Using electronic bedside observation to target support to deteriorating patients and facilitate research and development of new triaging and scoring systems

June 2017

<table>
<thead>
<tr>
<th>Trust name</th>
<th>Western Sussex NHS Foundation Trust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider type</td>
<td>Acute</td>
</tr>
<tr>
<td>Site (if applicable)</td>
<td>Worthing Hospital</td>
</tr>
<tr>
<td>Core service</td>
<td>Medicine/Surgery</td>
</tr>
<tr>
<td>CQC rating (SAFE)</td>
<td>Good</td>
</tr>
<tr>
<td>CQC rating (Overall)</td>
<td>Outstanding</td>
</tr>
</tbody>
</table>

Background

Western Sussex Hospitals NHS Foundation Trust became a foundation trust on 1 July 2013, four years after the merger of the Royal West Sussex and Worthing and Southlands Hospitals NHS trusts. It serves a population of around 450,000 across a catchment area covering most of West Sussex. The three hospitals – St Richard’s Hospital, Southlands Hospital and Worthing Hospital – are in the local authorities of Worthing, Chichester and Adur. These areas have a higher proportion of people over 65 than the England average but a lower proportion of ethnic minority populations.

The hospitals provide 953 inpatient beds which include 32 critical care beds. In 2013/14, there were more than 127,000 inpatient admissions and 533,000 outpatient attendances; over 135,000 patients attended the accident and emergency departments across the Chichester and Worthing sites.

The challenge

As in many other trusts, clinicians at what was then Worthing and Southlands Hospitals NHS trust were determined to anticipate clinical deterioration, so that they could step up care as necessary and minimise the risk of adverse outcomes or patients dying.
The solution

Work on addressing the prompt identification of deteriorating patients and escalation of care had already started and continued following the merger, in the newly formed Western Sussex Hospitals. A number of initiatives have been developed over the years.

The trust was among the first trusts in the UK to develop and introduce its own version of the early warning score, which they called the physiological scoring system (PSS) which included respiratory rate, heart rate, systolic blood pressure, temperature, oxygen saturations and disturbed consciousness. It was validated in 2005 for emergency medical admissions.¹

With the rollout of an electronic tool for recording and monitoring bedside observations in 2005, the trust was able to deploy the PSS across both clinical sites. Outreach team members were able to remotely monitor the highest scoring, and therefore most at risk, patients and target their support accordingly. The tool also provided a condensed ward round view, a quick overview of the patient’s physiological parameters during ward rounds, and generated automated reports, providing ward managers and senior clinicians with an overview of progress. Over the years, the trust then incorporated other tools to identify deteriorating patients, including BUFALO² (sepsis six checklist), acute kidney injury (AKI) red flag and AKI amber flag.

Five years after the introduction of the PSS in Worthing Hospital, partly facilitated by automation of data collection through the electronic solutions, the trust evaluated its impact on mortality and length of stay. The study was performed in the same acute medical unit in Worthing hospital, where the validation study had been conducted. Although both of these had significantly reduced, once the trust had adjusted for other factors, such as case-mix, it concluded that the use of an electronic EWS system with automated alerts had had little effect on mortality in acutely ill medical patients³ but the admission PSS score did correlate with average length of stay (LoS). This is consistent with current studies and highlighted the usefulness of the PSS as a predictor of LoS with potential to facilitate discharge planning.

The trust also concluded that the PSS might be useful in prompting clinicians to decide earlier on in the admission process the patient’s resuscitation status and limitations of care. They later replaced the PSS with the National Early Warning Score system, given comparable outcomes to similar studies of the National Early Warning Score (NEWS) system.

---

² Sepsis bundle based on the national sepsis six scoring tool (blood cultures, urine output measurement, IV fluids, antibiotics, lactate measurement and oxygen)
³ British Journal of Anaesthesia doi:10.1093/bja/aeu107
Taking the learning from this process and maximising the benefit of the automated data collection provided by the electronic observations tool, the trust also decided to develop a scoring system to identify patients at risk of developing acute kidney injury (AKI). The rationale was the growing evidence that patients who develop AKI have poorer outcomes and higher in-hospital mortality, often made worse by delayed diagnosis and treatment.

They studied the relative contributions of electronically monitored patient admission physiology (respiratory rate, heart rate, arterial pressure, temperature, oxygen saturation and conscious level), biochemical parameters and known comorbidities to develop a practical robust scoring system that is easily calculable and can rapidly identify patients at risk of developing AKI following admission. The study led to the design of an alerting tool, the APS, or AKI predictive score, which can be easily applied to patients admitted as medical emergencies. Evaluation showed a reduction in inpatient mortality, reduced rate of progression to stage 3 AKI, reduced admissions to the intensive care unit and improved clinical practice, such as the timely discontinuation of nephrotoxic medications.

They complemented these interventions with outreach teams, training and education in acute illness and sepsis management for doctors, nurses and healthcare assistants, and appropriate care bundles, to standardise the quality of clinical interventions.

Enablers and challenges

The trust faced challenges in adopting electronic technologies across both sites, because of the different infrastructures. Switchboard infrastructure and multiple bleep technologies in a merged trust made it impossible to use auto alerts.

Despite this, however, being able to identify patients at risk of deterioration early on and to collect large amounts of data with minimal effort, helped the trust to improve care through early intervention, as well as make significant contributions to scientific development in this area, to the benefit of the whole NHS.

Strong clinical involvement and co-leadership for IT/change teams, including day-to-day running, was very important, as was ongoing awareness of developments in information technology and clinical intelligence models with industry.

Impact

Although the introduction of an early warning score and electronic tracking of bedside observations did not show statistically significant reduction in length of stay or mortality over the five-year evaluation period, there were positive benefits.

- First, the learning and the ability to collect large amounts of physiological information with minimal effort supported further research in clinical risk assessment. This allowed

the trust to develop and validate the evidence-based score for patients at risk of AKI, which did lead to statistically significant reduction in mortality and adverse outcomes for patients.

- Second, the extra training opportunities for staff, through the introduction of emergency bleep meetings and acute illness management training, as well as the introduction of bespoke care bundles, further enhanced the overall care to patients.

- Third, automated reporting made performance management possible, and this led to improved culture and practices around patients whose condition was deteriorating. It also helped to identify challenges with staffing mix in the hospital.

- Fourth, when evaluating the impact of the AKI alert on staff, all staff groups agreed it was positive:
  
  o “It really does ... it gives you details [of] what you should be doing, if you should be cutting out nephrotoxic medications and questioning any of the practices... and so it kind of really focuses your mind into what’s best practices and what you should be doing for this person.” (Nurse)

  o “So in the morning you can direct yourself as to which patients you are going to see first. So it helps prioritise where we go as well so it does ... yes, impact on the care we provide because we get to see the right patient first.” (Consultant)

  o “Better, I think definitely better, because we have to go up to them every hour, we are going there much more to see their output so it helps us to see whether the patient is declining...” (Healthcare assistant)

  o “It helps with time management because checking everyone’s renal function – I can just quickly check the traffic light system and then decipher whether or not I need to check their renal function. And then it also flags things earlier ... often you can catch things before a doctor does – so it does help.” (Pharmacist)

- In fact, the trust has recently been awarded a grant by the British Kidney Foundation, to support their work in evaluating the impact that the introduction of AKI predicting software has had on staff, through a series of focused interviews with staff.

- Finally, the work described in this case study inspired other clinicians to explore additional opportunities for using information technology to improve identification of patients and reduce time to treatment. For example, a partnership between Duncan Hargreaves (Quality Improvement Fellow) and Hannah Prince (Outreach Sister) led to the development and deployment of an automated sepsis alert called ‘BUFALO’, which alerts staff to consider sepsis. A nurse-led and derived checklist is currently being rolled out.
Next steps and sustainability

The trust continues to work with external partners, such as universities and a private provider of electronic solutions, to develop targeted risk scores as well as validate and improve existing scores for specific patient populations. These include:

- conducting validation studies of the NEWS score as a predictor of mortality in chronic obstructive pulmonary disease patients, and proposed appropriate changes
- developing a combined assessment tool for nursing staff, to allow automated alerting of frail high risk patients for risk preventative strategies to be targeted.

Going forward, with the introduction of additional targeted observation tools, managers will have access to real time dashboards highlighting the levels of nursing workload in each ward and therefore be able to target staff numbers appropriately.

Want to know more?

The following publications give more details:


For more information, contact:

Primary contact:

- Dr Richard Venn, Anaesthetics and Intensive Care Medicine consultant at Western Sussex Hospitals NHS Foundation Trust: Richard.Venn@wsht.nhs.uk

Alternatively, you may also contact:

- Professor Lui Forni, Professor and Consultant in Intensive Care at Royal Surrey County Hospital NHS Foundation Trust: lui@saqnet.co.uk
- Dr Luke Hodgson, Higher Specialist Trainee Respiratory Medicine and Intensive Care: drlhodgson@gmail.com
o Duncan Hargreaves (Quality Improvement Fellow, Duncan.Hargreaves@wsht.nhs.uk) or Hannah Prince (Outreach Sister, Hannah.Prince@wsht.nhs.uk) for information on the BUFALO sepsis six assessment tool

o Christina Koulouglioti, for information about the qualitative evaluation of impact on staff of the introduction of the AKI predicting tool: Christina.Koulouglioti@wsht.nhs.uk

To see the other case studies in this series: visit the NHS Improvement website at: Improving quality and safety in healthcare.