring timings. A one-sample Kolmogorov-Smirnov (1S-KS) test was performed to test daily BG timings against non-adherence represented by the uniform distribution. This test was performed among wards with high power, determined through simulation. The 1S-KS test was coupled with visualization via the cumulative distribution function (cdf) plot and a two-sample Kolmogorov-Smirnov (2S-KS) test, enabling comparison of the BG timing distributions between two consecutive days. We also applied mixture modelling to identify the key features in daily BG timings.

**Results:** We found that 11 out of the 24 wards had high power. Among these wards, 1S-KS test with cdf plots indicated adherence to BG monitoring protocols. Integrating both 1S-KS and 2S-KS information within a moving window consisting of two consecutive days did not suggest frequent potential change from or towards non-adherence to protocol. From mixture modelling among wards with high power, we consistently identified four components with high concentration of BG measurements taken before mealtimes and around bedtime. This agnostic analysis provided additional evidence that the wards were adherent to BG monitoring protocols.

**Conclusions:** We demonstrated the utility of our proposed analytical approach as a monitoring tool. It provided information to healthcare providers regarding the timeliness of daily BG measurements. From the real data application, there were empirical evidences suggesting adherence of BG timings to protocol among wards with adequate power for assessing timeliness. Our approach is extendable to other areas of healthcare where timeliness of patient care processes is important.

**Keywords:** Distributional analytics, Timeliness, Quality of care, Diabetes mellitus, Inpatient, Electronic medical records