Monitoring Technologies; Now & in the Future

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Technology; can it help or are we just victim of the “snake oil salesman”
Solution Overview

Unique features:
- Does not let go of the problem
- Failure to improve = escalation
- Failure to respond = escalation
- Configurable clinical and business rules
- Real time support at the bedside

Bedside Observation Capture

Alert Response & Intervention

Cascading Communications Hierarchy

Observations

Graded Alerts

Ward and ICU Patients' Status Views

Reports, Analyses, Patient Charts

Real-time Risk Assessment, Monitoring, Escalation, BoK

Patient Demographics and ATD

Technology Choices:
- Observation capture
- Alerting devices
- Infrastructure
The Patient Blackbox
For advice or information on the EWS contact:
Outreach Coordinator bleep 1767, ext 5016.
For advice or referral regarding a patient contact
ITU doctor bleep 4716.
EWS Recheck < 60 mins

- 29% EWS recheck < 60 mins
- 71% EWS recheck < 120 mins
- 91% EWS recheck < 4 hours
- 9% EWS recheck > 4 hours
- Range 8 mins to 11.9 hours
## EWS Accuracy

<table>
<thead>
<tr>
<th>Recorded EWS Scores</th>
<th>Actual EWS scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual EWS scores</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>3</td>
<td>7 25 234 25 2 1 0 0 0</td>
</tr>
<tr>
<td>4</td>
<td>0 5 12 130 10 2 1 0 0</td>
</tr>
<tr>
<td>5</td>
<td>0 0 1 5 51 8 0 0 0</td>
</tr>
<tr>
<td>6</td>
<td>0 0 0 0 1 28 2 2 0</td>
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<tr>
<td>7</td>
<td>0 0 0 0 0 1 5 0 1</td>
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<tr>
<td>8</td>
<td>0 0 0 0 0 0 1 5 0</td>
</tr>
<tr>
<td>9</td>
<td>0 0 0 0 0 0 0 1 1</td>
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- Results show manual EWS calculation is not accurate
- Patientrack “removes the red”

Removed 21% error rate in manual EWS recording (9% of total scores were actually >=4 but recorded as less, 12 cases where senior doctor should have attended within 30 mins were incorrectly recorded at lower score that did not trigger this response)
Deaths amongst patients with blood pressure <90 mm Hg versus duration of blood pressure <90 mm Hg
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Emergency Response Criteria:
BP < 90
1/4/09  0300

0430

Night Surge +1100 -
ATSP: LBP, systolic 80-90.

43yo F, Day 0 post - bilateral TRAM flap breast reconstruction.
BP measurement on 0 leg, by machine.
- measured by myself manually.
- pulse palpable when cuff inflated <100mmHg.

BP responded well to IV fluids.
PT received 7000ml of CSL, 1.5L of haemaccel, 2u PBC & 500ml of 4/6 Alb infraoperatively.
Card

No Hx of HTN/CCF/renal impairment.
Urine output excellent
- > 200 mL every hour.

Patient is not clinically overloaded.
no %o dyspnea.
no swelling of ankles.
JVP not elevated. O side neck.
Chest clear laterally. No wheeze/crackles.

P/W Med Reg.
- can continue IV boluses whenever BP is < 100.
- continue monitoring as per postop order.
Nursing night: Pt BP still not stable...been drop three. IV fluid bolus given. RN night cover. See above notes. Flap obs no changes. PCA Fentanyl 12ug Residue left. Surgical theatre contact not available coordinator contact. JP draining see FBC chart. Red IV still draining since 2am. Still been monitor BP at 3:30am.
CMMC NHS trust/ Trustech electronic EWS
Baseline data: 56 beds (MAU, AM1), 47 days, 738 patients

Total Obs
8000 (est)

EWS > 2
567
(116 patients)

EWS Recheck > 2
375 (66.1%)

EWS Recheck < 2
177 (31.2%)

Missing
15 (2.6%)

Missing 157 (41.8%)

Not done 73 (19.4%)

Clinical Team 142 (37.8%)

Parameters OK 3 (0.8%)

Accuracy ?

EWS recheck < 60 min ?

Clinical team review ?
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Cardiac Arrests & METS (Buist et al BMJ 2002 & 2007)

Death of Michael Friend
Intern Orientation
Med Reg CRM
Nurse Liaison
COAT vs ALS

ICT Software Knowledge Creation

**Hospital Bed:**
- Patient
- Nurse
- Doctor
- Utilisation

**Hospital:**
- Audit
- Risk
- Staffing
- Governance
- $ Savings

**Health System:**
- Benchmark
- Medico-Legal
- Political
- Safety
- Learning
Choice of Technologies and Flexible Deployment

Any Web Client device ...

- Nurse / Doctor PDA
- Ward Workstation
- Doctor Mobile Phone
- Ward Mobile Computer
- Ward Tablet

connected by any network connection ...

- Internet
- 3G Cellular
- Wireless Network
- Corporate LAN / WAN
- Cable TV / Entertainment

To server and database

- Choice of end user devices
- Available at the bed side
- Supports mobile clinicians
- Choice of technologies / manufacturers
- Make use of what’s available
- Not an obstacle to deployment
- Can reach out to remote sites
- Can host locally or remotely
The Future

- Real Time Clinical governance
- Community/Political Expectations
- Medico-legal
“Mother Dies after Chain of Blunders”
Sydney Morning Herald, 6 March 2008

“A NSW Health incident report reveals that Mrs Murray had been transferred to a recovery ward after a routine caesarean when her blood pressure dropped dangerously low. Nurses should have called a medical emergency team but instead left her bleeding.”
Clinical Response for EWS 3,4 or 5 (Buist in press *Resuscitation*)

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<td>705</td>
<td>776</td>
<td>ns</td>
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<td>Obs</td>
<td>7820 (est)</td>
<td>5848 (actual)</td>
<td>ns</td>
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<td>EWS Recheck</td>
<td>27%</td>
<td>22%</td>
<td>ns</td>
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<td>29%</td>
<td>78%</td>
<td>&lt;0.0001</td>
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## Clinical Response for EWS > 5

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<td>EWS &gt; 5</td>
<td>48</td>
<td>27</td>
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<tr>
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<td>96%</td>
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