

## Use of Casemix in Clinical Outcome Management

Deacons Yeung

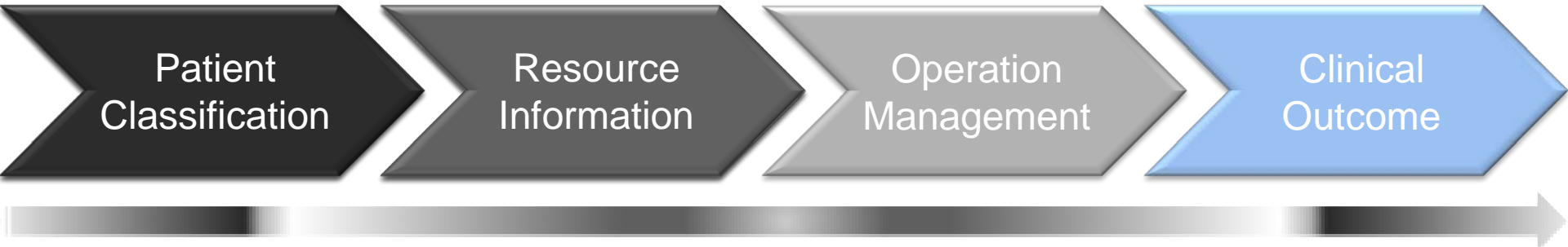
**“..if you can't measure,  
you can't manage it..”**

*Edwards Deming  
Peter Drucker  
And many other leaders*



# Development Journey of Casemix

## Use Casemix Beyond Resource Allocation from 2011

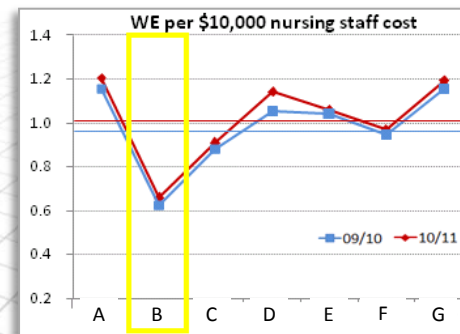


2008

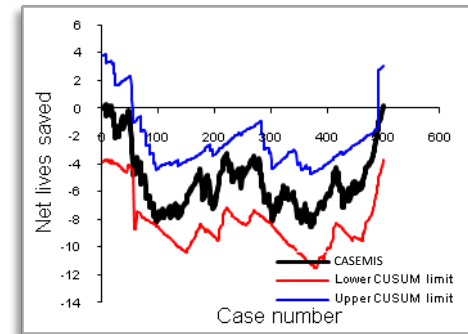
2011



Productivity: WE per \$10,000 nursing staff cost



CASEMIS for Clinical Outcome





**Use Casemix in clinical outcome monitoring.  
What clinical outcome should we start with?**

## Deaths of 29 children in 1994-95

In July 2001, the Bristol Inquiry (461 page report) uncovered lack of reaction to higher perioperative **death rate** for paediatric cardiac surgery patients at Bristol Royal Infirmary in the 90s.

The report said that most significant change needed was the change in the “club **culture**” of NHS.



# Up to 1200 patients had died needlessly by 2009

In February 2013, the Mid Staffordshire NHS Trust Public Inquiry (1782 page report) echoed with the first inquiry of the Trust that an engrained **culture** of tolerance of poor standards, a focus on finance and targets, denial of concerns, etc.

The warning sign that triggered concern about the Trust arose from **mortality** data.



News > UK > Home News

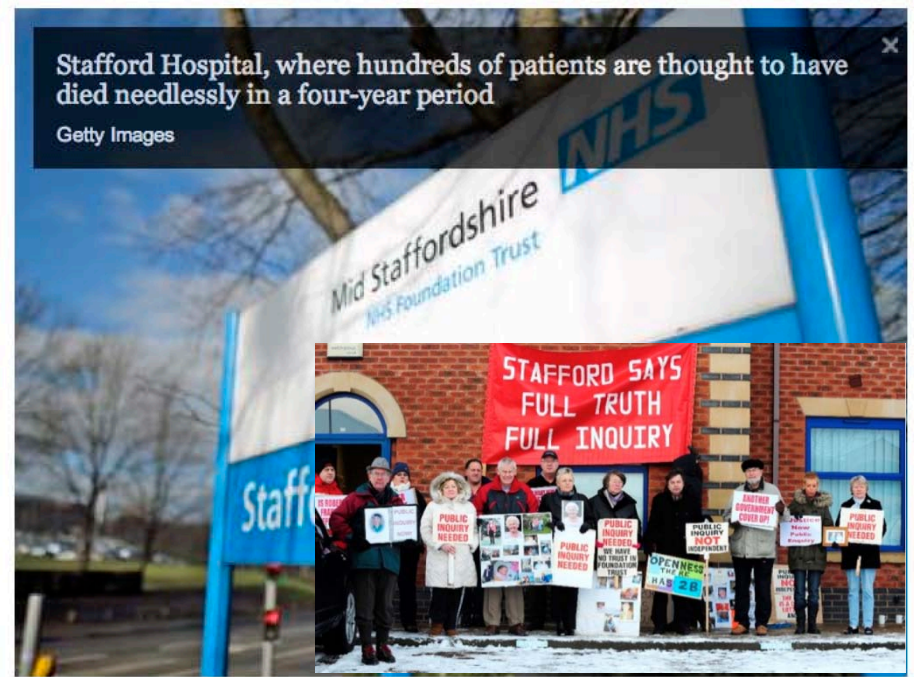
## Scandal-hit Mid Staffordshire NHS trust 'to be put into administration'

Regulator making move 'in order to safeguard services for local patients'

JEREMY LAURANCE + HEALTH EDITOR THURSDAY 28 FEBRUARY 2013

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# The Mid Staffordshire Report recommended...

**1.220** The public should be able to compare relative performance, and therefore need access to open, honest and transparent information to assess compliance with appropriate standards. To achieve the culture that is necessary for the NHS to flourish, every healthcare organisation and everybody working within the healthcare system must be honest, open and truthful in all their dealings with patients and the public. No personal or organisational interest must ever be allowed to outweigh the duty to be honest, open and truthful.

**1.221** Transparency and patient safety would be greatly enhanced by the introduction of user friendly electronic patient record systems. Patients should be able to in real time, or retrospectively, read and comment on their records. The system should be designed to include prompts and defaults to contribute to effective patient care and safety.

**1.222** All healthcare provider organisations should develop and publish real time information on the performance of their consultants and specialist teams in relation to mortality, morbidity, outcome and patient satisfaction, and on the performance of each team and their services against the fundamental standards.

**1.223** It must be a professional duty of healthcare professionals to collaborate in the provision of such information.

“Can’t you just show me how to use these (casemix) data to do a better job in caring for my patients?”

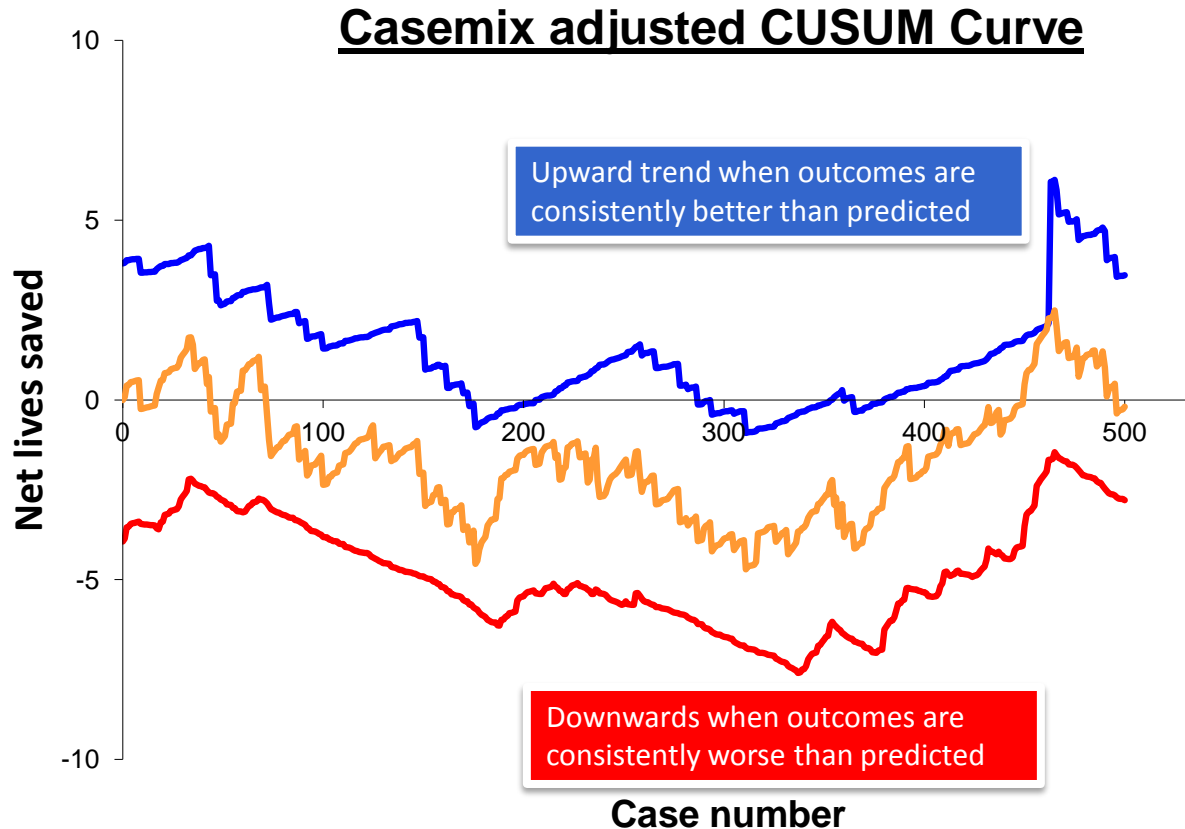
A hand is holding a magnifying glass over a circular area. The circular area contains text. The text is arranged as follows: "Casemix CAN HELP" in white, "Early Warning System" in red, and "for monitoring close to real time" in white.

Casemix CAN HELP  
Early Warning  
System  
for monitoring  
close to real time



# Mortality Rate

## Close to real time monitoring



Net life saved = Projected outcome – Actual outcome

For example, if the projected mortality of n<sup>th</sup> patient is 0.35 and he is eventually discharged home alive (0.00),

The net life saved is  $0.35 - 0.00 = 0.35$

# Logistic Regression

## Risk Adjusted Model - 30 Days Mortality

$$P(Y = 1) = \frac{e^Z}{1 + e^Z}$$

where  $Z = \beta_{Age} + \beta_{Urgency} + \beta_{Urea} + \beta_{SOI} + \beta_{ROM}$   
 $+ \beta_{Gender} + \beta_{Category} + \beta_{Re-op} + \beta_{Re-admit}$

- Age group (<=15/16-55/56-64/65-74/75-84/>=85)
- Urgency (Within 2hrs/Within 24hrs/Beyond 24hrs)
- Urea (Low/High) [>8]
- SOI (1/2/3)
- ROM (0/1/2/3)
- Gender (F/M)
- Category (I/M+/M-/UM)
- Re-operation (N/Y)
- Re-admission (N/Y)

Factors with statistical significance are highlighted in red

SOI: 3M IR-DRG Severity Level      ROM: 3M IR-DRG category - Risk Of Mortality

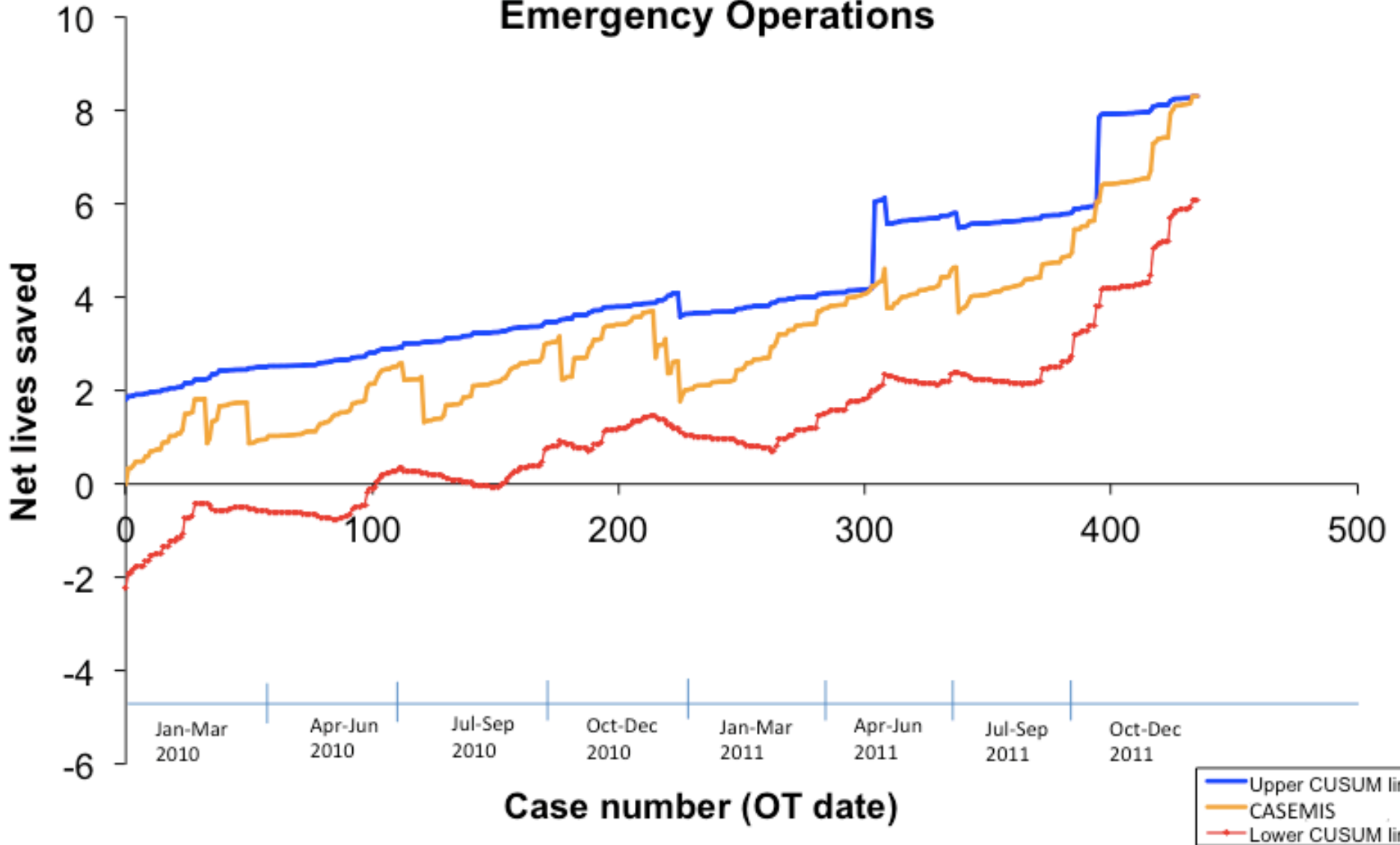
ROC: Receiver Operating Characteristic Curves      H&L: Hosmer and Lemeshow's goodness of fit test

Data Period: Jan2010 – Dec2011

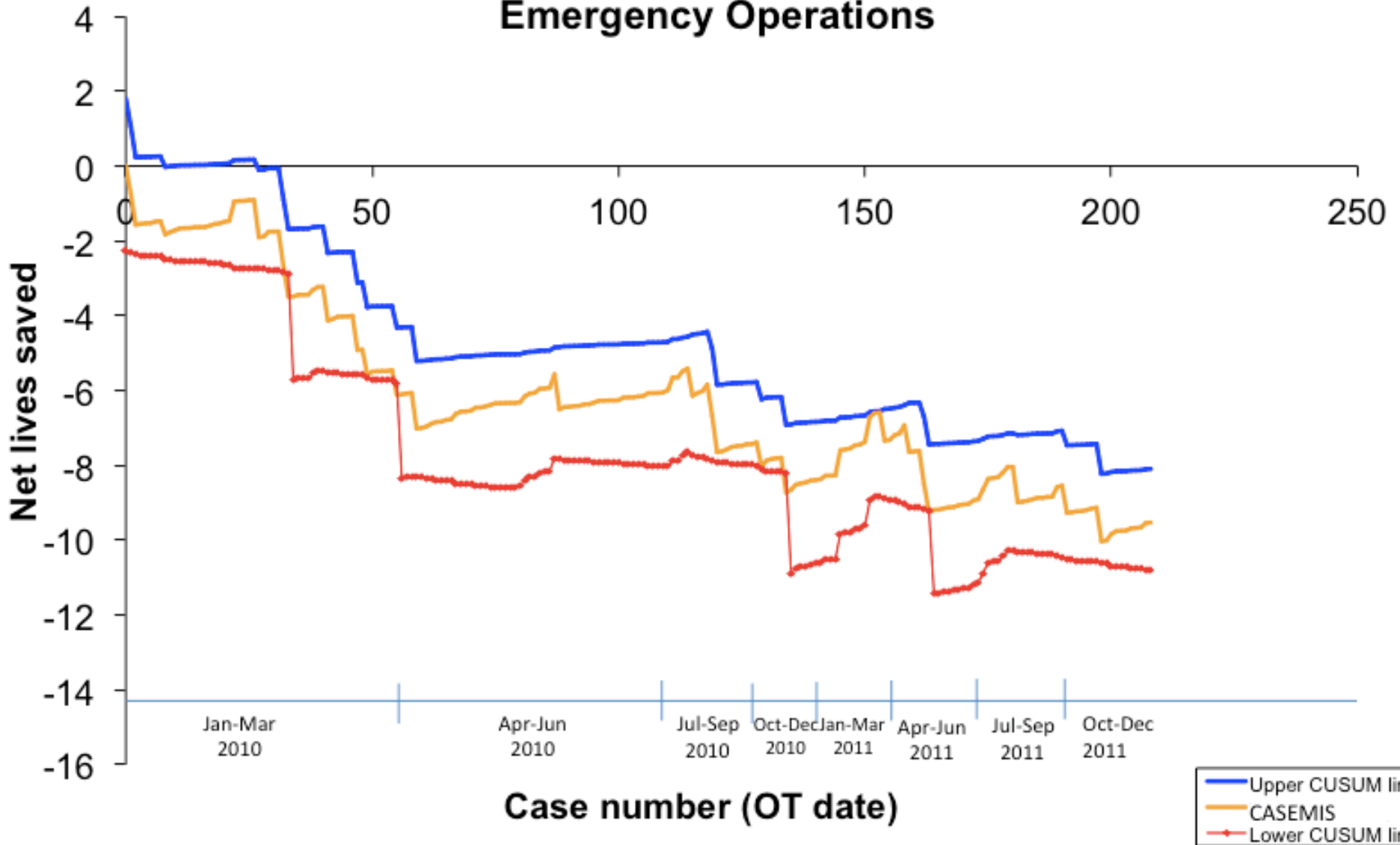
ROC: **0.8964**

H&L Goodness of Fit: 0.2699

# Emergency Operations



# Emergency Operations



# Logistic Regression Risk Adjusted Model - Complication

$$P(Y = 1) = \frac{e^Z}{1 + e^Z}$$

where  $Z = \beta_{Age} + \beta_{Category} + \beta_{ProcTime} + \beta_{SOI} + \beta_{Urea}$   
 $+ \beta_{Gender} + \beta_{Re-op} + \beta_{Re-admit} + \beta_{Urgency}$

- Age group (<=15/16-55/56-64/65-74/75-84/>=85)
- Category (I/M+/M-/UM)
- Procedure time (0-300min/300min-600min/600min+)
- SOI (1/2/3)
- Urea (Low/High) [>8]
- Gender (F/M)
- Re-operation (N/Y)
- Re-admission (N/Y)
- Urgency (Within 2hrs/Within 24hrs/Beyond 24hrs)

Factors with statistical significance are highlighted in red

SOI: 3M IR-DRG Severity Level

ROC: Receiver Operating Characteristic Curves

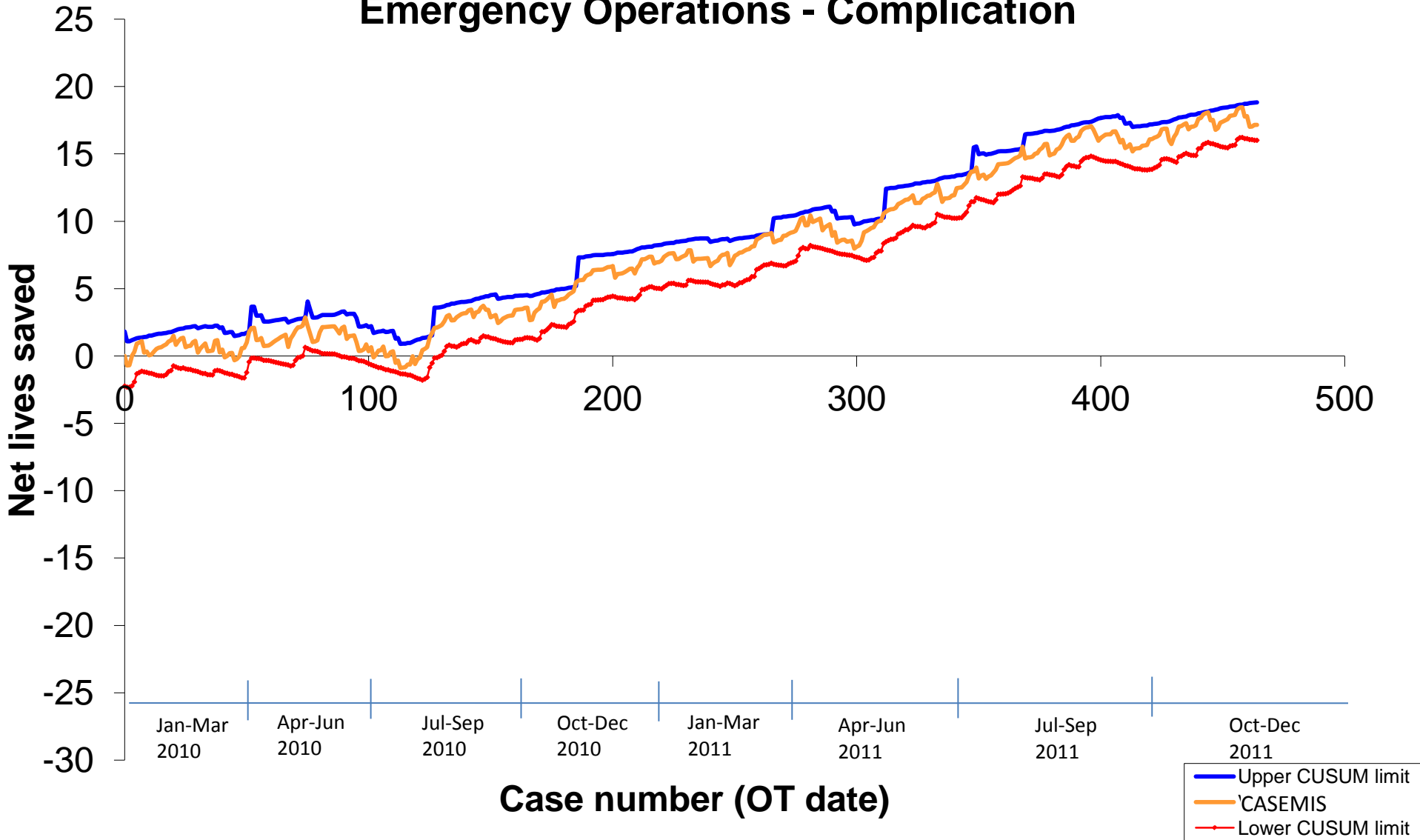
H&L: Hosmer and Lemeshow's goodness of fit test

Data Period: Jan2010 – Dec2011

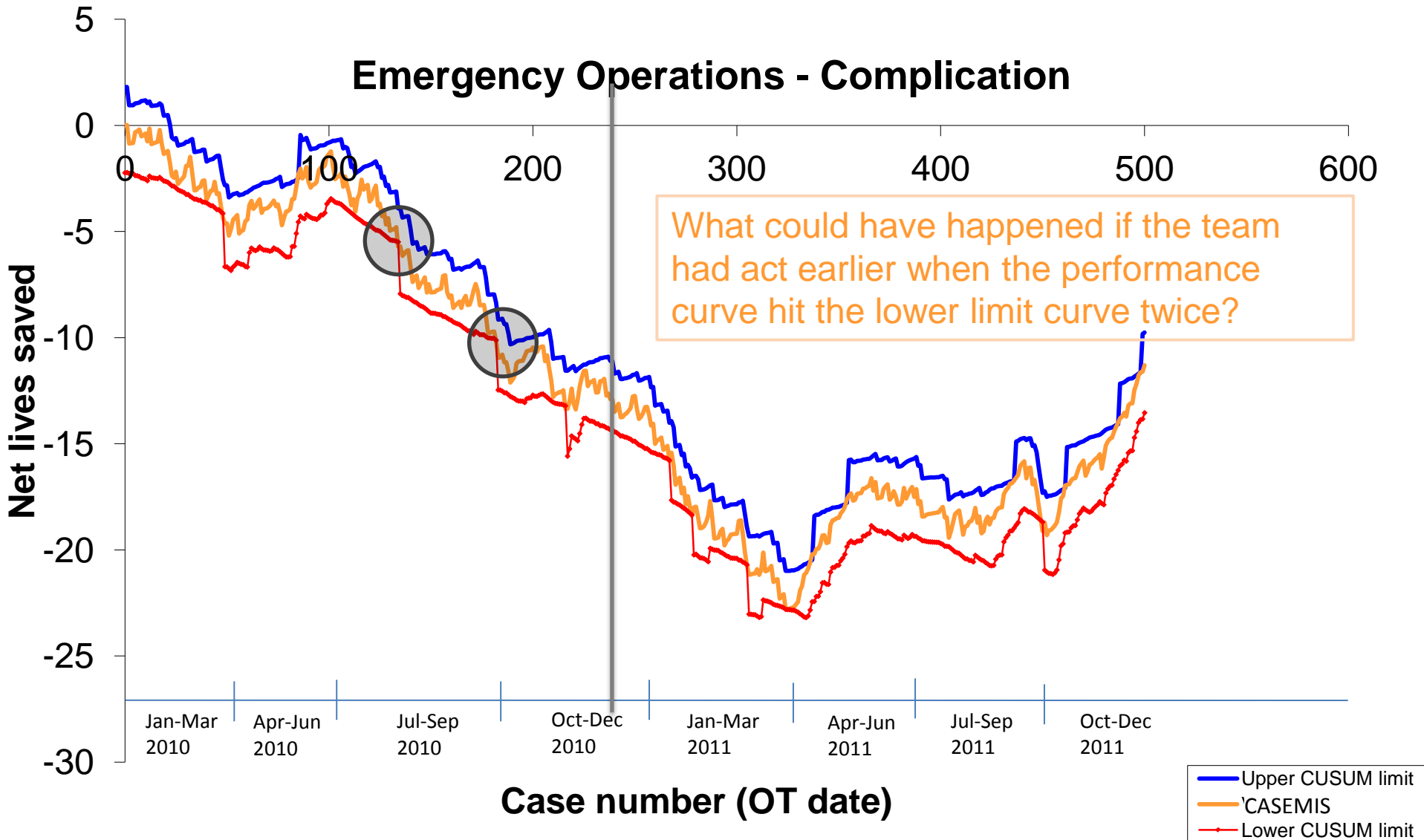
ROC: **0.8199**

H&L Goodness of Fit: 0.4412

# Emergency Operations - Complication



# Early Signaling & Monitoring

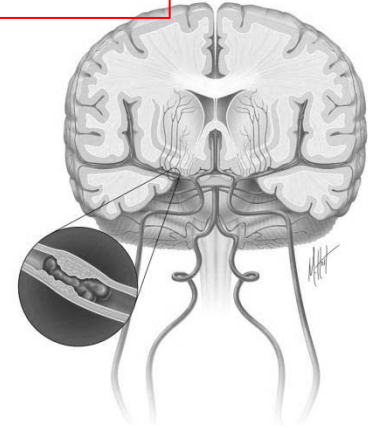


- Acute Myocardial Infarction (AMI)
- Heart Failure



**Wider Application to other areas is possible!**

- Stroke



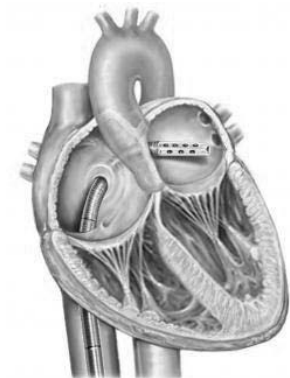
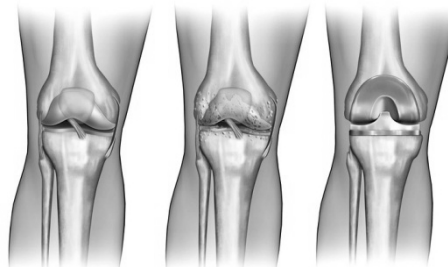
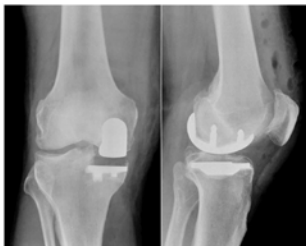
- Pneumonia



- Hip Fracture



- Knee Replacement





## In context of Mid Staffordshire, heart unit closure "right thing", says Health Secretary

Last updated Tue 23 Apr 2013

UK - Leeds Children's Heart unit



Health Secretary Jeremy Hunt has said that it was "absolutely the right thing" to suspend children's heart operations at Leeds General Infirmary.

“ *"I do think we need to have a different approach to safety issues in the NHS. What happened at Bristol and what happened at Mid Staffs was that there was disturbing data and then a big argument about whether the data was any good, and nothing was done in the period in between. The result was that patients continued to be harmed.*

*appreciate why this is something that people feel extremely strongly about and indeed the distress that this kind of issue causes.*

“ *"I do think we need to have a different approach to safety issues in the NHS. What happened at Bristol and what happened at Mid Staffs was that there was disturbing data and then a big argument about whether the data was any good, and nothing was done in the period in between. The result was that patients continued to be harmed.*

“ *"If there is a potential problem, the responsible thing, the only thing that Bruce Keogh could have done - faced with the information that he had - was to say: 'We're going to get to the bottom of this data, we're going to find out if it's right or not, but we're going to suspend heart surgery while we do that'.*

*"And I think that was absolutely the right decision."*

— JEREMY HUNT, HEALTH SECRETARY

**..Clinicians being mindful of cost is ethical..**

Saving Healthcare: Sustaining High Quality Healthcare Services

@HA Convention 2013

**Jim Easton**

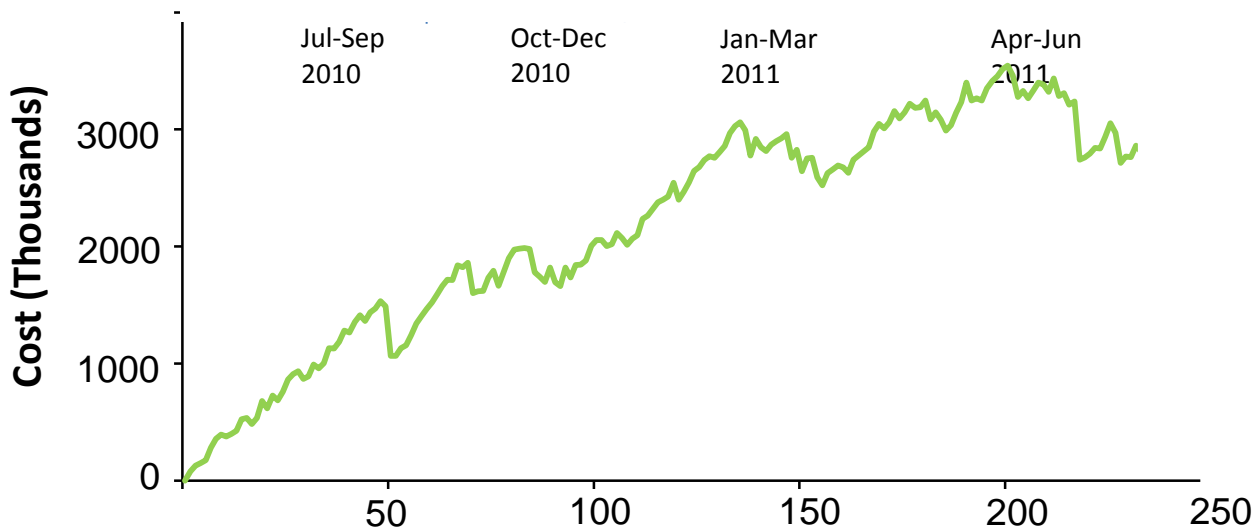
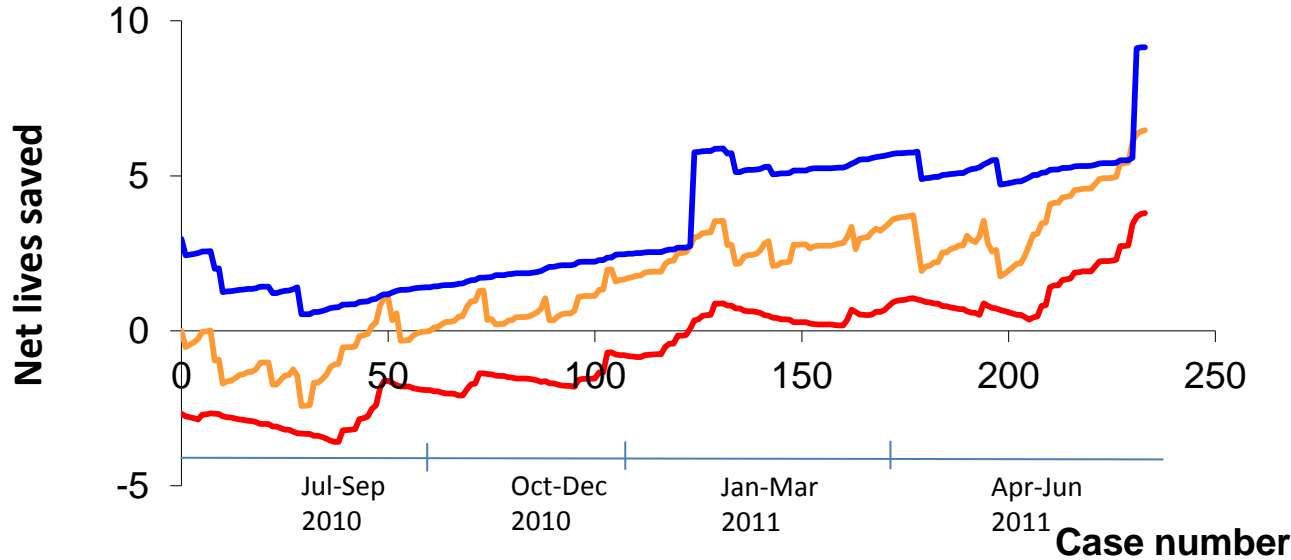
Managing Director

Care UK

# CASEMIS

## as an early signaling system

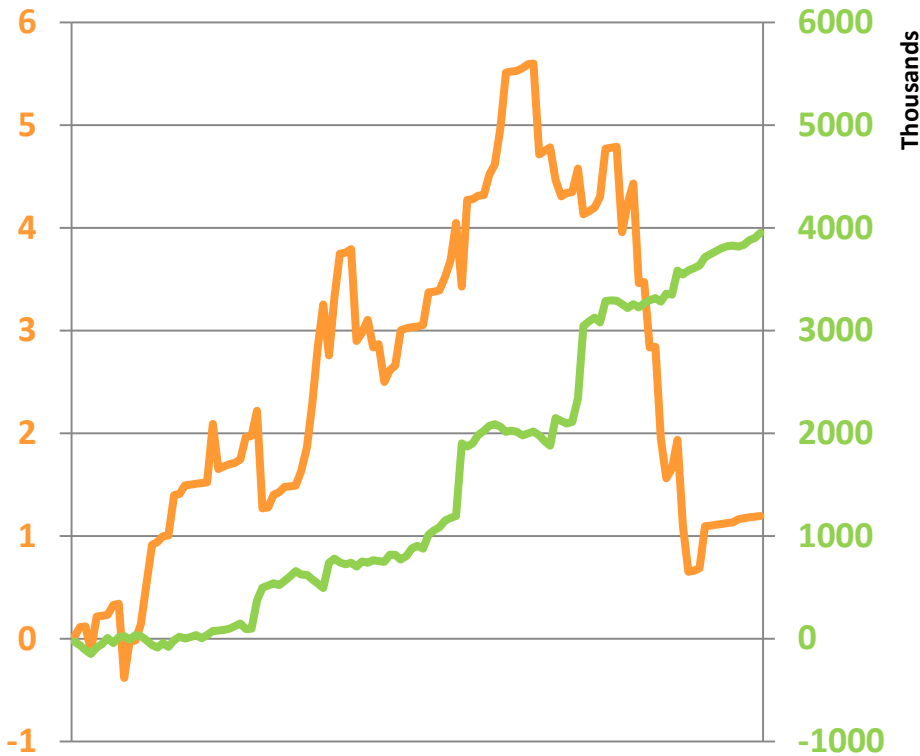
Casemix  
Adjusted  
Surveillance and  
Early-Signaling  
Management  
Information  
System



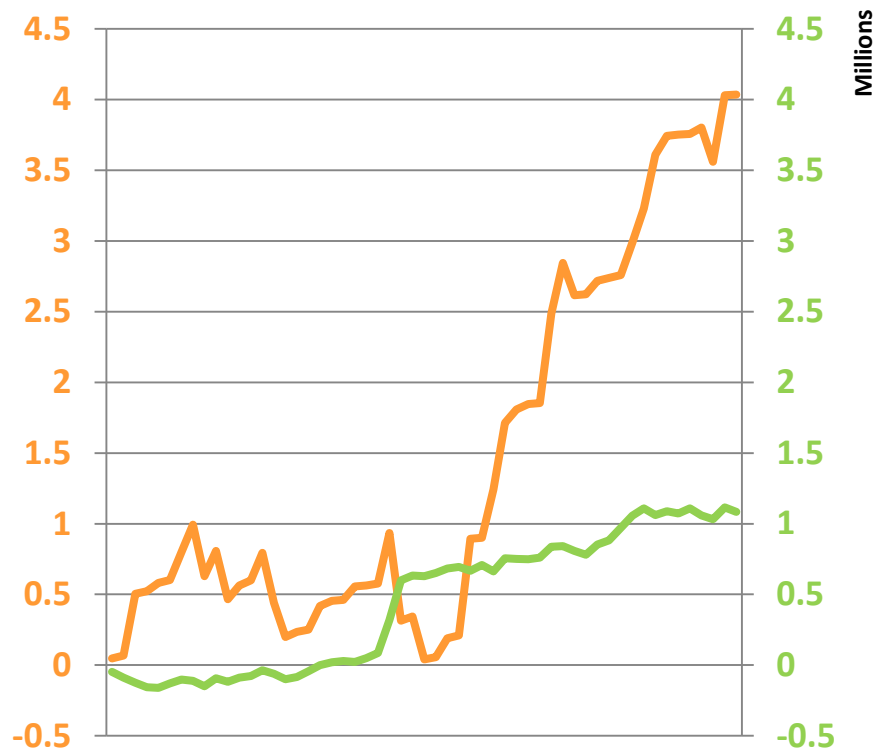
# Exemplary clinical departments

## Sharing of good practice

### Hosp A



### Hosp B



— lives saved

— CUSUM cost

# Purpose of Standardisation in Healthcare



Learning

Sharing of good practice

# Casemix development continues for better care and better value in HA



**Thank You**

If interested in testing out the idea, email [casemix@ha.org.hk](mailto:casemix@ha.org.hk)