MANCHESTER TRIAGE SYSTEM: why, how and where?

Kevin Mackway-Jones
Manchester Royal Infirmary
UK
History

- Observations 1994
  - “Surprising” triage decisions
  - Inconsistent triage decisions
History

• Question

• How does triage work?
History

- Answer
  - Because it does
History

- Case
  26 year old man involved in pedestrian RTA. Bilateral fractured tibia and fibula. 5 hours in “minor” treatment without treatment
History

- Local consultation
  - Common problem
  - Wish for common solution
History

- Local review
- No consistency
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Second</td>
<td>&lt;15</td>
<td>10</td>
<td>5-10</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Third</td>
<td>&lt;120</td>
<td>60</td>
<td>30-60</td>
<td>~</td>
</tr>
<tr>
<td>Fourth</td>
<td>&lt;240</td>
<td>120</td>
<td>~</td>
<td></td>
</tr>
<tr>
<td>Fifth</td>
<td>~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>FGHI</td>
<td></td>
</tr>
</tbody>
</table>
History

• The Manchester Triage Group 1995
  • All local Emergency Physicians
  • All local Emergency Nurses
History

- Common nomenclature
- Common definitions
- Common methodology
- Common teaching
- Common audit
Triage Group: Nomenclature

- How many priorities?
- What should they be called?
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Second</td>
<td>&lt;15</td>
<td>10</td>
<td>5-10</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Third</td>
<td>&lt;</td>
<td>60</td>
<td>30-60</td>
<td></td>
</tr>
<tr>
<td>Fourth</td>
<td>&lt;120</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fifth</td>
<td>&lt;240</td>
<td>~</td>
<td>~</td>
<td>~</td>
</tr>
</tbody>
</table>
## Triage Group: Nomenclature

<table>
<thead>
<tr>
<th>Number</th>
<th>Colour</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Red</td>
<td>Immediate</td>
</tr>
<tr>
<td>Second</td>
<td>Orange</td>
<td>Very urgent</td>
</tr>
<tr>
<td>Third</td>
<td>Yellow</td>
<td>Urgent</td>
</tr>
<tr>
<td>Fourth</td>
<td>Green</td>
<td>Standard</td>
</tr>
<tr>
<td>Fifth</td>
<td>Blue</td>
<td>Non-urgent</td>
</tr>
</tbody>
</table>
## Triage Group: Nomenclature

<table>
<thead>
<tr>
<th>Number</th>
<th>Colour</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td></td>
<td>Immediate</td>
</tr>
<tr>
<td>Second</td>
<td></td>
<td>Very urgent</td>
</tr>
<tr>
<td>Third</td>
<td></td>
<td>Urgent</td>
</tr>
<tr>
<td>Fourth</td>
<td></td>
<td>Standard</td>
</tr>
<tr>
<td>Fifth</td>
<td></td>
<td>Non-urgent</td>
</tr>
</tbody>
</table>
## Triage Group: Nomenclature

<table>
<thead>
<tr>
<th>Number</th>
<th>Colour</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>Orange</td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>Fourth</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>Fifth</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Colour</td>
<td>Name</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>First</td>
<td>Red</td>
<td>Immediate</td>
</tr>
<tr>
<td>Second</td>
<td>Orange</td>
<td>Very urgent</td>
</tr>
<tr>
<td>Third</td>
<td>Yellow</td>
<td>Urgent</td>
</tr>
<tr>
<td>Fourth</td>
<td>Green</td>
<td>Standard</td>
</tr>
<tr>
<td>Fifth</td>
<td>Blue</td>
<td>Non-urgent</td>
</tr>
</tbody>
</table>
Triage Group: Definitions

- How long is it “safe” to wait
- How long is it “reasonable” to wait
Triage Group: Target Times

- First: 10 min
- Second: 60 min
- Third: 120 min
- Fourth: 240 min
- Fifth: 0 min
Triage Group: Methodology

- What is triage for?
  - What is the construct?

- How should triage be performed?
Triage Group: Methodology

- Triage IS: a professional assessment process that should identify the priority of the patient for clinical intervention
Triage Group: Methodology

- Triage IS NOT: designed to predict need for admission, resource usage, diagnosis, stream or final destination
Triage Group: Methodology

- Triage IS NOT: the only factor that affects the MANAGEMENT of the patient by the system
Triage Group: Methodology

- MTS is Reductive
  - All patients “start” as priority 1.
MTS divides patients into “presentations”

- Recognisable constructs
- NOT diagnoses
MTS uses “discriminators”

- General discriminators for all patients
- Specific discriminators depending on presentation
Triage Group: Methodology

Presentation
Triage Group: Methodology

P1 Discriminators
Triage Group: Methodology

Discriminators
Triage Group: Methodology

Diagram:

- P1 Discriminators
- P2 Discriminators
Triage Group: Methodology

P1 Discriminators

P2 Discriminators
Triage Group: Methodology
Triage Group: Methodology

Discriminators

P1

P2

P3

P4

Presentation
History
Triage Group: Training

- Training box
- 20 manuals
- 3 instructor manuals
- Instructor materials
History

- A national solution in the UK
Triage Group: Audit

- Individual practitioner
- Institution
Triage Group: Audit

- Initial case selection
- Random from computer record
Triage Group: Audit

- Assessment of accuracy of presentation selection
- Assessment of completeness of information gathering
- Assessment of accuracy of discriminator selection
Individual audit: Aims

- 0% episodes incomplete this includes pain scores, documentation, etc
- 95% accuracy
Triage Audit: Showing change

Priority pre MTS

<table>
<thead>
<tr>
<th>Priority</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>3</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>10%</td>
</tr>
</tbody>
</table>
Triage Audit: Showing change
Triage Audit: Institutional

Accuracy by Department

Accuracy (%)

Study ID
TRIAGE voor de spoedeisende hulp
Manchester Triage Group
Progress
Does the MTS work?

some evidence from the literature
Construct validity

- Does the system identify the patients it sets out to identify?
Does the Manchester Triage System detect the critically ill?

Cooke MW, Jinks S
J Accid Emerg Med 1999
Methods

- Analysis of triage coding of admissions to critical care areas

- Analysis of under-triage
  - Nurse operators
  - MTS
Conclusions

- The MTS is a highly sensitive tool for identifying critically ill patients on arrival at emergency department
Validation of physiological scoring systems in the A&E Department

Subbe CP, Slater A, Menon D, Gemmell L
Results

- Sensitivity at predicting ED-ITU
  - MTS 96%
  - MEWS 77%
  - ASSIST 22%
  - METS 1%
Results

○ Sensitivity at predicting ED-ward-ITU

● MTS 65%
● MEWS 55%
● ASSIST 8%
● METS 3%
Conclusions

- MTS is much more sensitive than any physiological score at identifying critically ill patients on arrival at emergency department.

- Physiological scoring adds little to the MTS in identifying critically ill patients on arrival at emergency department.
Detecting High Risk Patients with Chest Pain

Speake D, Teece S, Mackway-Jones K
Emergency Nurse 2003
Conclusions

- Sensitivity 86.8% (78.4 - 92.3)
- Specificity 72.4% (61.4 – 81.2)
Sensitivity and specificity of the Manchester Triage System for patients with acute coronary syndromes

Pinto D, Lunet N, Azevedo A
Rev Port Cardiol, 2010
Conclusions

- Nurses using MTS are highly sensitive at detecting cardiac chest pain
The diagnostic utility of triage nurses at recognising pleuritic chest pain

Wright J, Hogg K, Mackway-Jones K
Emergency Nurse, 2005
Conclusions

- Sensitivity 69.2% (56.7 - 81.7)
- Specificity 92.7% (88.2 - 97.2)
Predicting admission and mortality with the Emergency Severity Index and the Manchester Triage System: a retrospective observational study

van der Wulp I, Schrivers AJP, van Stell HF
Emergency Medicine Journal, 2009
van der Wulp I et al, 2009

- Retrospective database study from 4 EDs, 2006
- 34,258 patients
van der Wulp I et al, 2009

- Likelihood of admission decreased with decreasing triage category

- 96.6% of patients who died were priority 1 or 2
Is Manchester (MTS) more than a triage system? A study of its association with mortality and admission to a large Portuguese hospital

Martins HMG, De Castro Dominguez Cunã LM, Freitas P
Emergency Medicine Journal, 2009
Martins HMG et al, 2009

- Retrospective database analysis

- 321,539 patients (2005 – 2007)
Martins HMG et al, 2009

- Proportion admitted decreased with decreasing priority
- Odds of dying 39x higher in P1,2
Validity of the Manchester Triage System in paediatric emergency care

Roukema J, Steyerberg EW, van Meurs A et al
Emergency Medicine Journal, 2006
Manchester triage system in paediatric emergency care: prospective observational study

van Veen M, Steyerberg EW, Ruige M et al
British Medical Journal, 2008
Conclusions

- The Manchester triage system has moderate validity in paediatric emergency care. It errs on the safe side, with much more over-triage than under-triage.
Reproducibility

- Do different triage nurses arrive at the same priority when triaging the same patient?
Observer agreement of the Manchester Triage System and the Emergency Severity Index: a simulation study

Storm-Versloot MN, Ubbink DT, Choi VCA et al
Reliability and validity of the Manchester Triage System in a general emergency department patient population in the Netherlands: results of a simulation study

van der Wulp I, van Bar ME, Schrivers AJP
The Manchester triage system provides good reliability in an Australian emergency department

Grouse AI, Bishop RO, Bannon AM
Emergency Medicine Journal, 2009
Manchester Triage in Sweden – Interrater reliability and accuracy

Olofsson P, Gellerstedt M, Carlström ED
International Journal of Nursing, 2009
Interrater reproducibility studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Cases</th>
<th>Test group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm-Vestoot et al, 2008, Netherlands</td>
<td>50</td>
<td>8 nurses from 3 units</td>
</tr>
<tr>
<td>van der Wulp et al, 2008, Netherlands</td>
<td>50</td>
<td>48 nurses from 2 units</td>
</tr>
<tr>
<td>Grouse et al, 2009, Australia</td>
<td>50</td>
<td>20 nurses from 1 unit</td>
</tr>
<tr>
<td>Ollofson et al, 2009, Sweden</td>
<td>13</td>
<td>79 nurses from 7 units</td>
</tr>
</tbody>
</table>
Interrater reproducibility studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm-Vestoot et al, 2008</td>
<td>0.76 (0.68 – 0.83)</td>
</tr>
<tr>
<td>van der Wulp et al, 2008</td>
<td>0.62 (0.6 – 0.65)</td>
</tr>
<tr>
<td>Grouse et al, 2009</td>
<td>0.63</td>
</tr>
<tr>
<td>Ollofson et al, 2009</td>
<td>0.61 (0.57 – 0.65)</td>
</tr>
</tbody>
</table>
## Test-retest reproducibility studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm-Vestoot et al, 2008</td>
<td>0.75 (0.72 – 0.77)</td>
</tr>
<tr>
<td>van der Wulp et al, 2008</td>
<td>0.84 (0.73 – 0.94)</td>
</tr>
</tbody>
</table>
Conclusions

- The Manchester Triage System has good inter-rater reproducibility and good to excellent test-retest reproducibility.
Progress

• Increasing usage
• Little criticism
• Increasing evidence

• Some valid comments
• Changing clinical practice
Second Edition

- Manchester Triage Group

+ 

- International Reference Group
Second Edition

- Review of chart titles
- Review of chart contents
- Review of discriminators
General Discriminators

1. Airway compromise
   - Inadequate breathing
   - Exsanguinating haemorrhage
   - Shock
   - Currently fitting
   - Unresponsive child
   - RED

2. Severe pain
   - Uncontrollable major haemorrhage
   - Altered conscious level
   - Hot child
   - Cold
   - Very hot adult
   - ORANGE

3. Moderate pain
   - Uncontrollable minor haemorrhage
   - History of unconsciousness
   - Hot adult
   - YELLOW

4. Recent mild pain
   - Warmth
   - Recent
   - GREEN

5. BLUE
Second Edition

- New chart: Allergy
New Chart: Palpitations
New Chart: Falls
Second Edition

- Haematological
- D, V now D&V
- Nasal problems now Facial Problems
Progress

- Brazil
- Austria
- Norway
- Poland
- Slovenia
What is MTS for?

- Determining clinical priority
- Managing clinical risk
- Speaking a common language of urgency
What is MTS not designed for?

- Managing the department
- Predicting the need for admission
- Identifying resource requirement
What else can MTS do – the future

- Start the process of care
- Aid in initial disposition decisions
- Telephone triage
- Non-professional triage
Triage and the clinical process
Cardiac Chest Pain
Which Patients?

- Over 25 years
- Unrelated to trauma
- Not pleuritic
Deciding initial disposition (streaming)
Presentation-Priority Matrix

- There are 50 Charts
- There are 5 priorities
There are 250(ish) possible outcomes

• Presentation / Priority pairs
Presentation-Priority Matrix

<table>
<thead>
<tr>
<th>R</th>
<th>O</th>
<th>Y</th>
<th>G</th>
<th>B</th>
</tr>
</thead>
</table>
The local mapping process

- Identify possible dispositions
- Identify local stakeholders
- Map each p-p complex to a disposition
- Iteration
- Final Map
PPM for MRI

Triage Plus

Presentation and Priority Matrix Mapping Exercise

Manchester Triage System
Telephone Triage
Triage Group: TTA principles

- Now
- Soon
- Later
- Advice
Telephone charts

- Matching format
- Same principles
Non-professional triage
Severe pain
Major bleeding
History of unconsciousness
Acute chemical injury to the eye
Widespread burns
Deformity
Marked distress
Acutely short of breath
Currently fitting
Severe pain
Oedema of the tongue
Fails to react to parents
Non-blanching rash
Inconsolable by parents
Floppy

Child

Usual clinical assessment

Early clinical assessment

Adult

Acute short of breath
Currently fitting
Severe pain
Oedema of the tongue
Fails to react to parents
Non-blanching rash
Inconsolable by parents
Floppy

Severe pain
Major bleeding
History of unconsciousness
Acute chemical injury to the eye
Widespread burns
Deformity
Marked distress

YN

Y

N

N

N

N

Y

Y
The future

- Continuous improvement 2e to 3e
- Separate edition for children
- Separate edition for telephone triage
Summary

- MTS has come a long way in a short time

- It will go further
International Reference Group

- Lisbon
- Hamburg
- Manchester
- Graz
- Oslo 2012
MANCHESTER TRIAGE SYSTEM:
why, how and where?

Kevin Mackway-Jones
Manchester Royal Infirmary
UK
"For all is but a woven web of guesses"

Xenophanes