Introduction

Delirium has been defined as acute changes in mental status, which leads to a lack of concentration and disorganised thinking (Phan et al. 2007). Evidence suggests that 70% of mechanically ventilated patient’s (Higam et al. 2012) experience delirium while in ICU. This results in prolonged hospital admissions, cognitive deficiency following discharge, with an increased mortality and morbidity rates for these patients (Sahkh et al. 2013; Lamont et al. 2013). Sleep deprivation is a contributing factor for the onset of delirium (Derbyshire 2018). TIs are noisy, often exceeding WHO recommendations of 35 decibels (dBA) by day and 30dBA by night (Binglung et al. 1999). Dalmation and Young (2013) recorded peak daytime noise levels recorded above 100dBA between 22-28 hours every night with right time recordings peaking at 50dBA 10 times an hour.

Purpose

The aim of this Quality Improvement Project is to reduce ICU noise by 15% at night to improve patient sleep hygiene and reduce delirium in all critically ill patients on ICU in a Welsh hospital, within one month.

Methods

- Complete e-Learning module Quality and Safety: This module taught the principles of human factors, learning from error, measurement for improvement and model for improvement.
- Quality Improvement Project (QIP)
  - Model for Improvement Framework (UCH 2009): PDSA Cycle (table 1)
  - Reviewed dBA measurement pre-implementation
  - Implementation of noise wakening activation sign (NWAS) (results)
  - Implementation of educational teaching of MDT
  - Pre & post implementation review of diagnosed delirium using CAM-ICU.

Results

Data was collected for a 5-week period to obtain baseline noise levels, with a further 3-week period to ascertain if the implementation of noise activated warning signs reduced noise levels. Delirium levels have also been monitored in the post-implementation period, to determine if the QIP reduced the incidence of delirium. Results can be seen in tables 2 and 3.

Table 3: Comparison of diagnosed delirium in ICU patients pre and Post QIP

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of ICU admissions</th>
<th>Recorded Delirium Positive</th>
<th>Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>120</td>
<td>29</td>
<td>40.2%</td>
</tr>
<tr>
<td>2017</td>
<td>120</td>
<td>22</td>
<td>36.7%</td>
</tr>
<tr>
<td>2018</td>
<td>160</td>
<td>31</td>
<td>42.7%</td>
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</tbody>
</table>

Discussion

When analysing the quantitative data, it was important to note that averaging the dBA levels did not produce mean noise levels as decimals scales are logarithmic, therefore the average had to be derived from the power. Whilst same noises are perceived to be twice as loud, they are only actually 10 dBA apart. For example, a 40dBA noise meter will sound twice as loud as a 50dBA noise level, yet the 10dBA difference represents a tonal increase in intensity. The 70dBA ventilator alarm will sound four times as loud as the respiratory aspiration unit, but in relation to acoustic intensity, it is one hundred times more powerful. Therefore, every decrease of 3 dBA amounts a halving of sound intensity. Baseline noise levels identified on the author’s unit consistently exceeded the WHO recommendations. By day time average 59.6 dBA and right time average 55.5 dBA. These noise levels were consistent with contemporary literature (Derbyshire 2018; Delaney et al. 2017; Upton et al. 2017; Plummer et al. 2018; Simons et al. 2018). But it was noted that WHO’s recommended were not achievable in a lounge in the researchers’ house. There is an inconsistent perception that “quiet times” and weekends were quieter than “non-quiet times” and week days although the implementation of noise activated warning signs did reduce noise at “quiet times”. This reduction of 3 dBA during quiet time on the author’s unit equates to an 18.77% reduction in perceived noise, proving that this type of visual display did promote a behavioural change. The results demonstrate that both visual prompts with teaching were required to highlight noise in the author’s ICU. It is important to note there is a high risk of bias in the literature review and this data due to small sample sizes. Following both implementation of NWAS and MDT education, a significant 20% reduction in perceived noise was achieved, highlighting the necessity for both continued education and visual prompts. The impact of this suggest a 8.1% reduction in documented delirium between 2018 and 2019 to date.

Conclusions

The aim of the QIP project to achieve a 15% reduction of noise in the ICU of night was achieved. By reducing noise it could be argued that sleep may become easier, improved growth of sponges and added to reducing diagnosed delirium by 8.1% in a single centre ICU in Wales. The QIP project has not only achieved this aim set, but has demonstrated the value of post graduate education and its role in practice. Our experience demonstrates that critical care nurses use their academic learning to inform and influence their clinical practices to improve their patient care. Academic learning can improve clinical outcomes by supporting them with the knowledge, tools and confidence to gain the support of clinical managers and this can lead to improved patient care outcomes.

References


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