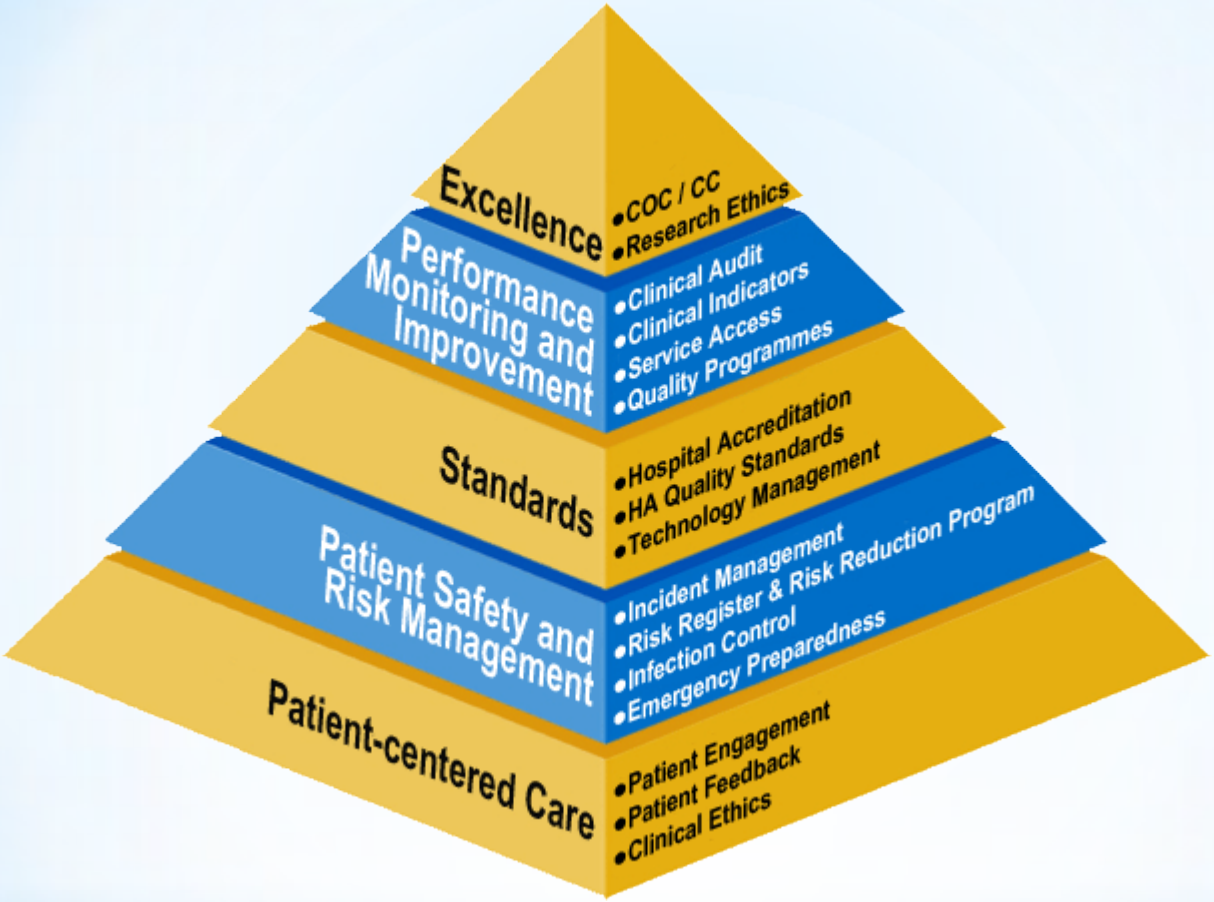
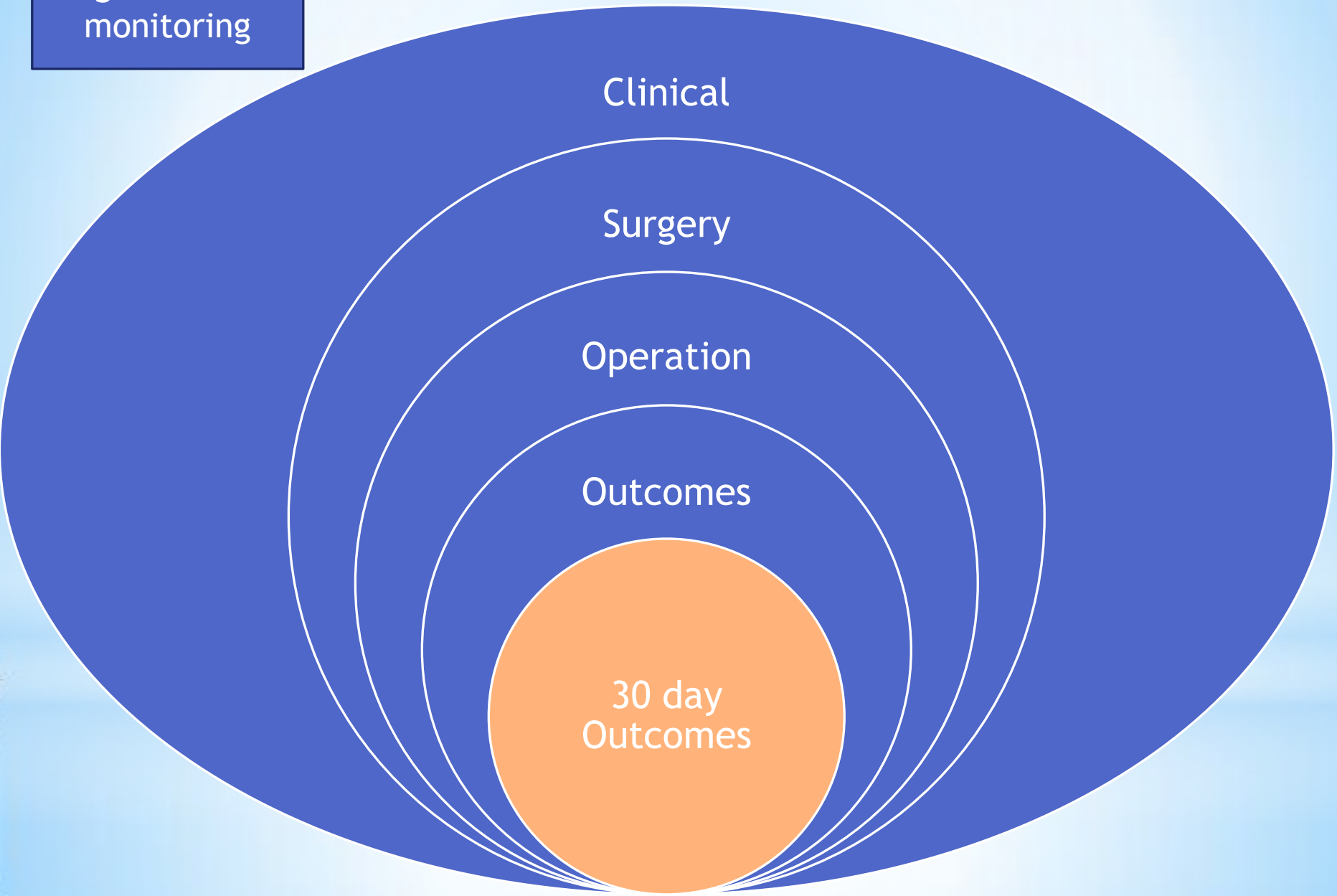
Applying Variable Life Adjusted Display in monitoring surgical outcomes

Dr Yuen Wai Cheung
SOMIP Director
Quality and Safety Division
HA Convention 2013

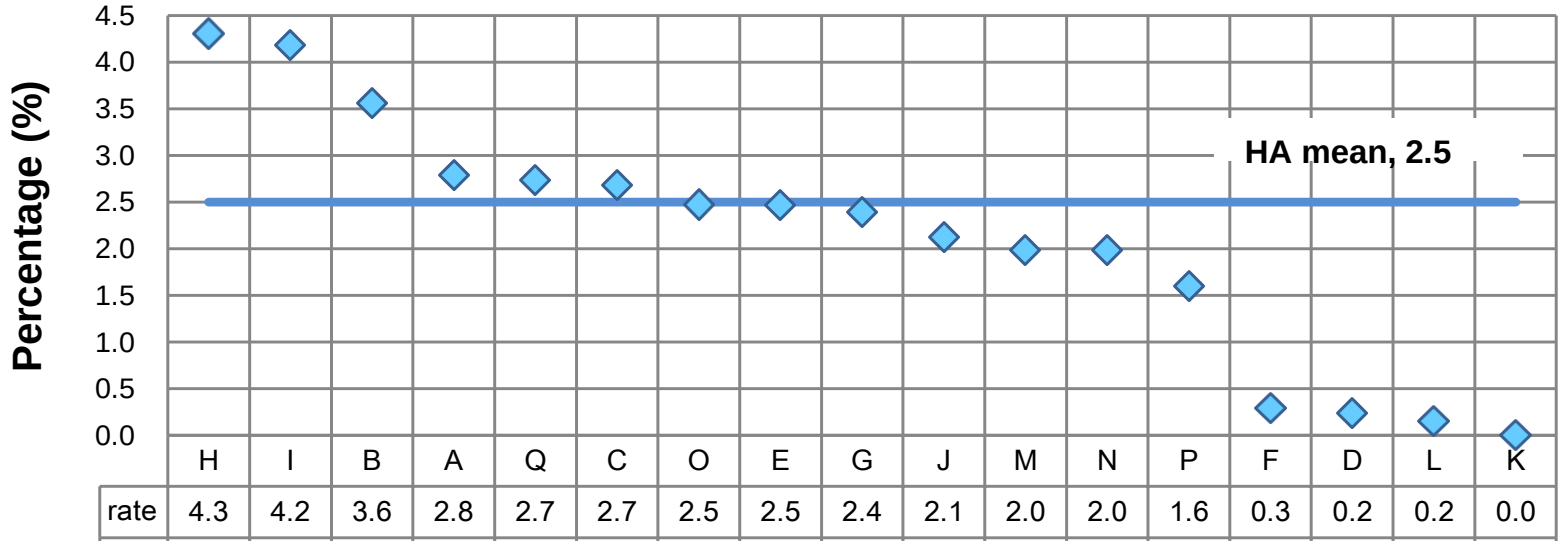


* Key functions of Quality and Safety Division HAHO

Target of SOMIP monitoring



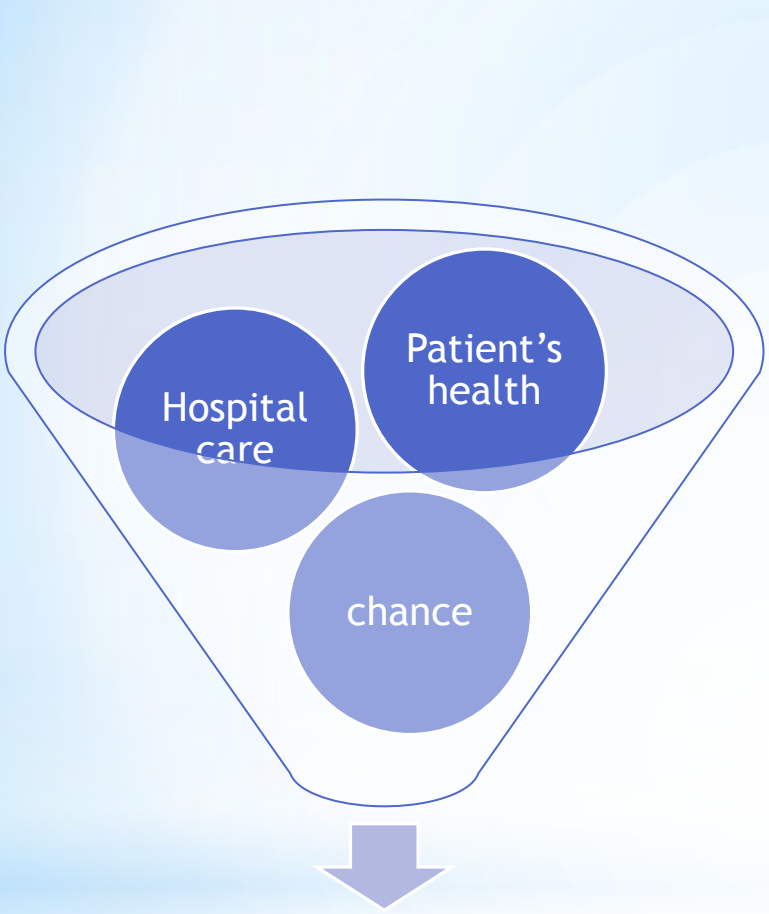
30 day crude mortality rate



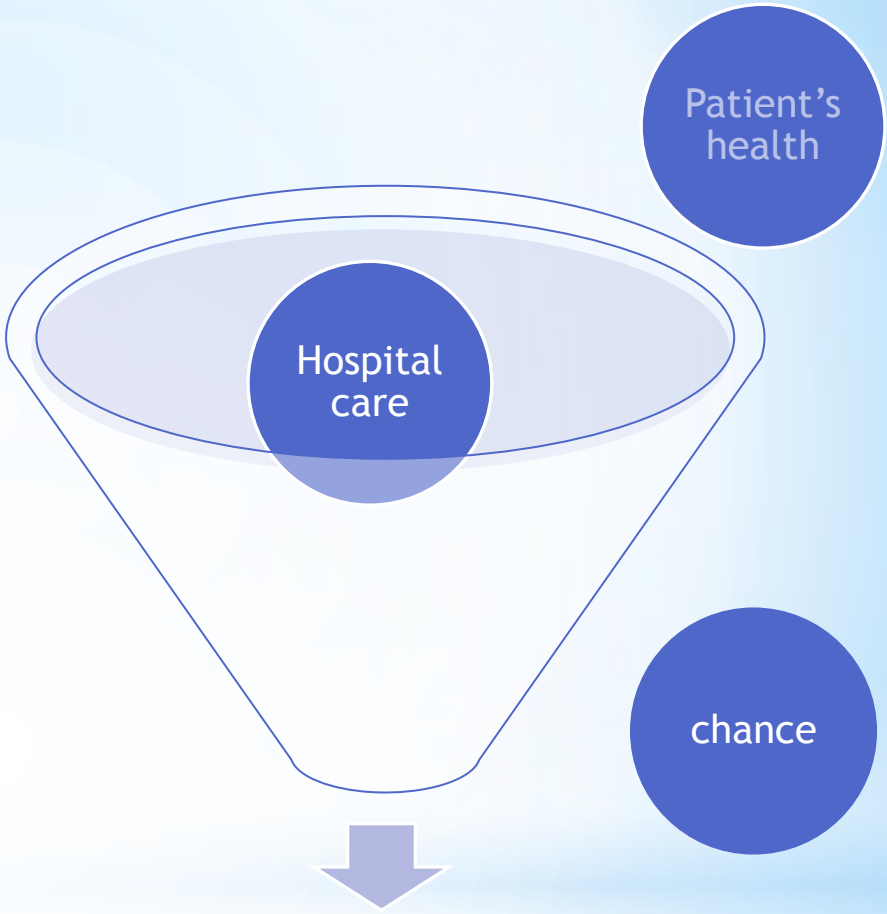
	H	I	B	A	Q	C	O	E	G	J	M	N	P	F	D	L	K
rate	4.3	4.2	3.6	2.8	2.7	2.7	2.5	2.5	2.4	2.1	2.0	2.0	1.6	0.3	0.2	0.2	0.0

Source of data: SOMIP database Jul 2011 to Jun 2012

* 608 patients died within 30 days after major or ultramajor operations in 17 HA hospitals in one year July2011- June 2012



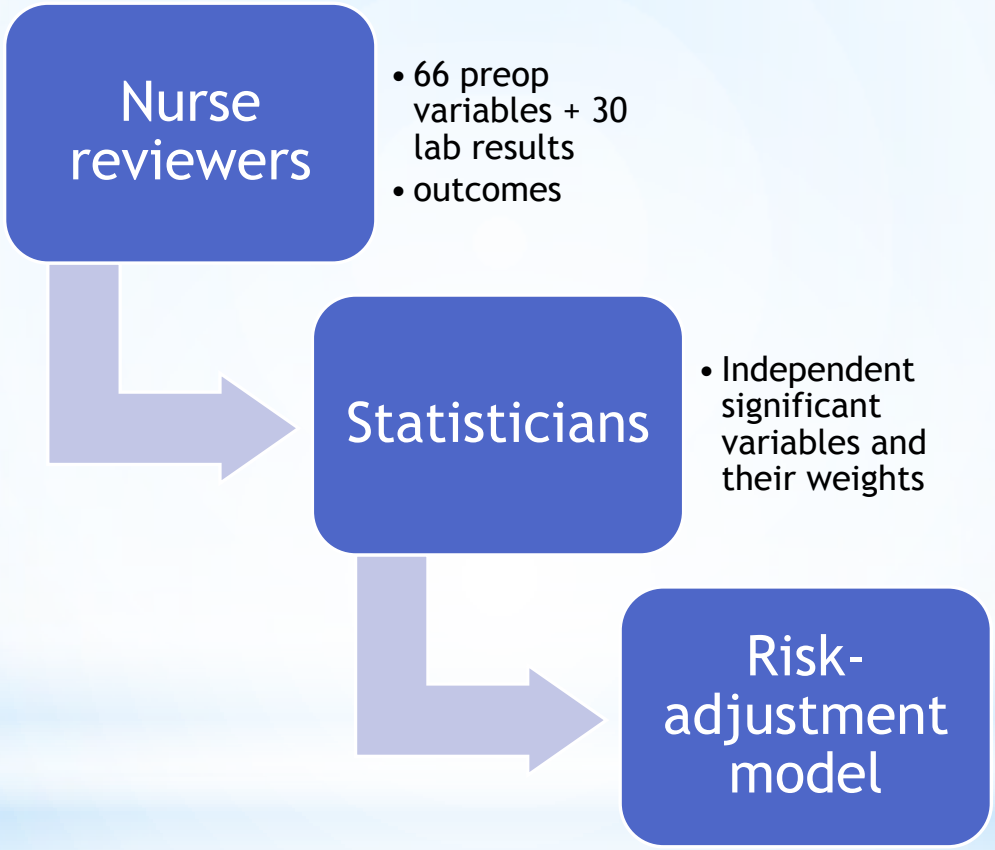
Crude outcomes



Risk-adjusted outcomes

Background

* HA has implemented Surgical Outcomes and Improvement Program (SOMIP) in all HA surgical departments since 2008.
* The aim is to provide an appraisal to hospitals based on risk-adjusted outcomes
* Short term outcomes (30days) of all major and ultra-major operations were monitored



*Methodology of SOMIP

* Model for emergency operations

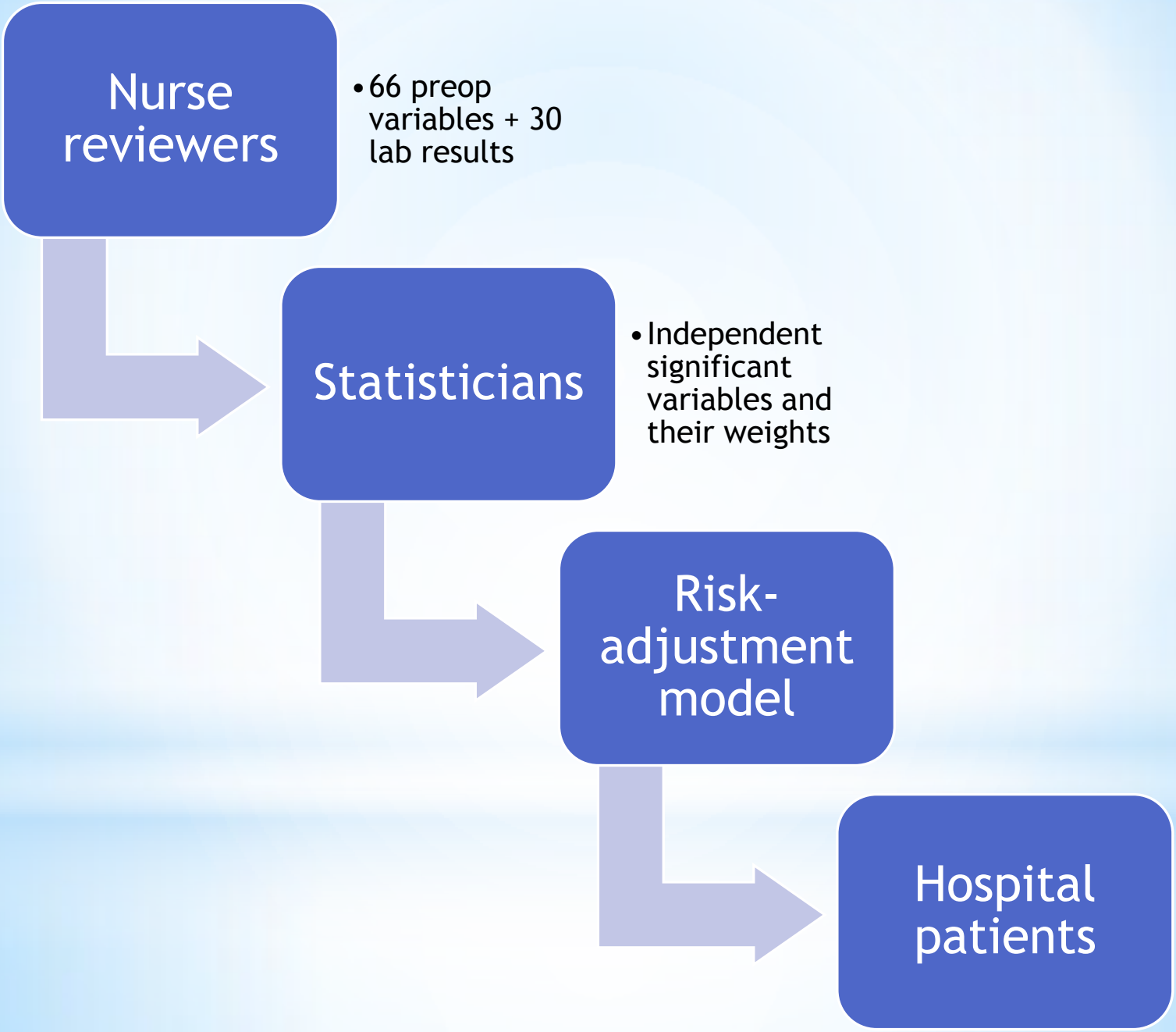
$$P = \frac{e^z}{1+e^z}$$

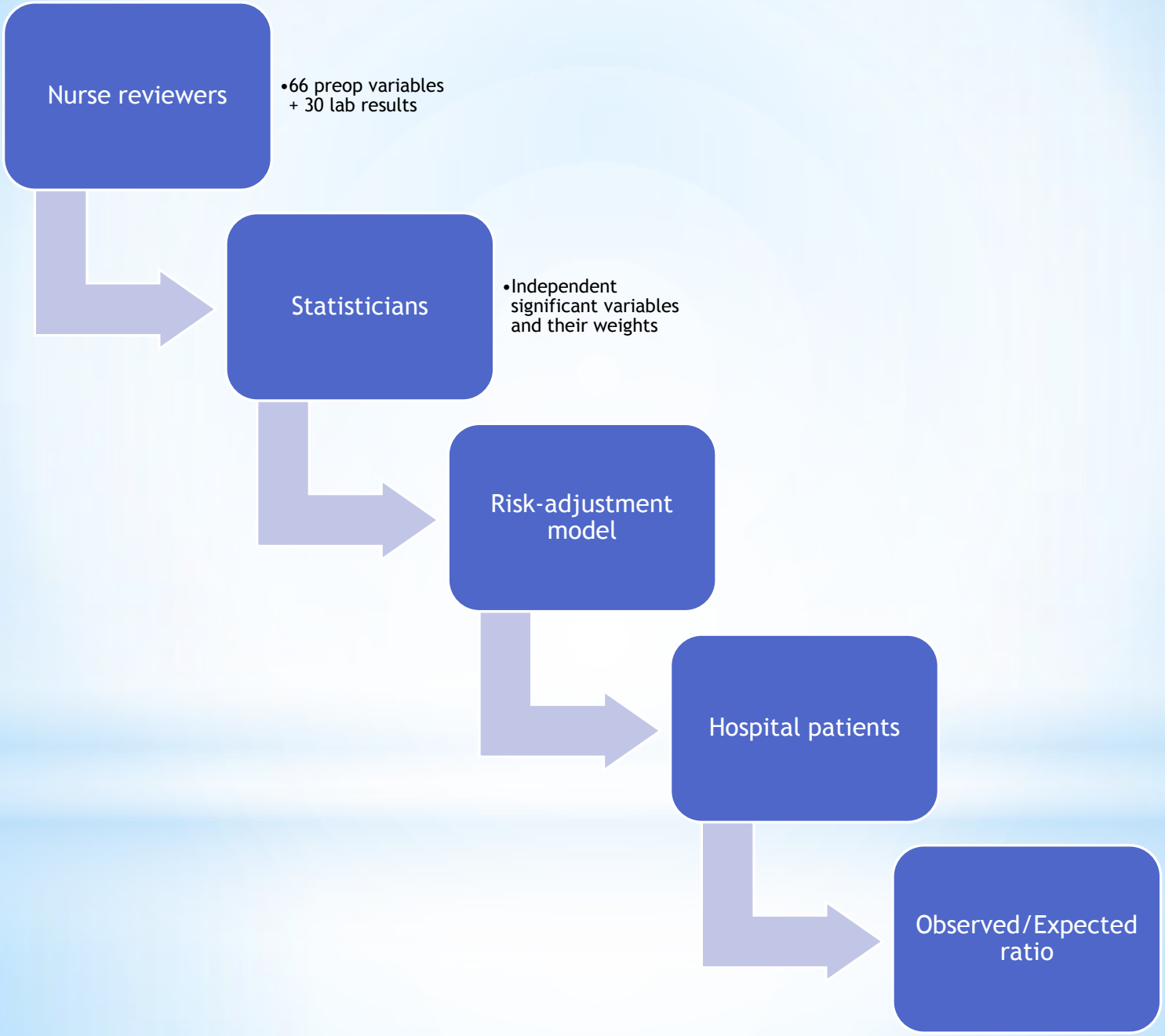
$$\begin{aligned} where\ z = {} & \beta_0 + \beta_{sex} + \beta_{age} + \beta_{ASA} \\ & + \beta_{\text{magnitude}} + \beta_{\text{degree of emergency}} + \beta_{\text{severeCOPD}} + \beta_{\text{renal failure}} + \beta_{\text{bleeding tendency}} \\ & + \beta_{disseminated\ cancer} + \beta_{\text{hypertension}} + \beta_{\text{steroid use}} + \beta_{\text{psychosis}} + \beta_{\text{alcohol}} \\ & + \beta_{\text{functional health status}} + \beta_{\text{weight loss}} + \beta_{\text{dsypnea}} + \beta_{\text{neurological status}} + \beta_{\text{ascites}} \\ & + \beta_{WBC} + \beta_{Sodium} + \beta_{Urea} + \beta_{Albumin} + \beta_{Bilirubin} + \beta_{Pulse} \end{aligned}$$

Model for elective operations

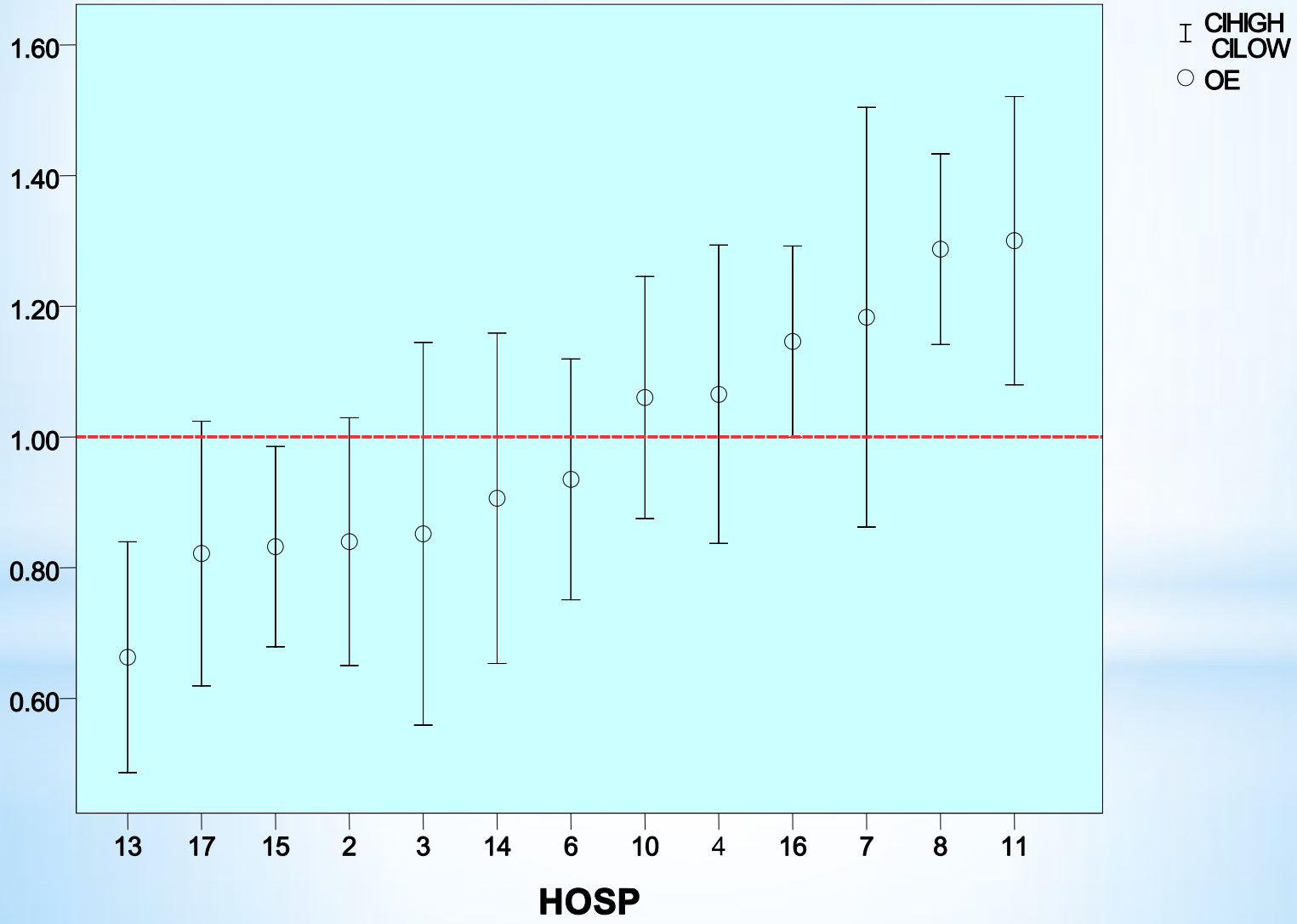
$$P = \frac{e^z}{1+e^z}$$

$$\begin{aligned} where\ z = {} & \beta_0 + \beta_{sex} + \beta_{age} + \beta_{ASA} \\ & + \beta_{\text{magnitude}} + \beta_{\text{ascites}} + \beta_{disseminated\ cancer} + \beta_{\text{hypertension}} + \beta_{\text{complexity score}} \\ & + \beta_{\text{functional health status}} + \beta_{\text{weight loss}} + \beta_{\text{dyspnea}} + \beta_{\text{gangrene}} + \beta_{WBC} \\ & + \beta_{Sodium} + \beta_{Urea} + \beta_{Creatinine} + \beta_{Albumin} + \beta_{Bilirubin} + \beta_{alk\ Pase} + \beta_{Pulse} \\ & + \beta_{base\ excess} + \beta_{blood\ loss} \end{aligned}$$

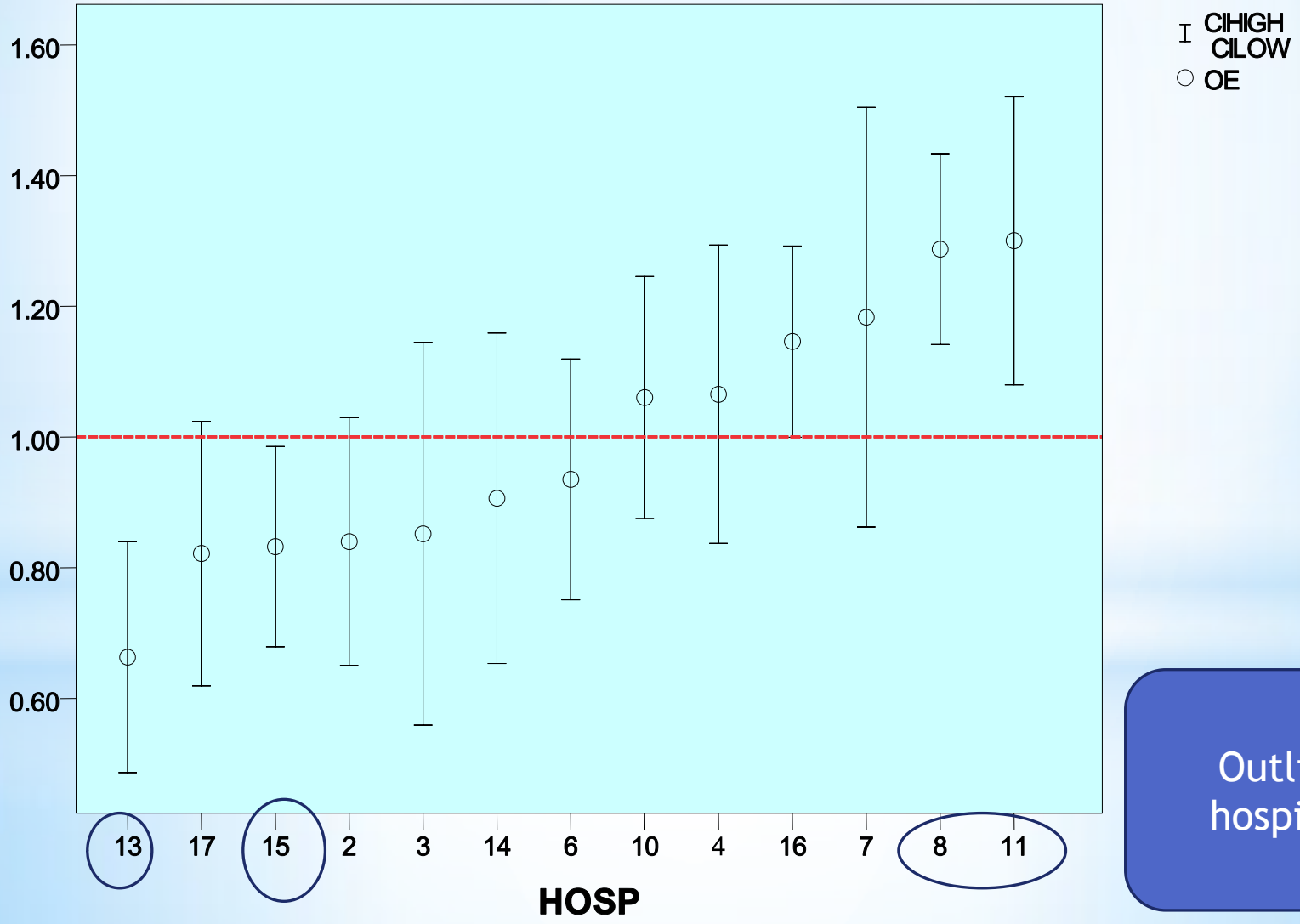

Nurse reviewers
• 66 preop variables + 30 lab results
Statisticians
• Independent significant variables and their weights
Risk-adjustment model
Hospital patients


Nurse reviewers
•66 preop variables
+ 30 lab results
Statisticians
•Independent
significant variables
and their weights
Risk-adjustment
model
Hospital patients
Observed/Expected
ratio

O/E Ratio and 90% CI for 30-day Mortality following Emergency Surgery

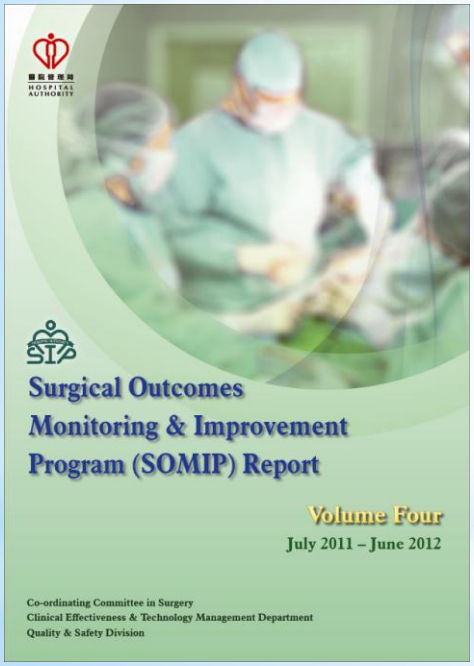


O/E Ratio and 90% CI for 30-day Mortality following Emergency Surgery



Outliers hospitals

* Starting in this year, we introduced VLAD to provide more information to hospital of their past performance



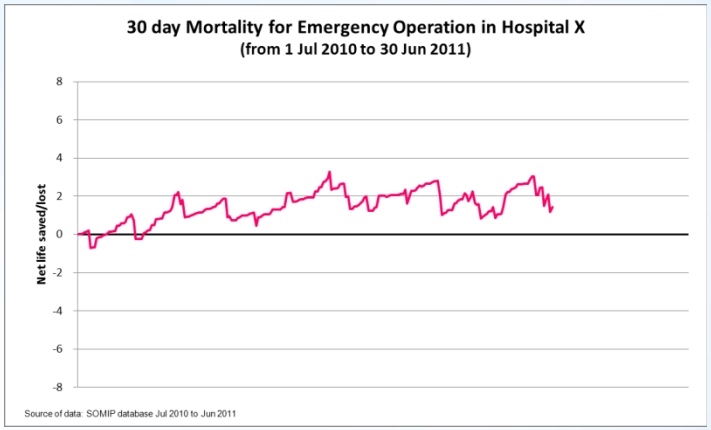
* Variable Life Adjusted Display (VLAD)

* The vertical axis shows the cumulative difference between the expected mortality and the actual deaths

* Every case is plotted on a horizontal axis

* Survivors: move up; death: go down

* The risk calculated by the SOMIP risk-adjusted model determines the magnitude the graph ascends or descends

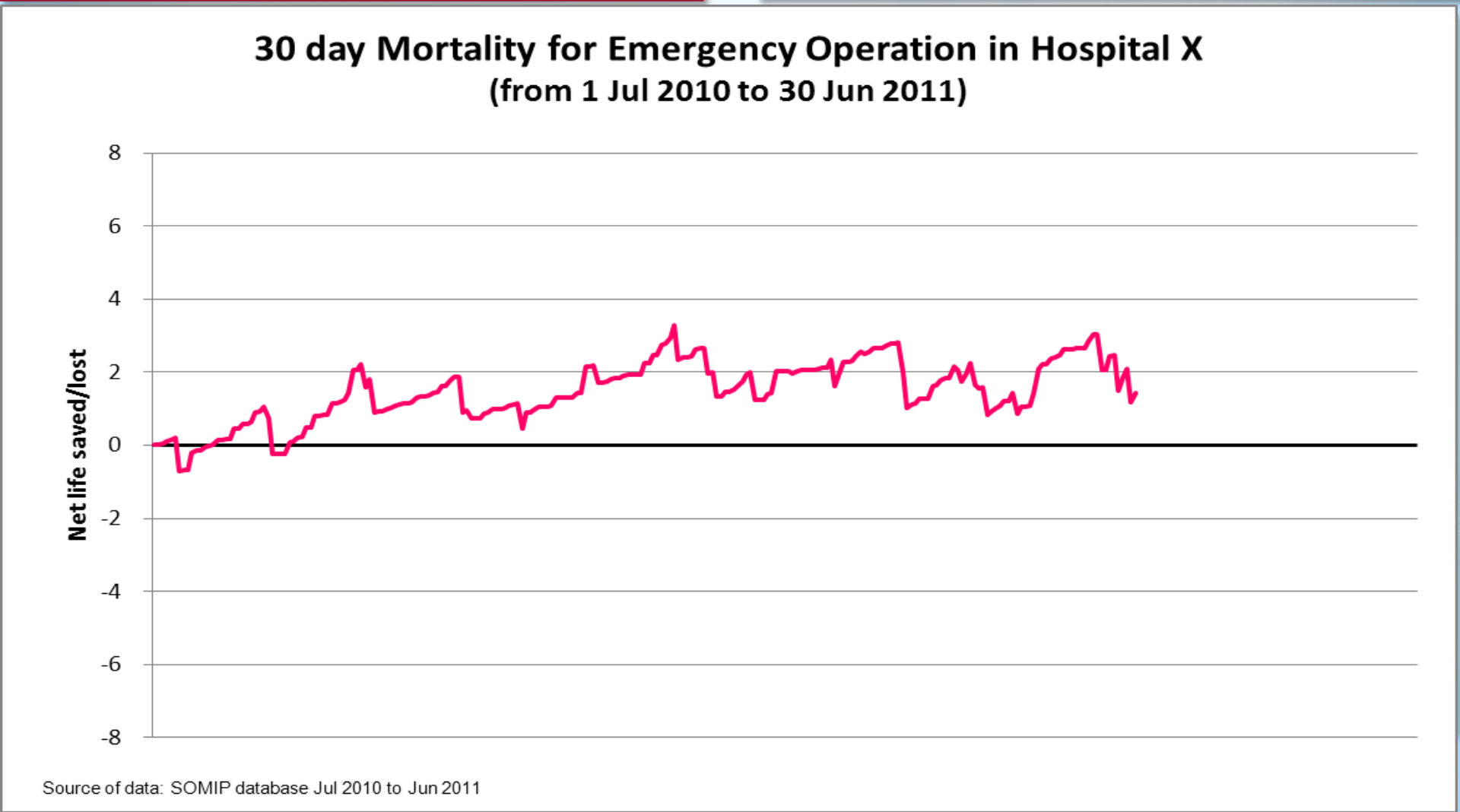


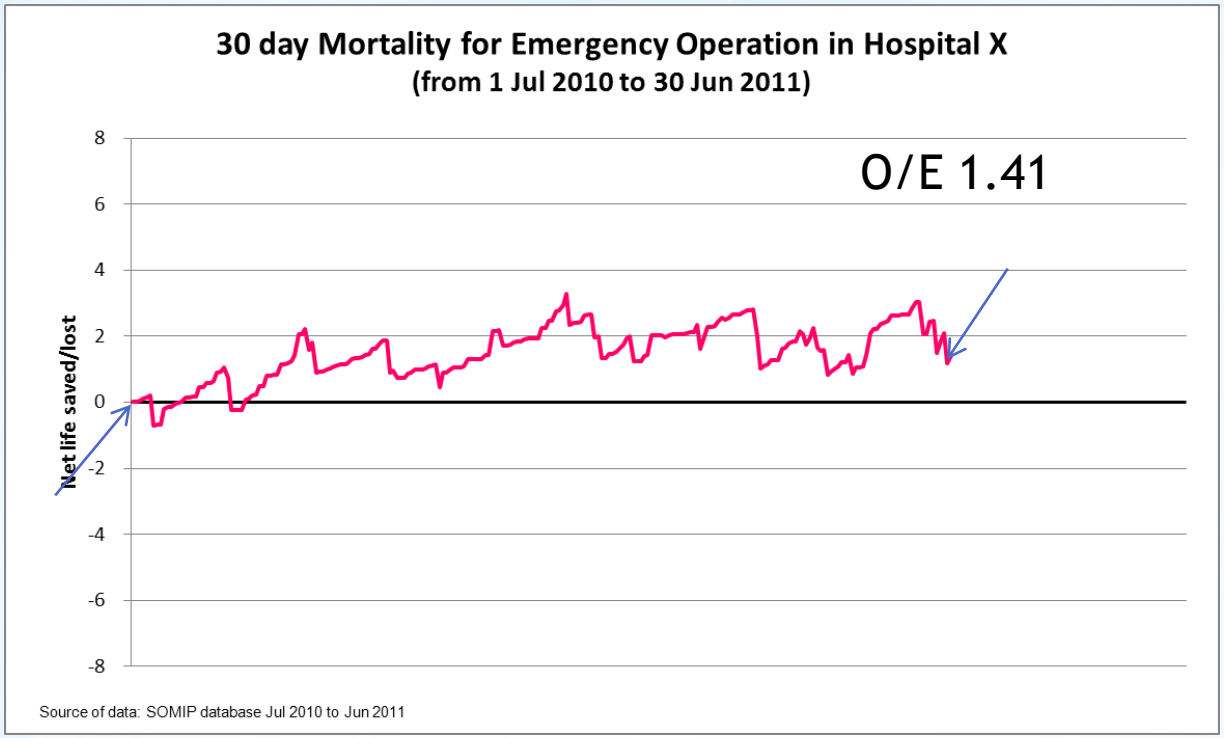
* Variable Life - Adjusted Display (VLAD)

Variable Life – Adjusted Display (VLAD)

Probability of death by individual case

Cumulative net live saved and lost





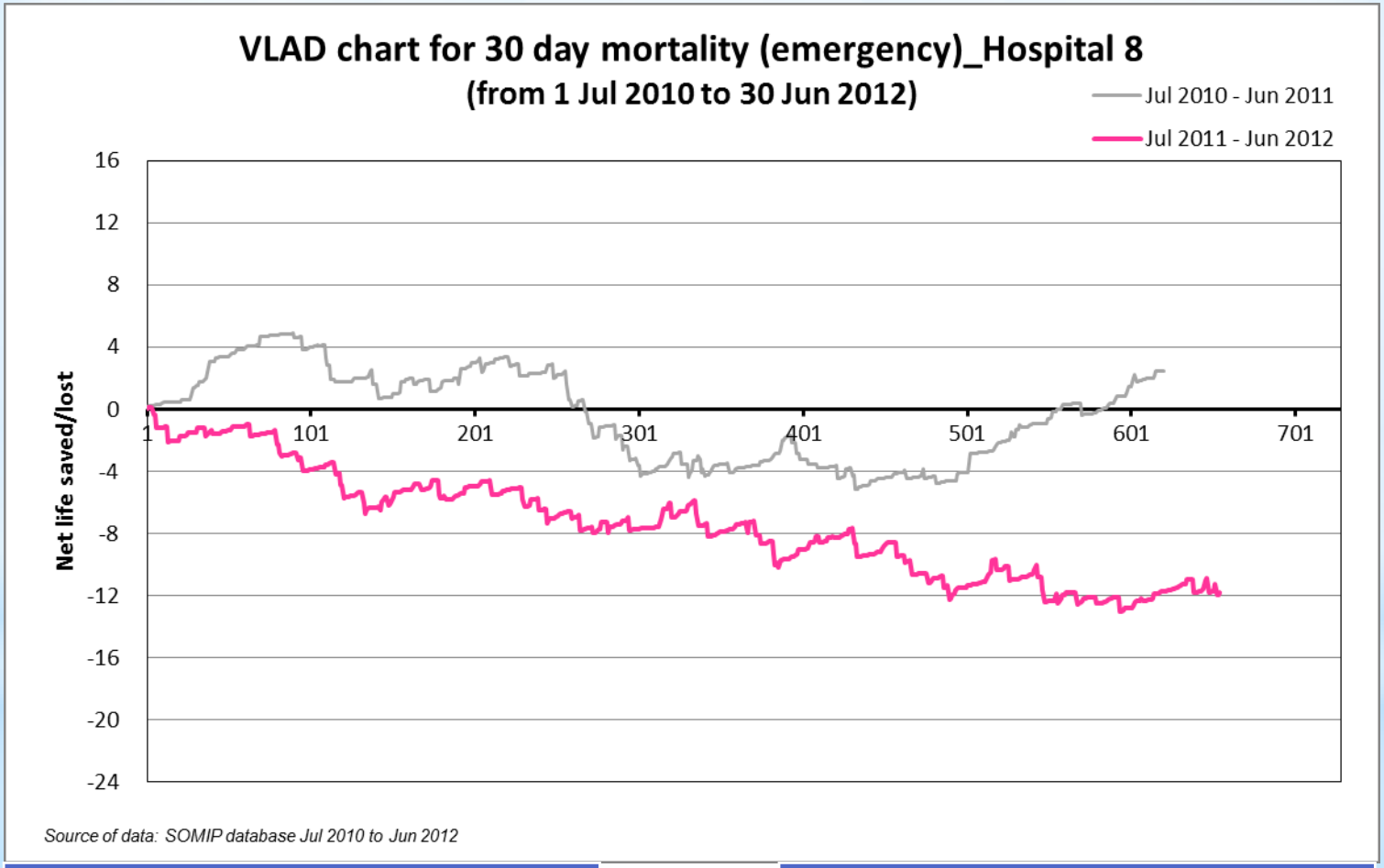
* O/E ratio measures the difference between two points while VLAD shows the changes between two points

O/E ratios of two years

Hospital	2010-11	2011-12
11	1.37	0.77
7	1.86	0.95
8	0.95	1.22
10	1.14	1.30
16	0.96	1.34

*Real examples of hospitals

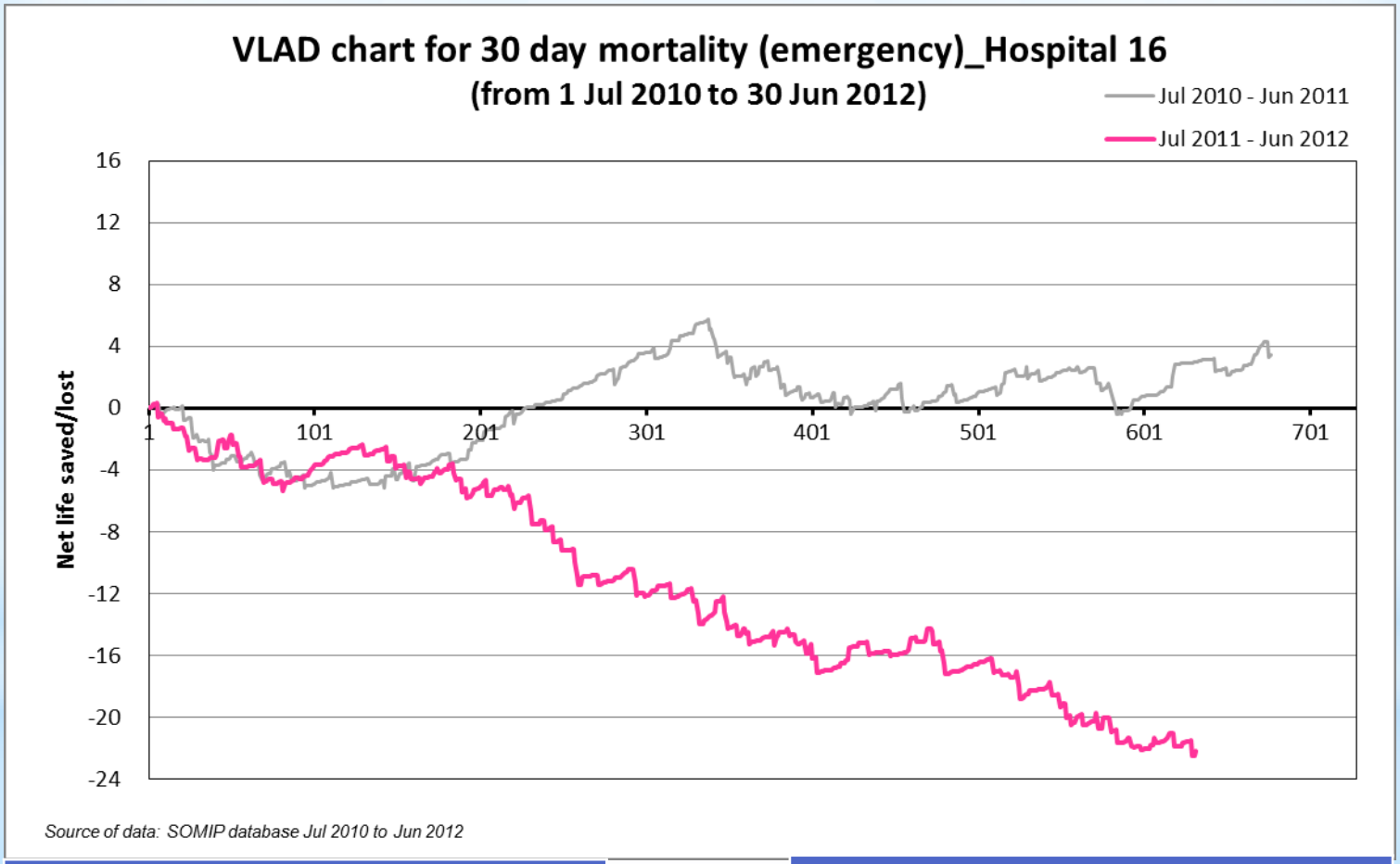
VLAD – Hospital 8 (Emergency)



O/E ratio(10/11) : 0.95406

O/E ratio(11/12): 1.21865

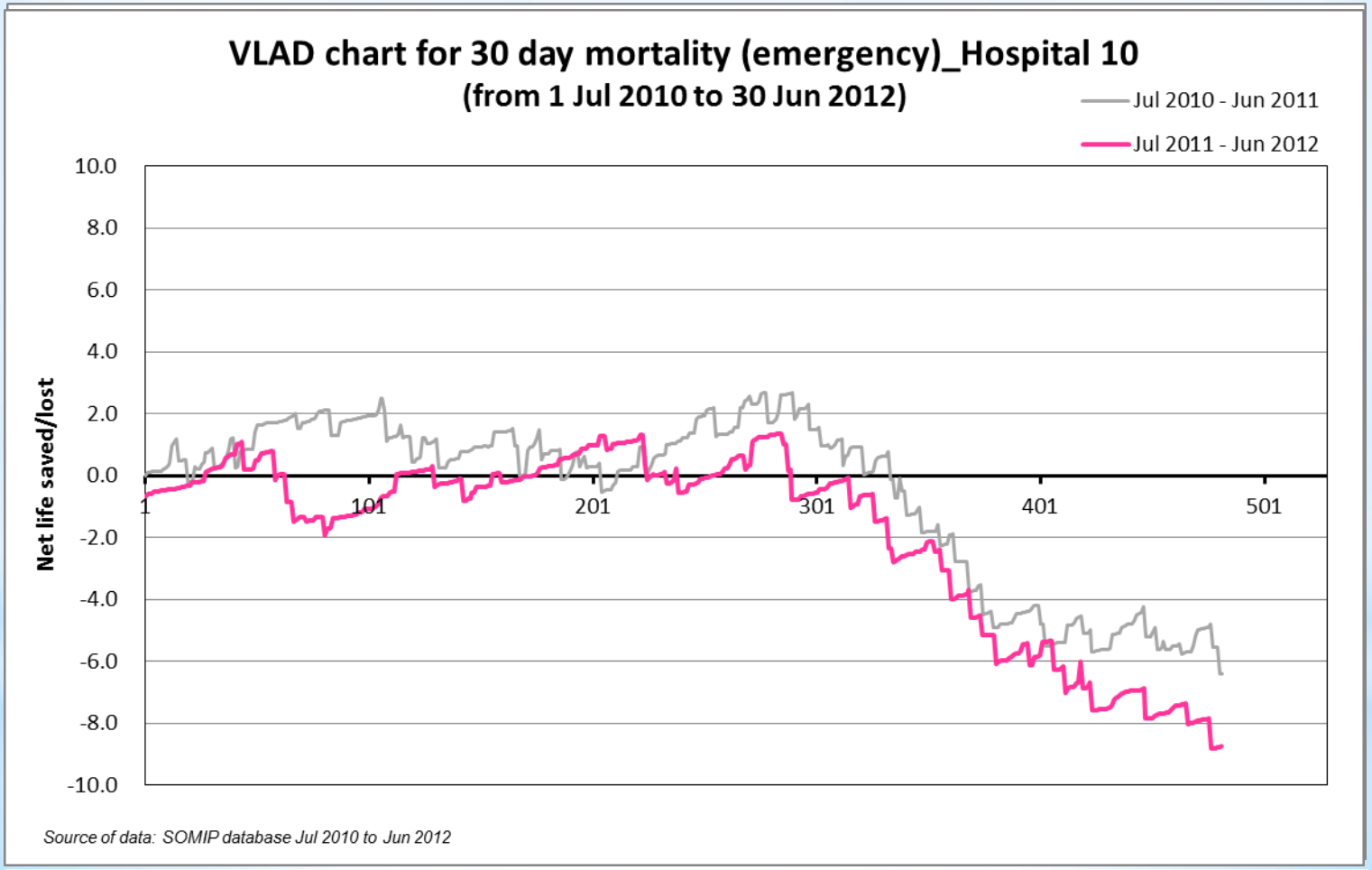
VLAD – Hospital 16 (Emergency)



O/E ratio(10/11) : 0.95528

O/E ratio(11/12): 1.33789

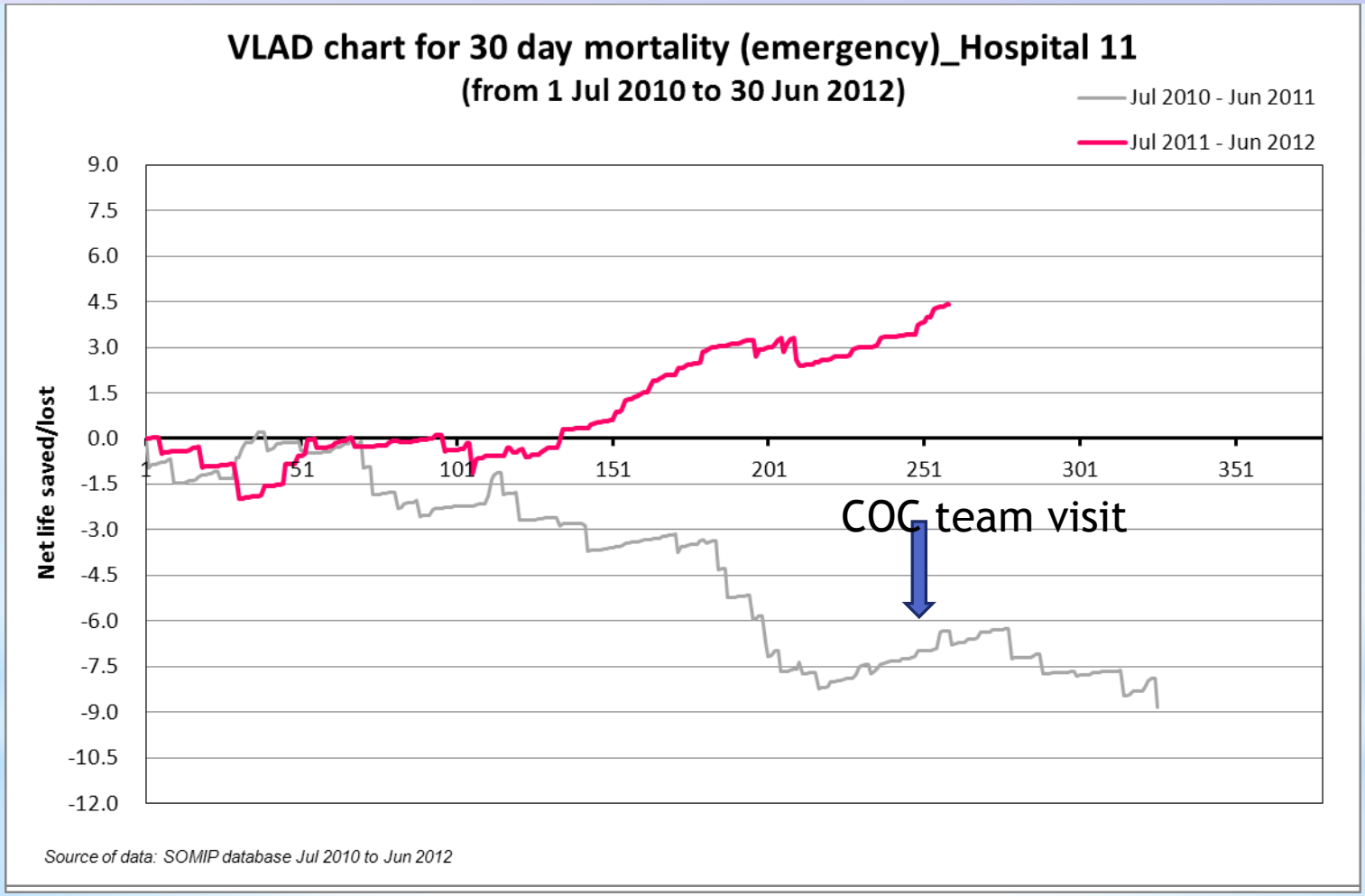
VLAD – Hospital 10 (Emergency)



O/E ratio(10/11) : 1.14329

O/E ratio(11/12): 1.29864

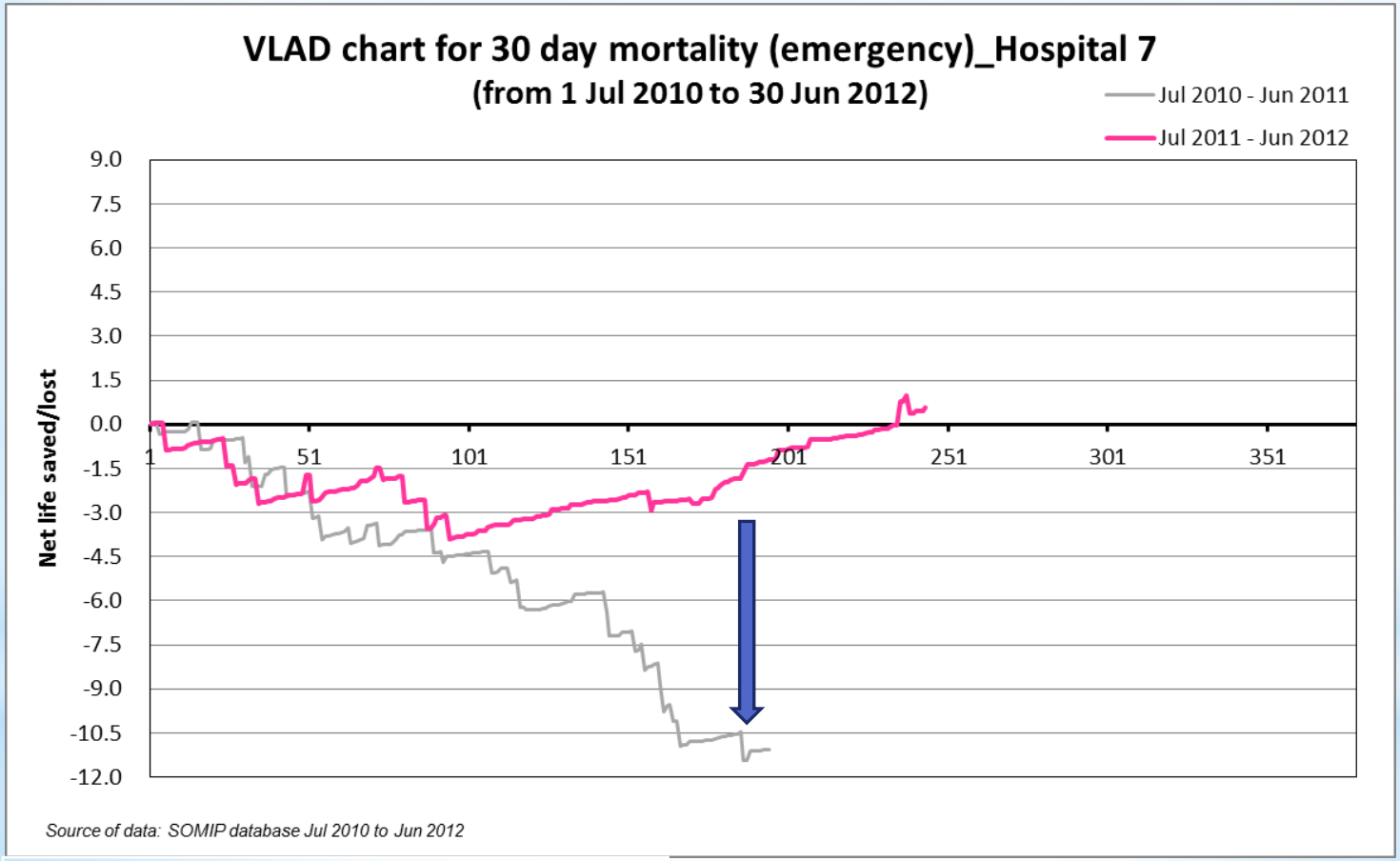
VLAD – Hospital 11 (Emergency)



O/E ratio(10/11) : 1.36609

O/E ratio(11/12): 0.77333

VLAD – Hospital 7 (Emergency)

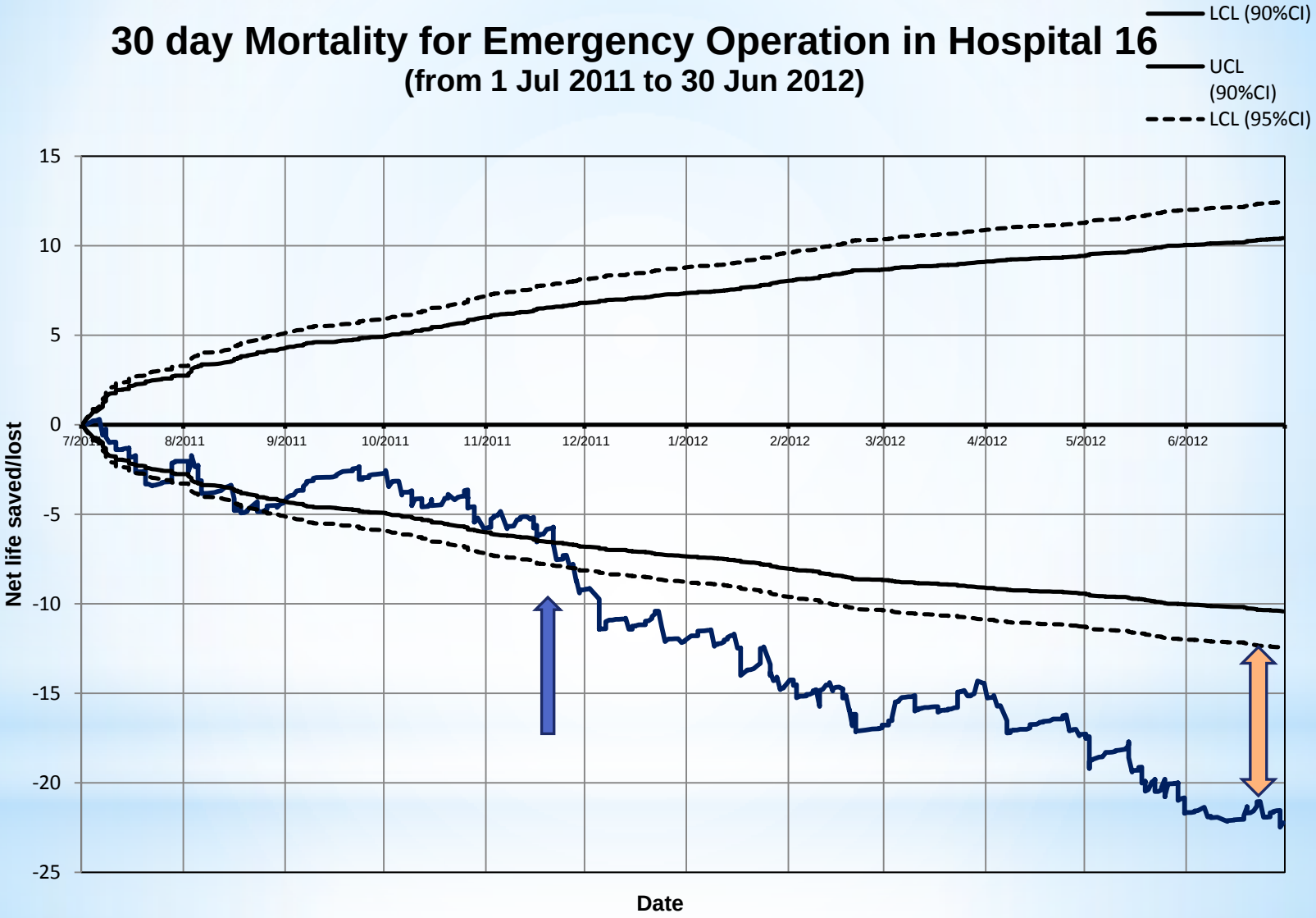


O/E ratio(10/11) **1.85732**

O/E ratio(11/12): 0.95322

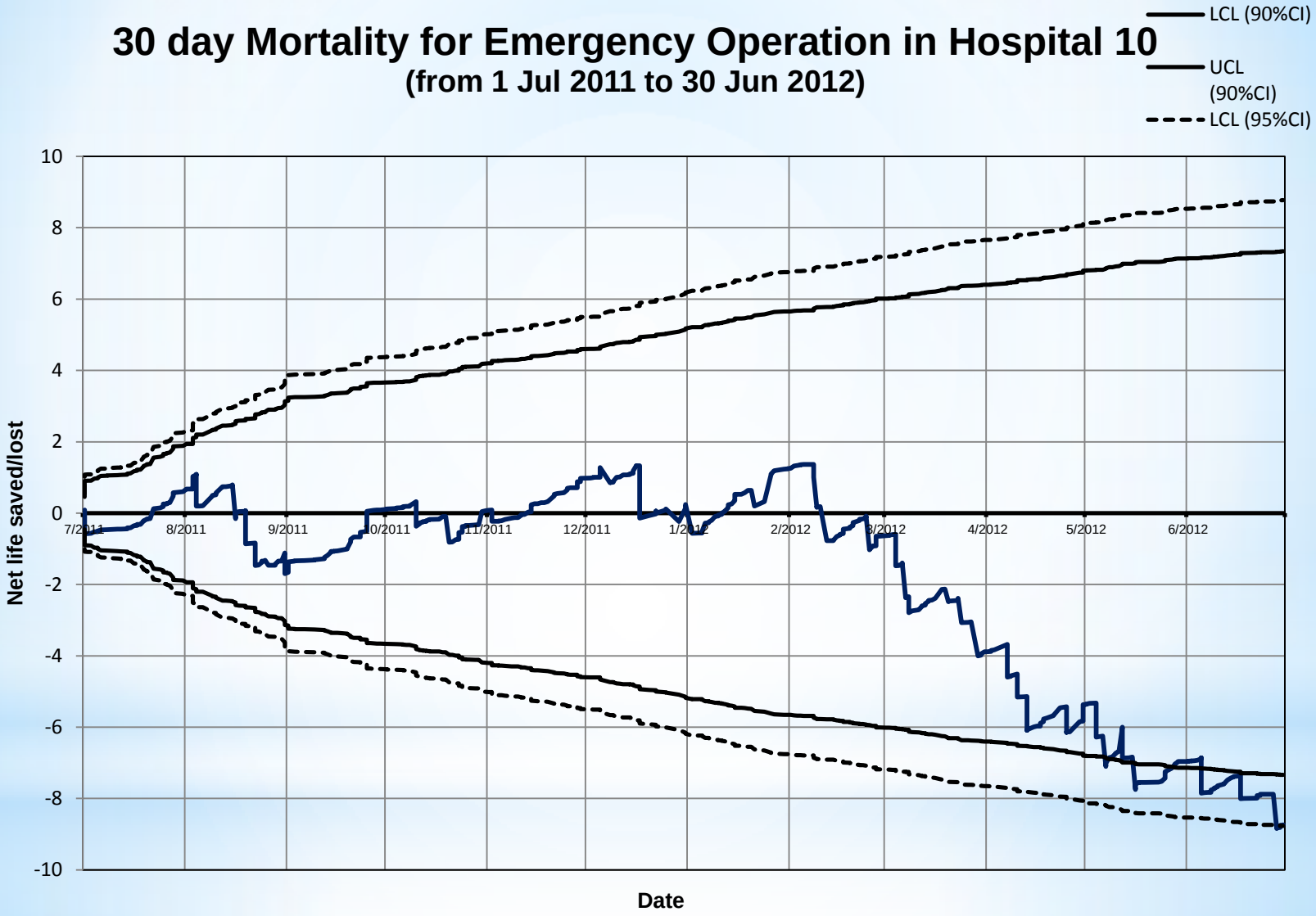
*Superimposing control limits to VLAD

30 day Mortality for Emergency Operation in Hospital 16
(from 1 Jul 2011 to 30 Jun 2012)



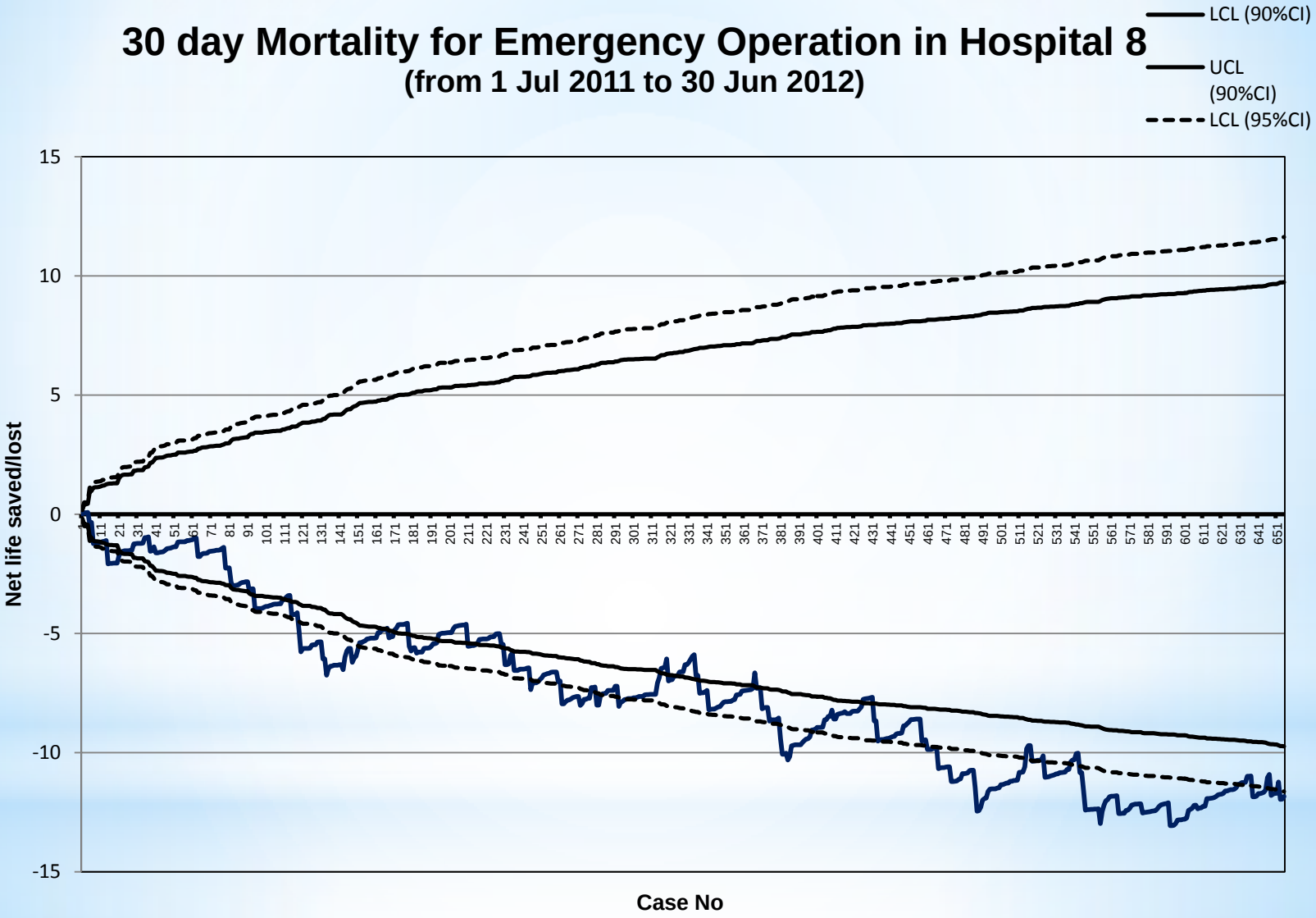
Source of data: SOMIP database 1 Jul 2011 to 30 Jun 2012

30 day Mortality for Emergency Operation in Hospital 10
(from 1 Jul 2011 to 30 Jun 2012)



Source of data: SOMIP database 1 Jul 2011 to 30 Jun 2012

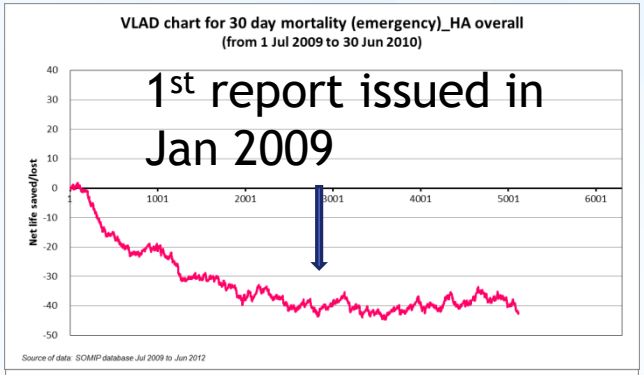
30 day Mortality for Emergency Operation in Hospital 8
(from 1 Jul 2011 to 30 Jun 2012)

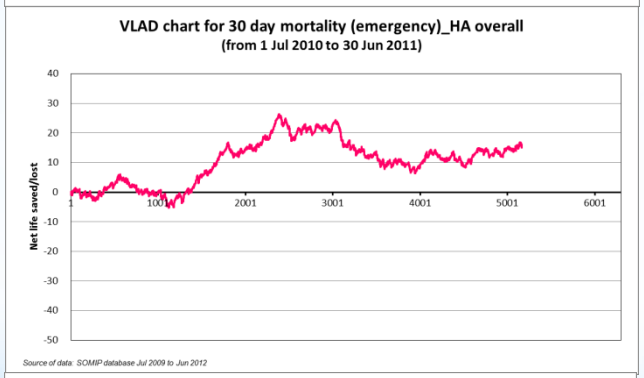


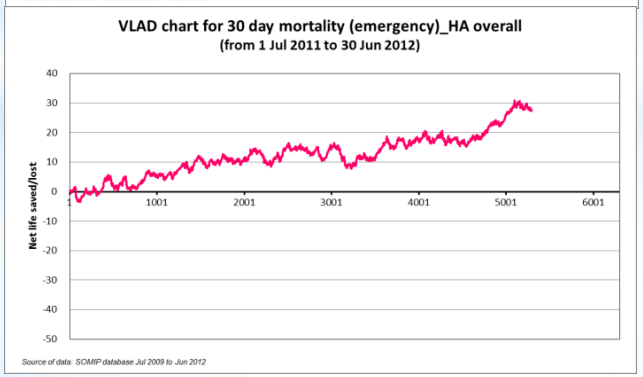
Source of data: SOMIP database 1 Jul 2011 to 30 Jun 2012

*VLAD can prove that SOMIP has improved HA surgical outcomes

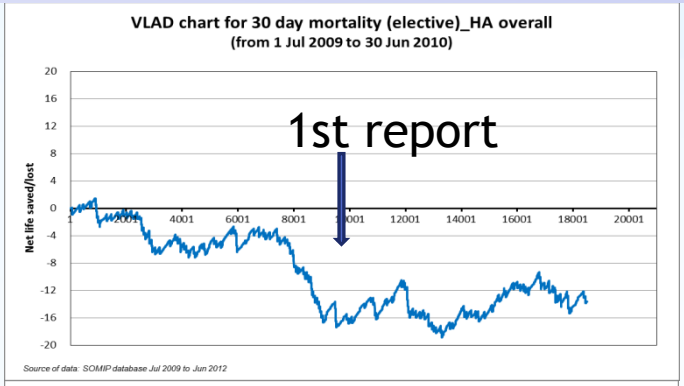
VLAD – 30 day emergency mortality HA hospitals (09-12)

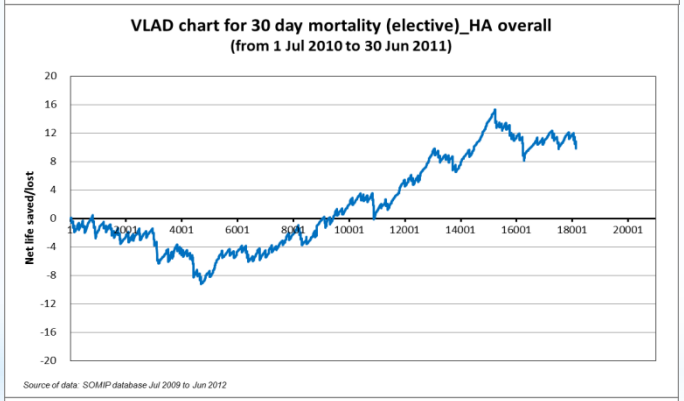


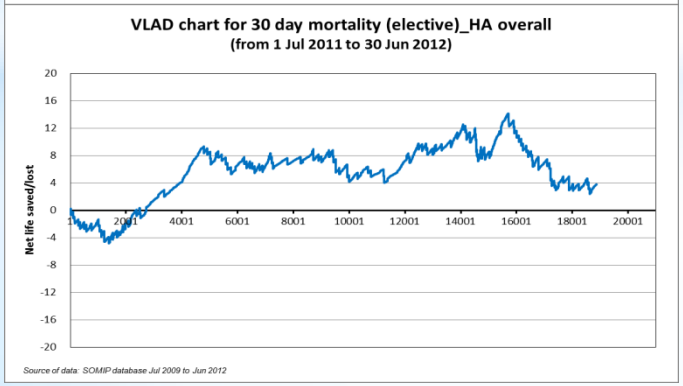




VLAD – 30 day elective mortality for HA hospitals (09-12)







Conclusions

- VLAD enhances the information provided by SOMIP
- It tells the time of changes
- It tells the effectiveness of improvement measure