MARSH MEDICAL CONSULTING

Patient Safety
Global Ministerial Summit 2017

Workshop 3: Patient safety and mHealth/big data/hand held services

CRAB™: Big Scale – Routine Data as First Alert

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Big data:
the OBJECTIVES

- To use standard, common datasets to monitor outcomes and reduce variation
- To identify avoidable problems and root causes and take remedial action
- To do so with minimal impact on clinical time, and reduce avoidable cost
- To do so at scale

Big data:
the OBJECTIVES

CRAB™: using big data without losing sight of the individual patient:

- A safety and quality monitoring system, designed to give doctors, nurses, hospitals & external assessors detailed visibility on clinical performance from patient-level data
- Identify good practice & danger zones based on clinical variation in practice that would not appear in statistical analysis.
- Provide audit of outcomes which beyond mortality to review underlying issues of morbidity and avoidable harm.
- Interpret headline SMR figures - explaining or validating outliers as well as pointing to root cause.

CRAB™ in Surgery

How it works

- Individual risk prediction of risk of mortality and complication for each patient having an operation.

  - Improves effectiveness of mortality and morbidity review
  - Identify those deaths where improvements in care potentially could have been made
  - Identification the successes (high-risk patients with a successful outcome): learn from what we did well!

CRAB™ in Surgery

Benefits

- A very accurate quality outcome measure: the Observed/Expected ratio (O/E ratio) (4x more accurate than SMR)
- Allows performance to be monitored over time and early detection of variation
- Works with very small numbers, so a sensitive early warning mechanism

CRAB™ in Surgery

Benefits

- Looks at **complications**:

  - Find the underlying causes of avoidable deaths

  - Find those areas which may not have resulted in death but where care nonetheless poor:
    complications are expensive – so we can improve quality whilst reducing avoidable cost!

The bigger picture:
causes of variation in outcome are multifactorial. It's not just about the surgeon!

Looking at complications (risk-adjusted) gives a detailed understanding of where the problem lies:

– <u>Surgeon and anaesthetist</u>
  - Problem with technique
  - Appropriate prophylactic measures (eg thromboprophylaxis, antibiotics)
  - Appropriate post-operative management (eg pain control, fluid balance)

The bigger picture:
causes of variation in outcome are multifactorial. It's not just about the surgeon!

Looking at complications (risk-adjusted) gives a detailed understanding of where the problem lies:

– <u>Supporting staff</u>
  - Nursing staff (eg mobilisation, pain relief, fluid balance)
  - Medical staff (eg fluid balance, appropriate response to deterioration)
  - Para-medical (eg physiotherapy provision)

The bigger picture:
causes of variation in outcome are multifactorial. It's not just about the surgeon!

Looking at complications (risk-adjusted) gives a detailed understanding of where the problem lies:

- Supporting facilities
  - Appropriate ward
  - Appropriate theatre
  - ITU/HDU provision

- Appropriate procedure for particular surgeon
- In addition by examination of the surgical success the best care pathway can be identified

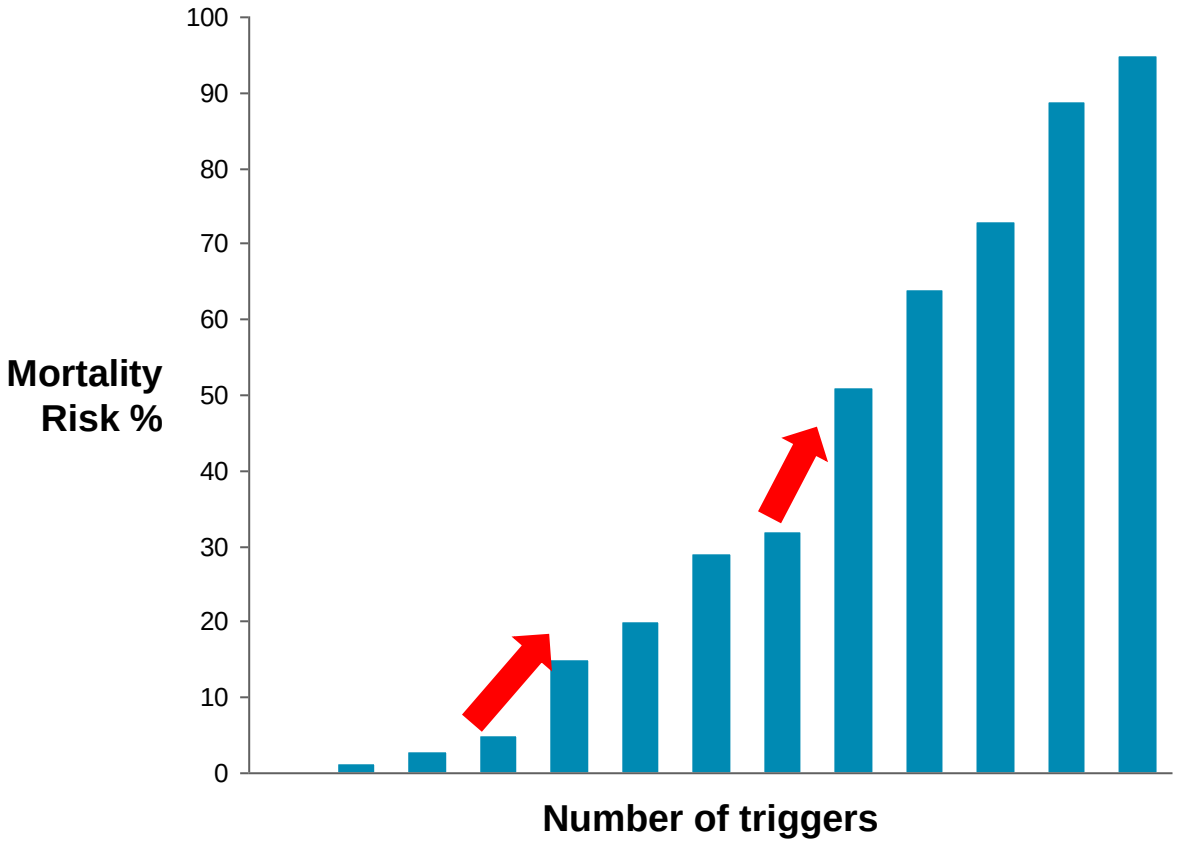
CRAB™ Medical:
finding evidence of avoidable harm across hospital care

Key triggers indicating problems in nursing & ward-based care

- Decubitus ulcer
- Shock/cardiac arrest
- Unplanned admission to ITU
- Acute kidney injury
- Abnormal electrolyte levels
- Falling haemoglobin
- Hospital acquired pneumonia
- Septicaemia
- Clostridium difficile infection
- **The combination of multiple triggers for a patient greatly increases the risk of death or serious avoidable harm**

CRAB™ Medical

Number of GTT triggers vs. mortality risk %: Overall organisation



Clinical Performance is more than mortality rates

- The previous slide is impossible mathematically and suggests an external cause: us
- The great majority of hospital deaths are to be expected
- The potentially avoidable ones are in those patients with harm events caused by us
- These are generally not disease specific
- The patients with 4 or more triggers hold the clue
  - Detectable by the percentage of patients with 4 or more triggers
  - Death may be avoided if a higher level of care is invoked
  - …Although harm may still be caused

Clinical Performance is more than mortality rates

- The mortality rate of patients with 4 or more triggers is a very sensitive measure of overall ward based care

  – **Wide** variation in the UK, Europe, USA, Australia and New Zealand

  – Those institutions aspiring to zero harm can
    - Reduce these rates significantly
    - Reduce complications
    - Reduce costs and litigation
    - Reduce avoidable death

CRAB™ is used worldwide, with consistently very high degree of accuracy

CRAB™ around the world

- **Sourced originally from the UK**
  - Used by a range of high-reputation University Teaching Hospitals and other organisations around the UK
  - Applied by UK national authorities (Ministry of Health, Hospitals Inspectorate and Regulatory Bodies)
- **Worldwide application**
  - Exclusive international benchmarking: world's largest surgical referential dataset of its kind covering >40 countries
  - Fully cross-referenced and tested to work on international datasets. Advisory work & clinical reviews across Europe, USA, Middle East & S.E Asia

CRAB™ accuracy

SURGICAL	CRAB predicted value	Manually collected actual value
Mortality[1]	3.92%	3.99%
Morbidity[2]	27%	26.2%

MEDICAL: Trigger Variables	Relationship to ICD10	Sensitivity (range per variable)	Specificity (range per variable)
Decubiti, Vitamin K, Naloxone, Flumazenil, Glucagon, Dextrose, Troponin, MRSA, C.Diff, Wound infection, VRE, Sepsis	Single code relationship	97.9 - 100	98.7 - 100
Patient fall, Change in procedure, Remove/damage organ	Multiple diagnostic & operative codes	93.1 – 97.1	92.7 – 97.8
Shock/Cardiac arrest, DVT/PE, Complication, Abrupt Medication Stop, High INR, Transfusion, Abrupt fall in hgb, Urea/Sodium/Potassium, Hypoglycaemia, N.Pneumonia	Multiple diagnostic codes	89.9 – 96.4	90.1 – 94.1
Lack response to EWS, Unplanned escalation	Complex diag. & op. codes with episode of care	87.3 – 93.2	90.6 – 93.2
Readmission, Escalation, Readmission to ITU, Return to Theatre	Episode of care	96.9 – 99.0	97.5 – 98.9

Notes: 1. 10yr collaborative national mortality outcomes research study of emergency general surgical patients across UK; 2. Independent validation of CRAB predictive accuracy of trauma & orthopaedic patients by Karolinska Hospital, Stockholm, Sweden

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