CUSUM- A Clinical Competency Assessment Tool

An Initiative by Cawangan Kualiti Penjagaan Pesakit
Ministry of Health

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1. Clinical competency monitoring in MOH
   - Why we need
   - Current method
   - Ideal method

2. CUSUM – what, how, usefulness

3. CUSUM in Ophthalmology

4. Implementing CUSUM in other disciplines in MOH
Ministry of Health

- Service provider
  - Diagnostic procedures
  - Therapeutic procedures

- Health care

- Training Institution
  - Houseman
  - Trainees
  - Post-graduate
  - Gazettment

- Quality of care
- Patient safety

- Need for competency monitoring

- Skill and Technology Assessments
  - New approaches
  - New equipments
Current methods of competency monitoring

### Trainees
- Supervisor comments
- Peer reviews
- Log books
- Progress interview

### Qualified doctors
- +/- Peer reviews
- Formal accreditation or credentialing

### Limitation
1. Informal
2. Subjective- bias
3. Arbitrary-based on fix counts regardless of previous performance
4. No explicit reference to agreed standards
5. No structured framework for continuous monitoring
Why continuous monitoring?

Need to determine:

- Rate of poor performance over time
  - inability to complete a procedure
  - intra-op & post-op complication (POMR)
  - outcome – morbidity & mortality by department or individual doctors

- Number need to do to be ‘safe’ surgeons (NTD)

- Unfit to proceed – objective measurement

- After achieving “competency”
  - Number need to do to maintain competency
    - converting to new technique e.g. open surgery to laparoscopic surgery, manual to robotic surgery
    - Using new equipment
Why monitor- benefits to trainee and trainer

• Trainee-
  – may not know outcome- not instant, f/u by other doctors
  – May not know how to improve outcome – need couching and mentoring

• Trainers-
  – Know which trainee need closer monitoring and which can perform independently

Essential :
Confidentiality
Respect
Monitoring competency – Part of Audit Process

1. What to monitor? – scope of audit
2. What is ‘success’? - set standard
3. How to collect data? – continuous, prospective
4. How data are analysed? - system and software
5. Presentation of results compared to standard/benchmark
6. Feedback to individual performers
7. Remedial and improvement
Performing procedure - learning curve

Targeted outcome

- Observe
- Assist
- Perform under supervision
- Perform independently

Mastered the skill
Ideal methods

1. Objective-non bias
2. Systematic-continuous performance
3. Evidence based
4. Accurate
5. Transparent
6. Relevant- referred to agreed standard
7. Beneficial to trainees and trainers
8. Non time consuming
9. Automated data collection & Statistical analysis
10. Simple graphic display

Answer: CUSUM
Cumulative Sum (CUSUM)

- Statistical process control tool - Control chart/line chart
- Graphic representation of outcomes of a consecutive procedures by a surgeon
- Constructed based on CUSUM score derived from CUSUM formula

\[ C_n = \max(0, C_{n-1} + X_n - k) \]

- \( C \) = case
- \( n \) = no. of procedure
- \( X \) = outcome measure
- \( K \) = reference value (pre-specified standard)
- \( h \) is the decision interval (horizontal lines)

- CUSUM score
  - Failure – positive, increase
  - Success – negative, decrease
- Rate of progress – Steepness of curve
  - Poor progress - Steep
  - Good progress - flattening
CUSUM Chart

Case 1-3 - Acceptable – stay at ‘0’

Case 4 & 5 - unacceptable – upward and cross decision interval

Case 6&7 - acceptable – downward

After case 24 - Mastering the skill

Decision Interval

Begin
Advantages of CUSUM

1. Monitoring trainees’ performance – detect small changes, provide early warning
2. Provide number needed to be done under supervision before independent performance
3. Outcome standard - national or institutional standard & is modifiable
4. Trade off between sensitivity and false alarm
5. Objective and visual graphic make interpretation easy
6. Minimize potential for bias as data are entered by independent party
CUSUM in Ophthalmology
Cataract Surgery

- High volume-commonest surgery
- Adverse events leads to poor outcome
- Outcome closely related to surgeon’s skill
- Awareness of adverse events – instantly, by doctors and patients
- Outcome parameters - clearly defined, measurable and routinely collected
Parameters for CUSUM monitoring in cataract surgery

1. Posterior capsular rupture (PCR)
2. Post-op vision outcome
3. Induced astigmatism

1 and 2 – KPI Ophthalmology service
Data are routinely collected in web based Cataract Surgery Registry
Entered by independent staff
All data entered will be charted
Using eCUSUM
  Feedback real time
  Automated – ‘no sweat’
• Web-based patient registry
• On visual threatening eye diseases
• Participated by all MOH Ophthalmology depts

Includes database on:
1. Cataract Surgery Registry
2. Contact Lens Related Corneal Ulcer Surveillance
3. Diabetic Eye Registry
4. Glaucoma Registry
5. Retinoblastoma Registry
6. Age Related Macular Degeneration Registry
7. Monthly Ophthalmology Service Census, MOH
8. Key performance indicator
eCusum Chart - PCR
CSR data

Trainee

Specialist

Gazetting Specialist

Consultant
https://app.acrm.org.my/eCUSUM
E-cusum

- **Trainee**
  - log on regularly
  - verify correct data – bail out/ delete cases- wrong case, poor outcome due to other factors’ non surgeon related
  - view chart
  - submit chart to supervisor for evaluation
  - Obligation to submit chart
  - failure to submit data is a clear violation of that obligation.

- **Trainer**
  - View chart when indicated
  - Provide feedback
  - Trainees who are poor- may view more frequent
  - Responsibility to review & respond to submission,
  - failure to do so is an abnegation of trainer's responsibility.
CUSUM application in MOH

Current
1. Renal Biopsy
2. Cataract surgery

Explore new areas:
1. Medical – ERCP, cardiac catheterization
2. Surgical – appendisectomy, Laparoscopic procedures
3. Anaesthsia – Orotracheal intubations, local anaesthsia
4. Interventional radiology
5. Office procedure – biopsy
Etc
Suitable Procedures

1. Frequently performed – **High Volume**
2. **High Risk** or maybe **high cost** procedure
   - complications or adverse events that lead to significant morbidity or even mortality
3. Adverse event - clearly defined and measurable
4. Outcome related to surgeon’s skill
   - Can be ‘bailed out’ if is contributed by individual patients’ factors or environmental factors
5. Display a demonstrable learning curve
   - reflects surgeons’ mastering of skill over time
Explore Usage of CUSUM in MOH

Prospective clients

1. Individual: personal audit, trainees’ progress (available data from COTDS)

2. Institution: Dept audit (link to ePOMR)

3. Medical discipline: Clinical service (NIA) / Professional body

4. National bodies responsible for performance improvement:
   - MOH Steering Committee for QA
   - MOH Hospital licensing authority
   - MOH/AMM: Specialist Credentialing Committee
   - MOH/MSQH: Hospital accreditation program
Before use of CUSUM

Acceptance of competency monitoring need maturity & trust
Responsibility and commitment of supervisor/consultants: to monitor, assess, take action in implementing improvement programmed and to evaluate

- Establish a database (ePOMR, COTDS, registry)
- Link to eCUSUM
Conclusion

- 50% of harmful events among in-patients are related to surgical care
- Continuous monitoring of doctors’ competency is mandatory
- eCUSUM- effective, easy, office tool

• Quality of care
• Patients’ safety
• Patients’ satisfaction
Thank You

Time for a check-up...

KLCC...