

# Improving Management of Prolonged Seizures

## The Problem:

There is high morbidity and mortality for children with prolonged seizures<sup>1,2</sup>, with longer duration of status epilepticus associated with worse outcomes<sup>1</sup>. Contributors include respiratory and/or cardiovascular compromise due to ongoing seizure activity and respiratory depression secondary to benzodiazepines<sup>3,4</sup>. Medication delays are associated with longer duration<sup>5</sup>, however there is limited data on causes<sup>6</sup>.

A single-site retrospective audit provided baseline data and identified timelines for medication and escalation as potential factors. Having shared these results with our regional neurosciences operational delivery network it was suggested these factors would be regional and thus a regional multi-professional improvement project launched.

## Aims:

To improve morbidity and mortality of paediatric patients with prolonged seizures in the Wessex region in one-year as measured by:

1. time to seizure termination
2. proportion intubated and ventilated or admitted to level 3 care.

## Making a case for change:

Prior to recruiting leads at each hospital, we presented local audit findings and the wider problem, as we perceived it at several different regional network meetings. The purpose of this was to raise awareness, foster discussion and gain ownership of the problem.

Data was collected on timings of seizures, transfer into hospital, medications and escalation of care. This was initially via paper and then, after several PDSA cycles of how to improve returns, online forms (table 1).

Table 1. PDSA cycles to improve data collection

Data collection method	Changes made
Paper forms distributed by local teams	Make this available online via SORT website
PDF version designed and reviewed, then uploaded to SORT website	Provide prompt directing use of data collection form when prolonged seizure guideline accessed via SORT website
Prompt 'pop up' added to SORT website	Suggestion that an additional online data collection form would be useful

Online data collection form designed and made available on regional 'PIER' website and SORT website in addition to paper forms	
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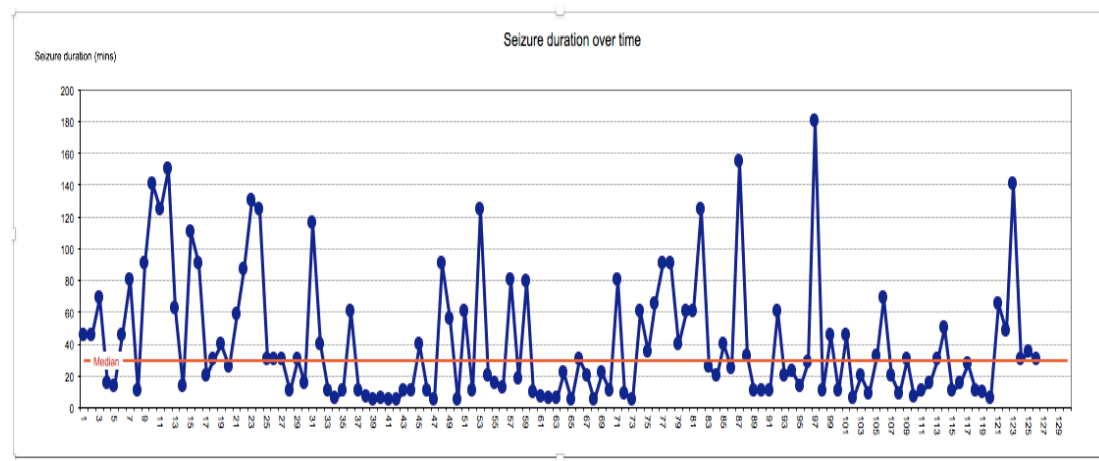
Multi-disciplinary, cross-specialty (paediatrics, anaesthetics, ED) teams were encouraged and, at several sites nursing and clerical staff were involved in data collection. Differences in service delivery meant that data collection had to be adapted to best suit the local hospital dynamics. Local adaptation was encouraged, e.g. using paper lists where staff could note prompting details.

A further method of collecting cases was implemented using the regional PICU website (<http://www.sort.nhs.uk/Guidelines/Guidelines.aspx>), where regional guidelines for management of acutely ill and injured children are hosted. The details were passed to local leads to follow up.

### Results & Improvements:

Results were collated regionally and locally as run charts for time to seizure termination and Phenytoin load and fed back regularly. Other measures were number of benzodiazepine doses given, proportion intubated and ventilated, duration of intubation and highest acuity of care.

Over the 13-month period, 137 cases were submitted.



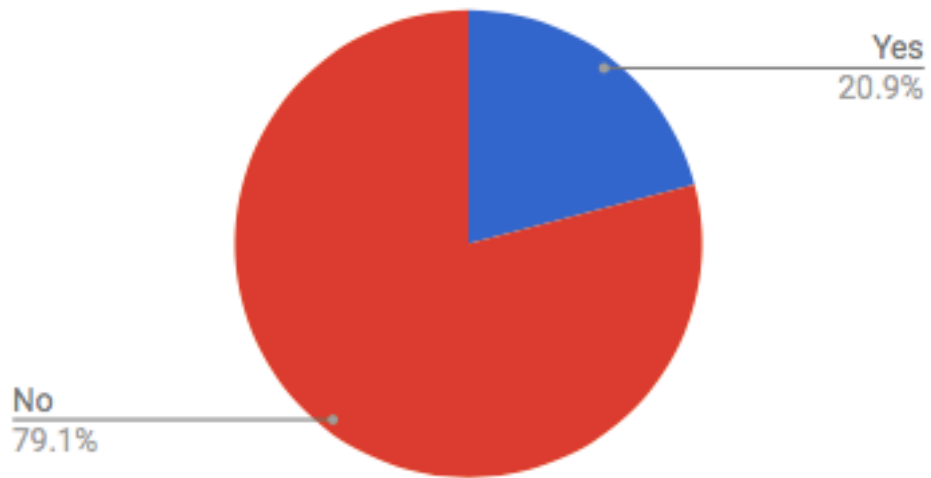
**Figure 1 Regional run chart for seizure termination over time**

Figure 1 illustrates variability in time to seizure termination. Median termination time is acceptable, however high outliers and large range suggest improvements are required. Time to phenytoin was influenced by transfer time and pre-hospital treatment. Training paramedics about seizure management was proposed, however this was postponed due to staffing and limited paramedic CPD time allocated for paediatrics.

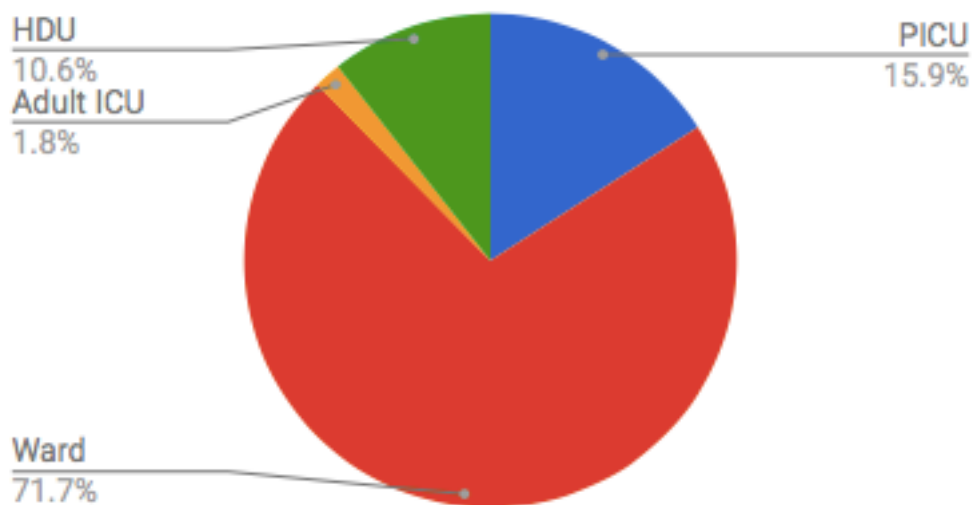
Considering the second aim, the majority were cared for on the ward, with 15.9% going to PICU and 1.8% staying in adult ICU (fig 3). Surprisingly 20.9% of

patients were intubated (fig 2), this could be biased due to the 'safety net' of recording all cases discussed with or admitted to PICU.

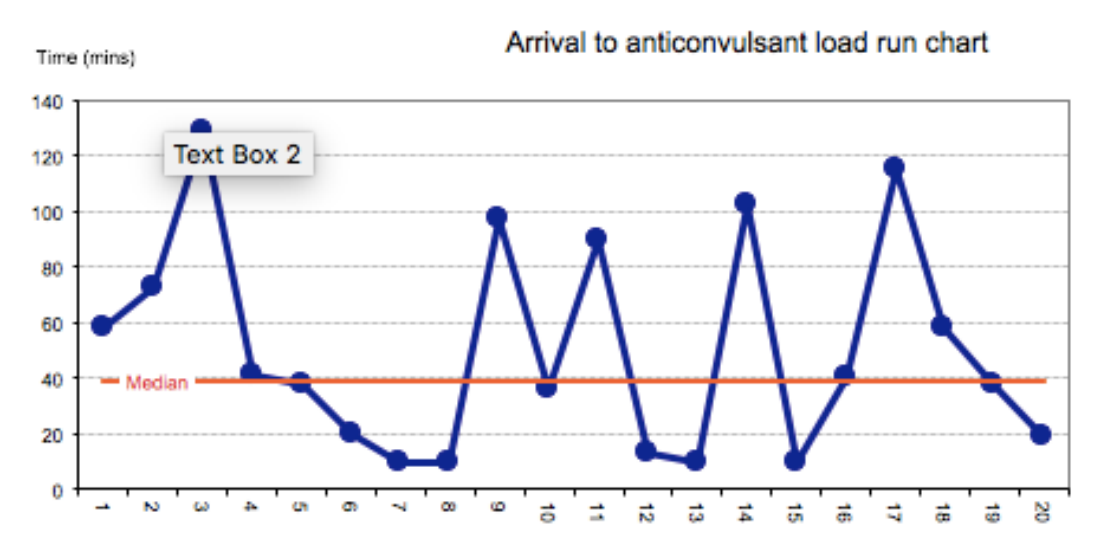
**Figure 2: Patient intubated and ventilated?**



**Figure 3: Highest acuity place of care**



A modified run chart of arrival to anticonvulsant load was created (figure 4). This required documentation of time of arrival and medication, available for 20 cases. Median time to anti-convulsant load was 40 minutes with wide variation.



**Figure 4: Regional run chart for arrival to anticonvulsant load over time**

The first improvement implemented was ‘thinking ahead’ to the next step of treatment. Regionally, via modification to the SORT guideline. Locally teams considered how best to achieve on each site.

**Limitations and their effect on findings:**

Not all cases were captured, there was no ‘back up’ for non-PICU cases.

Producing run charts was dependent on record keeping for seizure timings and medications.

**Learning & future steps:**

Engagement varied hugely, those centres with a ‘champion’ had better data collection and commitment. Time and personnel were barriers. Reasons for success were ‘buy-in’ to the ‘problem’, creating perception of need for improvement, and enthusiastic nursing involvement.

This project highlights challenges of producing meaningful change in a short time. We hoped a year would provide time to make changes, in reality only baseline data was achieved. The next stage is testing small changes to work towards anticipated improvements.

The regional multi-professional project structure lends itself to learning and spreading best practice and can hopefully be used as a model for future improvement projects.

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