Queensland Government
Queensland Health

Clinical Practice Improvement Centre

Variable Life Adjusted Displays (VLADs)

a monitoring tool

Kirstine Sketcher-Baker

health • care • people

Introduction

In the last few years significant changes have driven various improvements in safety and quality in Queensland Health

- Corporate and clinical leadership
- Changes in Clinical Governance - accountability
- Public Reporting – transparency & accountability
- State-wide introduction of a more timely and sensitive statistical monitoring tool – Variable Life Adjusted Displays (VLAD)
- State-wide introduction of pyramid model of investigation and an IT system that timely delivers VLADs and captures review feedback

Variable Life Adjusted Display
(VLAD)

A VLAD is a type of statistical process control chart that visually represents treatment outcomes for selected clinical indicators

- A monitoring tool of clinical indicators
- Displays trends over time within a hospital
- Compares individual hospitals with the state average

VLAD Characteristics

A VLAD investigates:

- ✓ A clinical indicator
- ✓ According to a particular outcome
- ✓ For a particular time period
- ✓ For a particular hospital (public or private)
- ✓ By each patient
- ✓ Against a particular cut-off for reactive increase or decrease

Current VLAD Clinical Indicators

Mortality

- Acute Myocardial Infarction
- Heart Failure
- Stroke
- Pneumonia
- Fractured Neck of Femur

Readmission and Long Stay

- Acute Myocardial Infarction
- Heart Failure
- Knee Replacement
- Hip Replacement
- Depression
- Schizophrenia
- Paediatric Tonsillectomy and Adenoidectomy

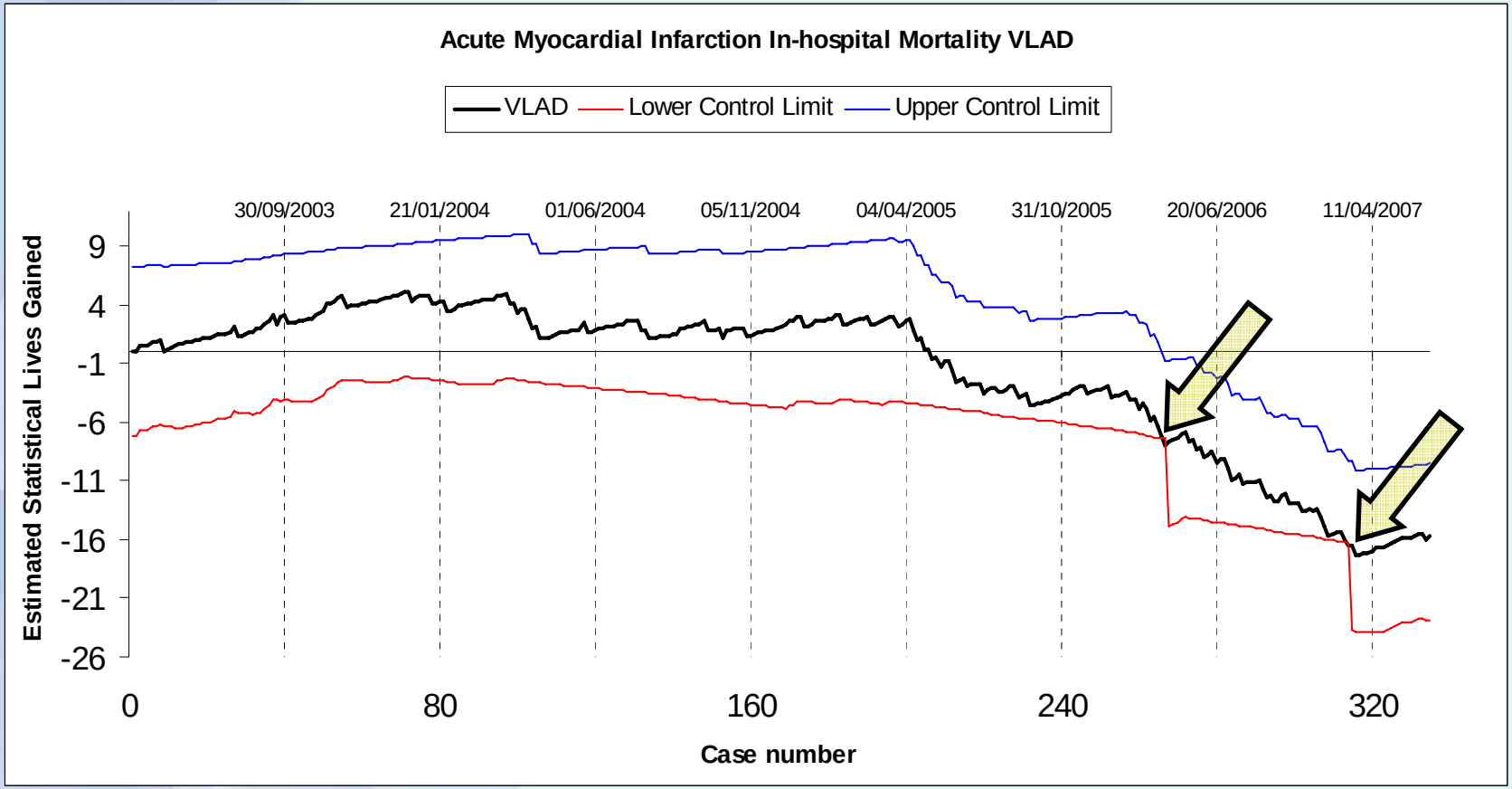
Complications of Surgery

- Vaginal Hysterectomy
- Abdominal Hysterectomy
- Fractured Neck of Femur
- Colorectal Carcinoma
- Knee Replacement
- Hip Replacement
- Prostatectomy

Obstetrics & Gynaecology

- Caesarean Section
- Selected Induction of Labour

In-hospital Mortality VLAD

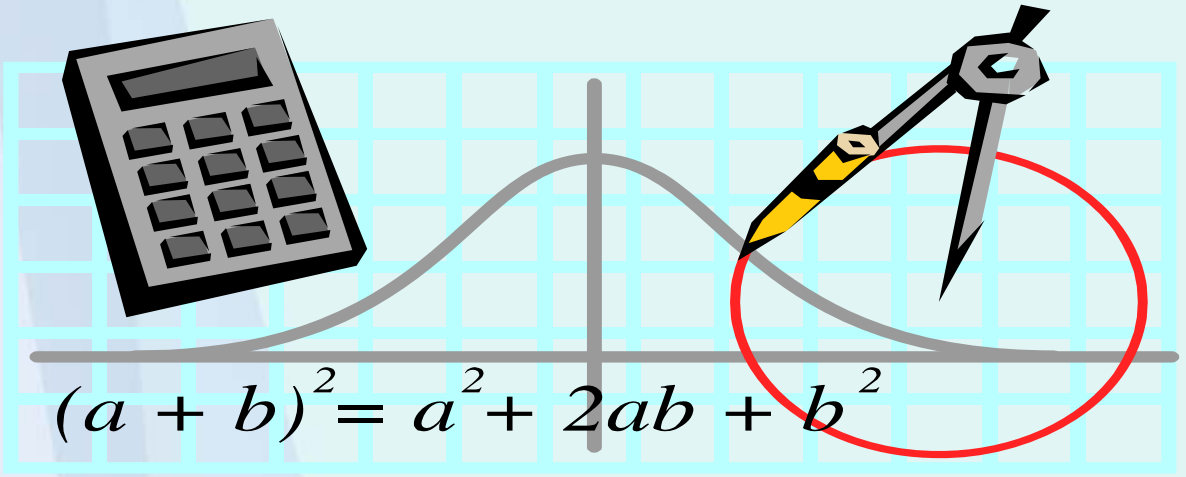


Making a VLAD Step by Step

Step 1: Calculate the probability of the clinical indicator outcome for each patient

Making a VLAD Step by Step

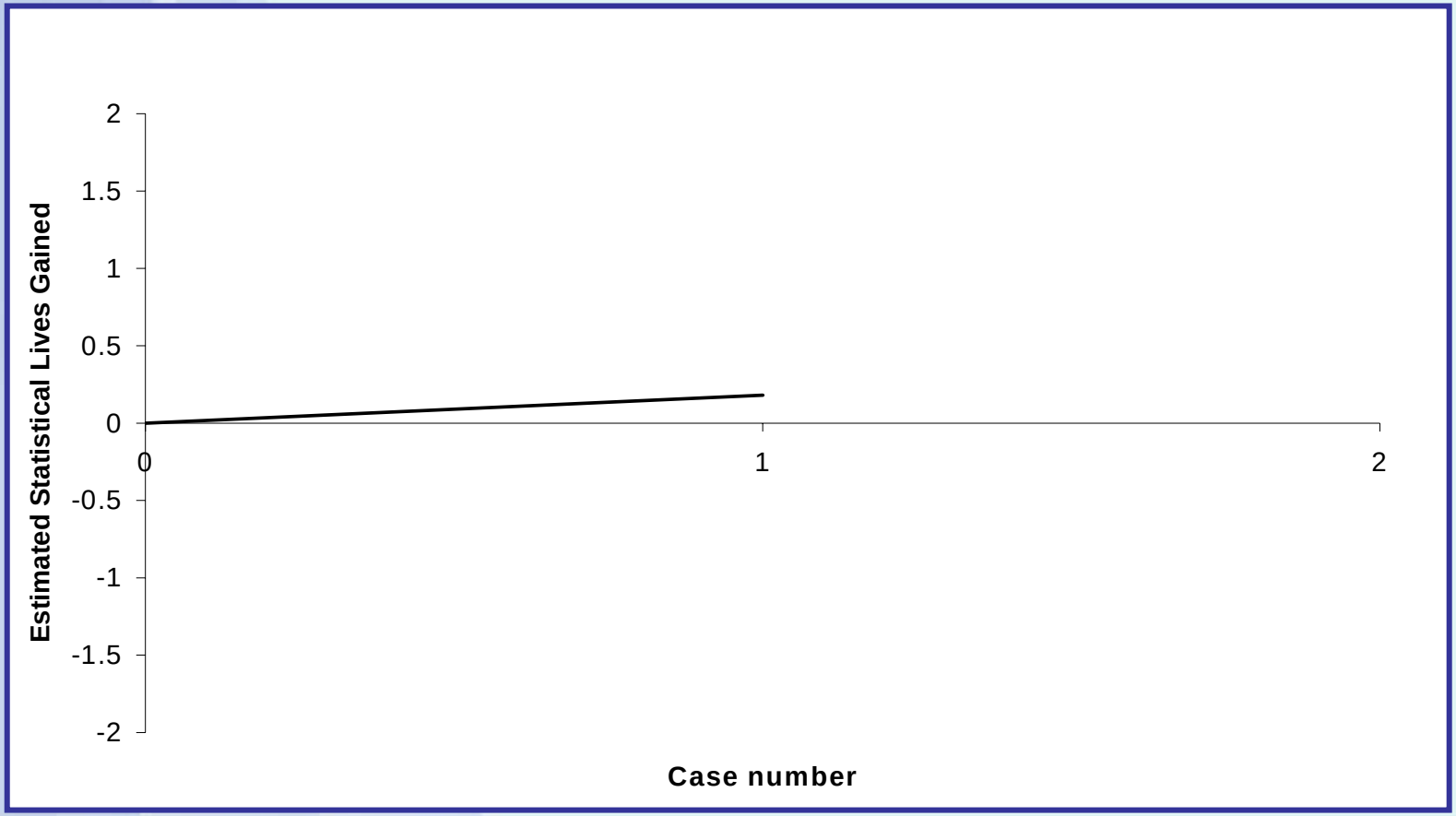
Step 2: Plotting the first patient using their probability of outcome and if the outcome occurred



In-hospital Mortality VLAD

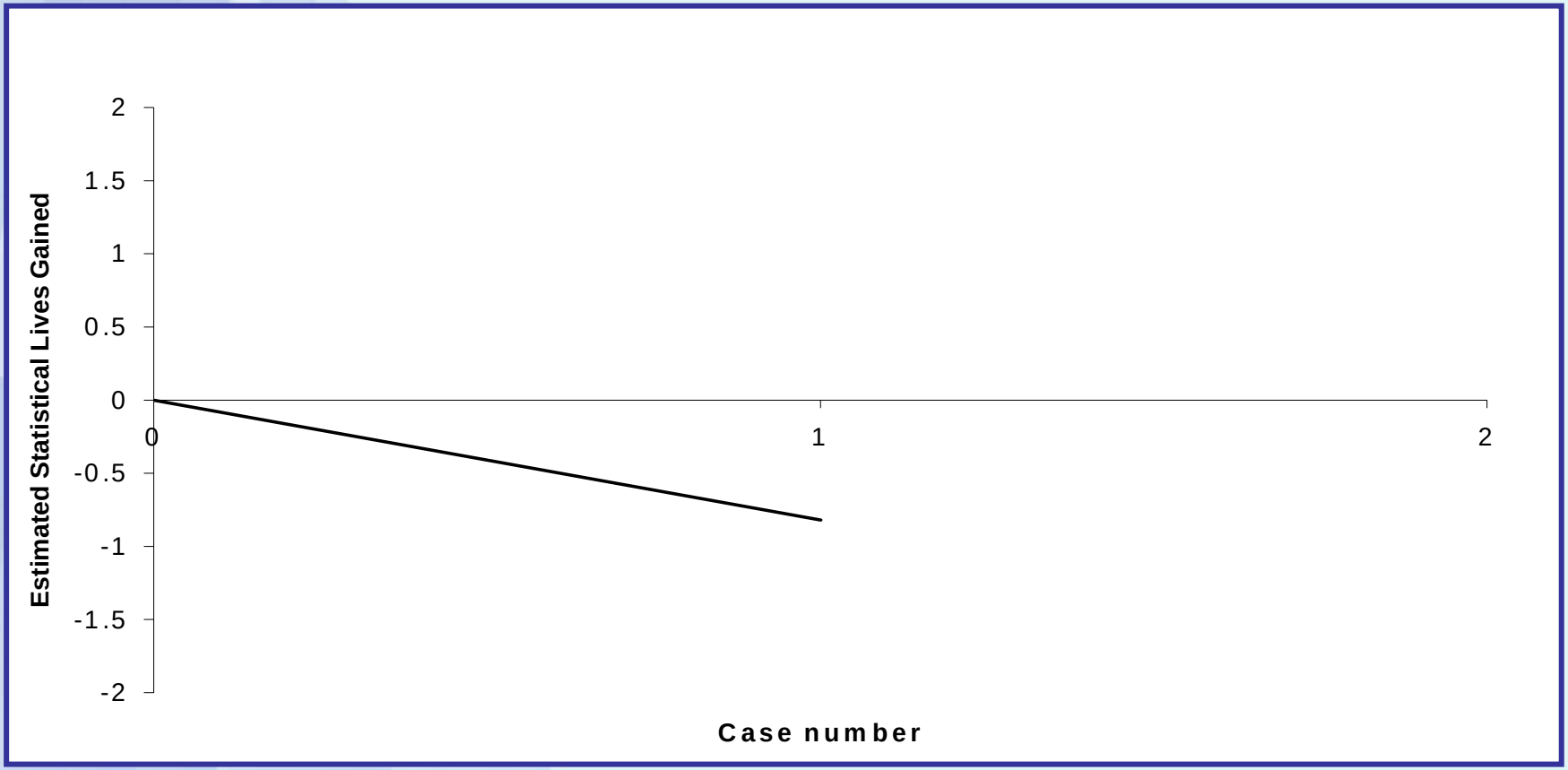
First patient survives -

VLAD increases by the probability of the first patient dying



In-hospital Mortality VLAD

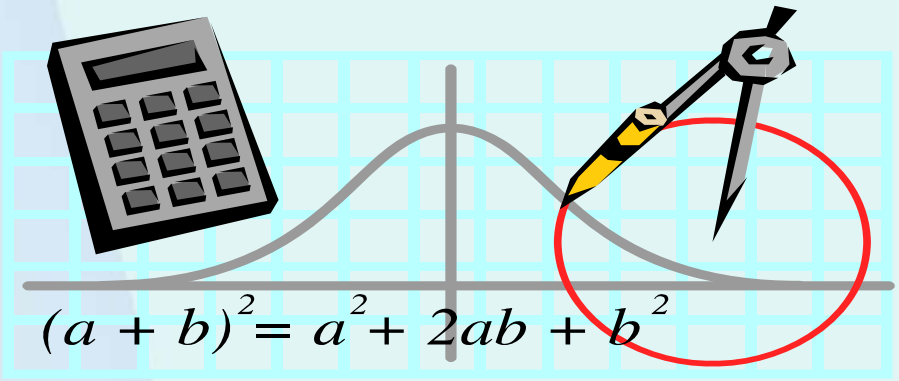
First patient dies –
VLAD decreases by the probability of the first patient surviving



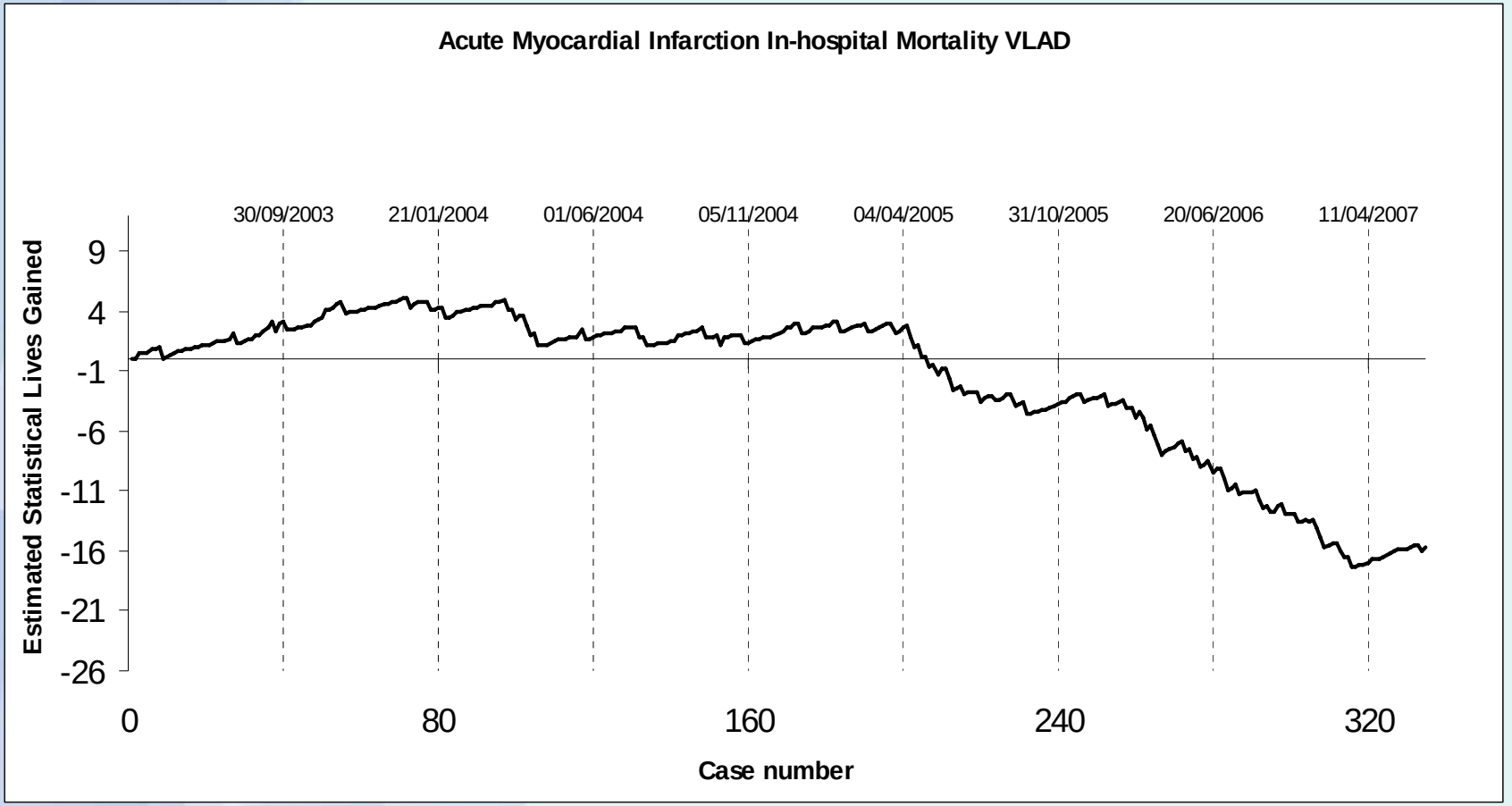
Making a VLAD Step by Step

Step 3: Plotting subsequent patients

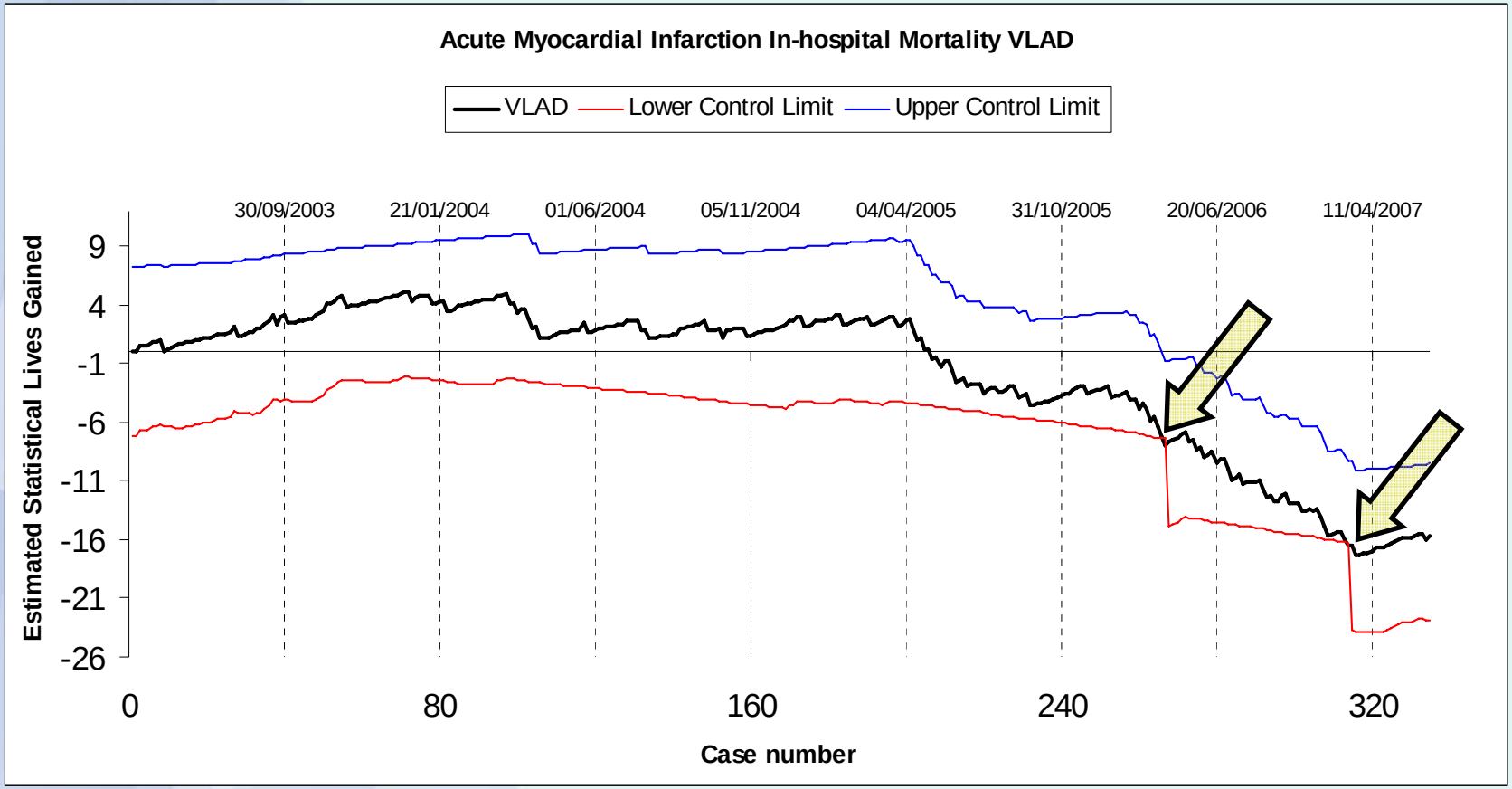
Using the same algorithm, the VLAD continues plotting patient until all of the information for the set period has been accounted for



In-hospital Mortality VLAD

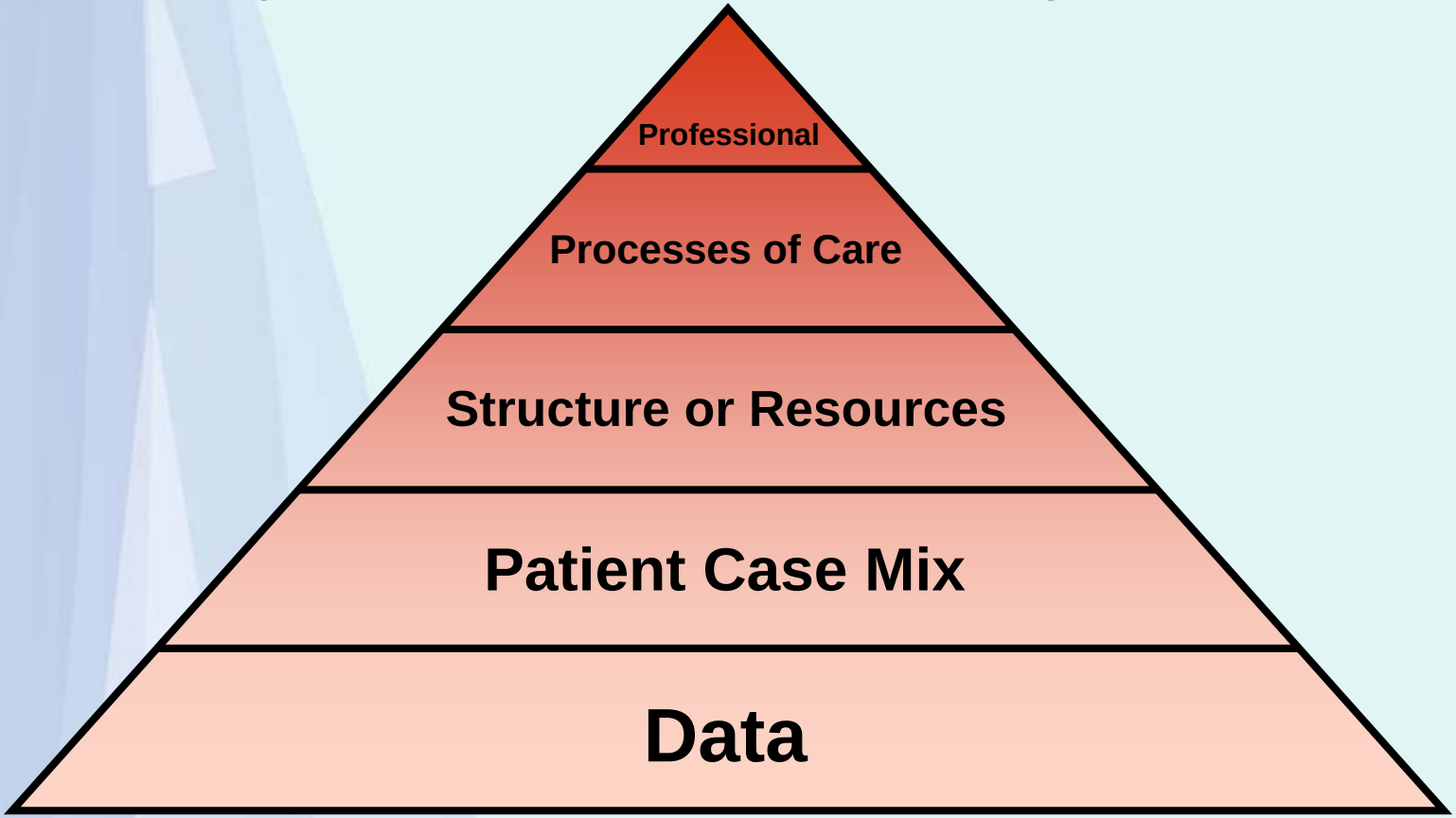


In-hospital Mortality VLAD



What to consider in a review?

Pyramid model of investigation



VLADS at Work

Indicator

- AMI Mortality

Findings – lower flags (higher rate than state)

- Delays in transferring of patients to other facilities
- Incorrect coding due to poor chart documentation

Findings – upper flags (lower rate than state)

- Delays in lysis (previously patients were sent to Coronary Care for lysis however patients now given lysis in Emergency Dept)

VLADs at Work

Indicator

- Pneumonia In-hospital Mortality

Findings – lower flag (higher rate than state)

- Junior doctor did not notify consult about a positive blood test (Enterococcus infection) affecting treatment with appropriate antibiotic

Findings – upper flag (lower rate than state)

- A high number of low risk patients were admitted which could have been simply treated within the community [antibiotic therapy with recommendations] Clinical Pathway adhered to

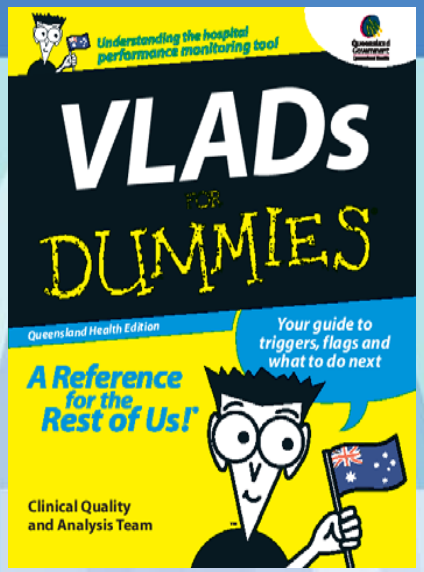
VLADS at Work

Indicator

- Laparoscopic Cholecystectomy Complications of Surgery

Findings – lower flags

- Majority of patients had an inadvertent puncture/laceration of the gall bladder – not considered to be a complication of surgery
- Clinical Director identified a locum's management of cases flagged as concerning - Locum surgeons since this event are now only given less complex cases to manage with supervision by a senior surgeon
- A Laparoscopic clip applicator which had been re-used a number of times failed to secure the cystic duct in a laparoscopic cholecystectomy



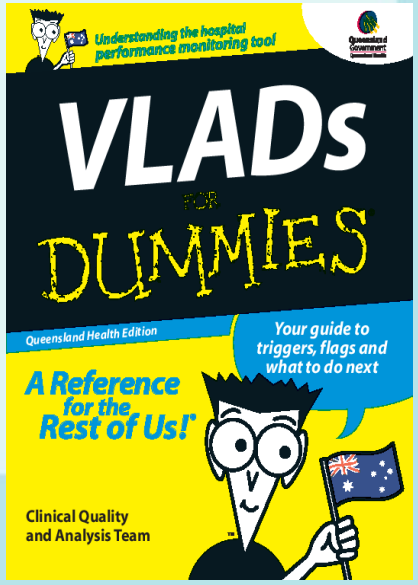
Queensland Government
Queensland Health

Clinical Practice Improvement Centre

Variable Life Adjusted Displays (VLADs)

a monitoring tool

Kirstine Sketcher-Baker



health • care • people

Variable Life Adjusted Displays (VLADs)

a monitoring tool

Kirstine Sketcher-Baker

health - care - people

Introduction

In the last few years significant changes have driven various improvements in safety and quality in Queensland Health

- Corporate and clinical leadership
- Changes in Clinical Governance - accountability
- Public Reporting – transparency & accountability
- State-wide introduction of a more timely and sensitive statistical monitoring tool – Variable Life Adjusted Displays (VLAD)
- State-wide introduction of pyramid model of investigation and an IT system that timely delivers VLADs and captures review feedback

health - care - people

All of these changes have been integral in driving safety and quality improvement in Queensland Health over the last 2 years.

Variable Life Adjusted Display (VLAD)

A VLAD is a type of statistical process control chart that visually represents treatment outcomes for selected clinical indicators

- A monitoring tool of clinical indicators
- Displays trends over time within a hospital
- Compares individual hospitals with the state average

health - care - people

Monitoring, not punitive tool

VLAD Characteristics

A VLAD investigates:

- ✓ A clinical indicator
- ✓ According to a particular outcome
- ✓ For a particular time period
- ✓ For a particular hospital (public or private)
- ✓ By each patient
- ✓ Against a particular cut-off for reactive increase or decrease

health - care - people

Current VLAD Clinical Indicators

Mortality
- Acute Myocardial Infarction
- Heart Failure
- Stroke
- Pneumonia
- Fractured Neck of Femur

Readmission and Long Stay
- Acute Myocardial Infarction
- Heart Failure
- Knee Replacement
- Hip Replacement
- Depression
- Schizophrenia
- Paediatric Tonsillectomy and Adenoidectomy

Complications of Surgery
- Vaginal Hysterectomy
- Abdominal Hysterectomy
- Fractured Neck of Femur
- Colorectal Carcinoma
- Knee Replacement
- Hip Replacement
- Prostatectomy

Obstetrics & Gynaecology
- Caesarean Section
- Selected Induction of Labour

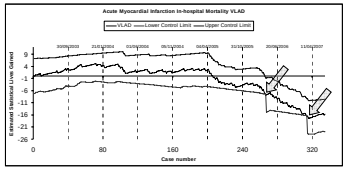
health - care - people

There are currently 28 clinical indicators monitored in Queensland.
5 of these indicators are in-hospital mortality indicators.

Queensland Health select clinical indicators according to 5 criteria which include
Clinical Significance: Clinical significance in terms of burden of disease
Volume: Sufficient numbers of patients to provide a statistically reliable measure
Indicator clarity: Clearly defined and reliable
Responsive potential: The disease, condition or procedure type can be systematically improved
Systematic data: Derived from systematically collected data

All indicators are reviewed and further refined based on feedback

In-hospital Mortality VLAD



health - care - people

•The black line represents individual patients who are plotted in sequential order of their date of discharge or death according to their probability of outcome and if the outcome occurred. If the trend remains somewhat horizontal this indicates that the average of the hospital is consistent over time and similar to the state. If the trend is rising, this indicates that the hospital average rate of outcomes is lower than the state. If the trend is decreasing, this indicates that the hospital average rate of outcomes is higher than the state. This example shows a rate similar to the state from July 2003 through until April 2005……. Etc. Etc.…

•The purpose of the VLAD is to identify if there are significant differences between a hospital and others.

•That is what control limits are for. The upper and lower lines are the control limits… The boundaries

•When the VLAD touches one of these control lines, that touch point is "flagged". A flag identifies a point in the VLAD where the cases prior to the flag should be reviewed to determine potential causes of a variation. However, a flag at a point in the VLAD does not identify that this case is the cause of the variation.

•In this example we can see that the control limits are touched in two instances, indicating this hospital has a higher than state average.

Making a VLAD Step by Step

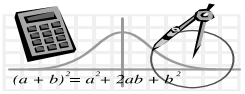
Step 1: Calculate the probability of the clinical indicator outcome for each patient

health - care - people

Probability is calculated for each patient using logistic regression (statistical methodology) based on 12 months of data - according to age, sex and co-morbidities

Making a VLAD Step by Step

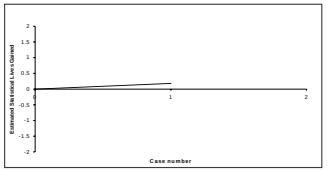
Step 2: Plotting the first patient using their probability of outcome and if the outcome occurred



health - care - people

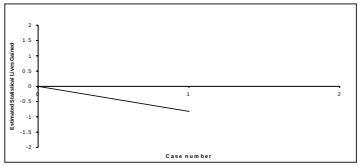
In-hospital Mortality VLAD

First patient survives -
VLAD increases by the probability of the first patient dying



In-hospital Mortality VLAD

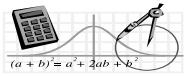
First patient dies –
VLAD decreases by the probability of the first patient surviving



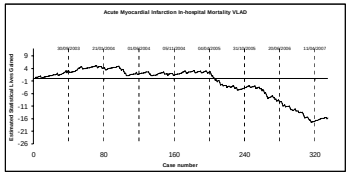
Making a VLAD Step by Step

Step 3: Plotting subsequent patients

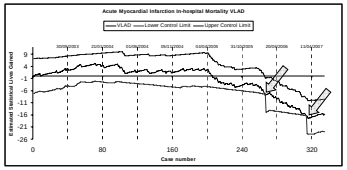
Using the same algorithm, the VLAD continues plotting patient until all of the information for the set period has been accounted for



In-hospital Mortality VLAD



In-hospital Mortality VLAD



health - care - people

•The black line represents individual patients who are plotted in sequential order of their date of discharge or death according to their probability of outcome and if the outcome occurred. If the trend remains somewhat horizontal this indicates that the average of the hospital is consistent overtime and similar to the state. If the trend is rising, this indicates that the hospital average rate of outcomes is lower than the state. If the trend is decreasing, this indicates that the hospital average rate of outcomes is higher than the state. This example shows a rate similar to the state from July 2003 through till April 2005……. Etc. Etc….

•The purpose of the VLAD is to identify if there are significant differences between a hospital and others.

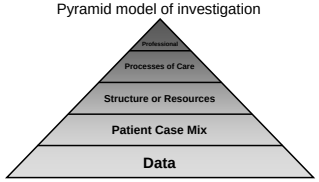
•That is what control limits are for. The upper and lower lines are the control limits…. The boundaries

•When the VLAD touches one of these control lines, that touch point is "flagged". A flag identifies a point in the VLAD where the cases prior to the flag should be reviewed to determine potential causes of a variation. However, a flag at a point in the VLAD does not identify that this case is the cause of the variation.

•In this example we can see that the control limits are touched in two instances, indicating this hospital has a higher than state average.

What to consider in a review?

Pyramid model of investigation



health - care - people

VLADS at Work

Indicator

- AMI Mortality

Findings – lower flags (higher rate than state)

- Delays in transferring of patients to other facilities
- Incorrect coding due to poor chart documentation

Findings – upper flags (lower rate than state)

- Delays in lysis (previously patients were sent to Coronary Care for lysis however patients now given lysis in Emergency Dept)

health - care - people

VLADs at Work

Indicator

- Pneumonia In-hospital Mortality

Findings – lower flag (higher rate than state)

- Junior doctor did not notify consult about a positive blood test (Enterococcus infection) affecting treatment with appropriate antibiotic

Findings – upper flag (lower rate than state)

- A high number of low risk patients were admitted which could have been simply treated within the community [antibiotic therapy with recommendations] Clinical Pathway adhered to

health - care - people

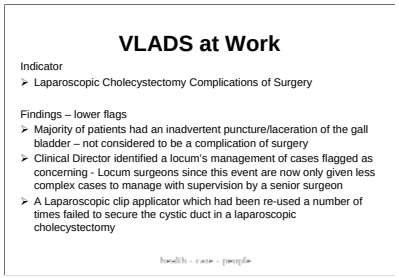
Lower Level VLAD (lack of consultant review during patient admissions)

Investigation

- There were concerns identified with the process of care in regards to lack of documented evidence of consultant review during patient admissions.
- Junior doctor should have notified consultant about positive blood test (Enterococcus infection) & treated with appropriate antibiotic which could have influenced patient's outcome.

Management Action Plan

- Lead clinician to ensure junior doctors notify consultant in regards to abnormal blood cultures.
- Lead clinician to ensure consultant review is carried out for all patients within 24hrs.



The Health Services Act requires Queensland Health to openly report on information from 42 prescribed public hospitals using indicators from areas such as;

1. Clinical Performance
2. Efficiency
3. Patient satisfaction and
4. System integration and change

Queensland Health does this through a number of methods including the Annual Public Hospital Report – pictured here and released last March.

Within Queensland Health an Integrated Performance Reporting Policy and supporting Standards have also been established to operationalise these aspects of the Act.