Reducing Noise in Critical Care

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Project leaders:
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Location:
University Hospital of Wales

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Introduction
The subject of excessive noise levels within critical care is not new and has been identified on numerous occasions in the literature (Meyer et al., 1994; Kahn et al., 1998). Research illustrates the detrimental effect of noise on patients both physically and psychologically (Cmiel et al., 2004; Overman Dube et al., 2008).

The project team’s interest in this field stemmed from Fundamentals of Care audits (Welsh Assembly Government, 2003) which described noise as being too high and disturbing for patients on the critical care unit. The unit provides critical care facilities for a large hospital which provides tertiary services for multiple specialities and comprises fourteen Level 3 and ten Level 2 beds in three ward areas which are used flexibly to suit the demands on the service.

It is a busy unit with some environmental noise origins but also a high density of staff and relatives. Increasingly, the unit is providing care for patients over extended periods of time and who are awake and aware, making the impact of noise even more significant.

Aims and objectives of the project
Whilst it is understood that the process of delivering patient care in hospital does generate noise and that certain sources and levels of noise are not amenable to modification, there is some evidence in the literature that noise modification projects can be successful in reducing noise (Walder, 2000; Cmiel et al., 2004; Monsen and Edell-Gustafsson, 2005). The aims of the project were therefore to:

- Reduce noise levels within the critical care unit
- Improve patient satisfaction with noise levels

The objectives were to:

- Undertake a literature review of noise in the critical care environment
- Fully assess noise levels using a “Sound ear” device
- Identify the main sources and patterns of noise, identifying those sources that are avoidable or open to modification
- Run focus groups to engage staff in identifying these sources
- Undertake a small test of change to reduce noise levels in one area
- Roll out of solutions across the unit
- Reassess sound levels again

**Literature review**

A literature review was undertaken searching for relevant papers using the Athens electronic resource and using the “Google” search engine. Papers from 1994 onwards were identified. The key findings from this review were:

- Noise levels in ICUs are still too high despite this being first identified 30 years ago
- Behaviour modification programs can be beneficial in bringing about a reduction in noise levels
- “Quiet time” initiatives can be beneficial in reducing noise for a dedicated period of time
- Provision of ear plugs may prove beneficial to certain groups of patients

**Assessing noise levels on the unit**

The extent of the problem was initially explored by undertaking an audit of noise using an on-the-spot soundmeter. This showed that noise levels were consistently between 52 and 65dB over a 24 hour period, which is above the World Health Organisation (1999) recommendations for a patient care environment of 35dB and 40dB limit. This confirmed the need to address the subject of noise within the unit.

Noise levels were then investigated further using a Soundlog device. This enabled the project team to measure noise levels continuously over multiple 24 hour periods. The device measures the noise level every second and then records the average measurement every 5 minutes. Noise levels were audited over a 6 week period in a variety of locations in an effort to gain an accurate assessment of noise levels. In doing this, patterns and themes in levels of noise could be identified and analysed.
Figure 1 provides an example of the noise levels during the 24 hour noise audits. Each coloured line represents a 24 hour audit in a specific area of the unit.

Figure 2 represents the noise levels around bed spaces where long term patients were being cared for. This shows that between 23.00 and 04.00, noise levels were consistently below 55dB which would suggest that a reduction in noise can be achieved.

**Benchmarking with other units**
The project team communicated with other critical care units through the English and Welsh critical care networks and followed up responses from an email sent out by
FoNS using its online database to understand more about the concerns of other units in relation to noise and the strategies had been used to reduce noise.

Whilst many units recognised that noise was a problem, not all units measured noise. A number of approaches have been taken to try to reduce noise, these included the introduction of “quiet time” during the day and the installation of perspex screens around nurses stations.

Two units who did measure noise (Bristol and Portsmouth) shared their readings with the project team. In both units decibel readings were between 50 and 60 dB(A), similar to those within this unit.

Both units expressed that they had found it difficult to bring about a reduction in the levels of noise - both had adopted a directive approach where the staff were told what to do. In discussion with FoNS, the project team decided to adopt a different approach whereby the staff themselves would be involved in identifying the sources of noise and asked to suggest possible solutions, so involving them in the development of the plan to bring about a reduction in noise levels.

Understanding the experience of noise on the unit
A number of approaches were used to explore and understand the experience of noise on the unit from the perspective of staff, patients and relatives. This included questionnaires, focus groups, a notice board and observations.

Staff questionnaires
A questionnaire was developed by the clinical psychologist using Likert scales to assess staff opinions and open questions to elicit staff ideas about sources of noise and potential solutions. The questionnaire was sent out to approximately 180 staff (nursing, medical, allied health professionals) (see Appendix 1) to gain their views on noise within the unit. 55 responses were received. The responses are outlined below.

<table>
<thead>
<tr>
<th>1. How would you rate the noise levels on the unit from a staff perspective?</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very acceptable</td>
<td>1</td>
</tr>
<tr>
<td>Acceptable</td>
<td>13</td>
</tr>
<tr>
<td>Not really noticed</td>
<td>8</td>
</tr>
<tr>
<td>Unacceptable</td>
<td>30</td>
</tr>
<tr>
<td>Very unacceptable</td>
<td>3</td>
</tr>
<tr>
<td>Not answered</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. How would you rate the noise levels on the unit from a patient perspective?</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very acceptable</td>
<td>1</td>
</tr>
<tr>
<td>Acceptable</td>
<td>5</td>
</tr>
<tr>
<td>Not really noticed</td>
<td>6</td>
</tr>
<tr>
<td>Unacceptable</td>
<td>28</td>
</tr>
<tr>
<td>Very unacceptable</td>
<td>16</td>
</tr>
<tr>
<td>Not answered</td>
<td>1</td>
</tr>
</tbody>
</table>
3. What do you think are the main noise problems?  
(Top 12 responses)  
<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>33</td>
</tr>
<tr>
<td>Alarms</td>
<td>20</td>
</tr>
<tr>
<td>Radios</td>
<td>9</td>
</tr>
<tr>
<td>Telephones</td>
<td>9</td>
</tr>
<tr>
<td>Large numbers of people on unit/ward rounds</td>
<td>9</td>
</tr>
<tr>
<td>Equipment</td>
<td>8</td>
</tr>
<tr>
<td>TVs</td>
<td>7</td>
</tr>
<tr>
<td>Admissions</td>
<td>5</td>
</tr>
<tr>
<td>Background noise</td>
<td>4</td>
</tr>
<tr>
<td>Doorbell</td>
<td>4</td>
</tr>
<tr>
<td>Bin</td>
<td>4</td>
</tr>
<tr>
<td>Humidified oxygen</td>
<td>4</td>
</tr>
</tbody>
</table>

4. What would be your top tips for reducing noise?  
(Top 8 responses)  
<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff to keep voices down/not call to each across unit/talk away from bed space</td>
<td>18</td>
</tr>
<tr>
<td>Headphones</td>
<td>8</td>
</tr>
<tr>
<td>Education/increased awareness of noise</td>
<td>7</td>
</tr>
<tr>
<td>Acknowledge alarms promptly</td>
<td>6</td>
</tr>
<tr>
<td>Turn alarm volume down</td>
<td>4</td>
</tr>
<tr>
<td>Ear plugs</td>
<td>4</td>
</tr>
<tr>
<td>Reminders/notices/posters</td>
<td>3</td>
</tr>
<tr>
<td>Quiet hour/rest period</td>
<td>3</td>
</tr>
</tbody>
</table>

5. Do you have any ideas as to how we can address this?  
(Top 8 responses)  
<table>
<thead>
<tr>
<th></th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campaign/signs/posters/newsletter</td>
<td>10</td>
</tr>
<tr>
<td>Ask politely</td>
<td>7</td>
</tr>
<tr>
<td>Speak quietly/don’t shout to colleagues</td>
<td>6</td>
</tr>
<tr>
<td>Education</td>
<td>4</td>
</tr>
<tr>
<td>Music therapy</td>
<td>3</td>
</tr>
<tr>
<td>Cards/ non-verbal hand gestures/sign language</td>
<td>3</td>
</tr>
<tr>
<td>Earplugs</td>
<td>2</td>
</tr>
<tr>
<td>Change phone ringtone</td>
<td>2</td>
</tr>
</tbody>
</table>

In summary, overall staff felt that noise on the unit was too high both for patients but also for staff. Staff and alarms were identified as the main causes of noise and increasing staff awareness of this was offered as the most popular solution.

Patient questionnaires
The questionnaire for patients was also developed by the clinical psychologist and was designed to be short and easy to complete. It assessed opinions using Likert scales allowing direct comparison with staff data and open questions to get patient feedback.
The project team felt that it was important to have feedback from the patients themselves too so conscious patients were invited by one of the unit psychologists to give their feedback using the questionnaire; 6 questionnaires were completed. There was some difficulty in gaining patient feedback as so many of the patients on the unit are not conscious and not able to communicate. The patients that did give the feedback were those who were on the ward for an extended period of time who had overcome the acute phase of their illness but still required intensive care. This group of patients were able to provide comprehensive feedback to the questions being asked.

In summary, patients were not as concerned as staff about the general noise levels, it was the meaning that they attached to the noise that bothered the patient rather than the noise per se. For example, one patient had been very frightened by the noise created by the defibrillator during its regular routine testing as they were not aware that it was being tested and thought that it was being used to resuscitate a patient. If the patient thought the noise indicated something was wrong with themselves or a fellow patient then it upset them rather than the monitor alarm as a noise itself. Other patients expressed concern about noises that they perceived to be needless e.g. banging doors, alarms left sounding and noisy bin lids. One patient expressed that the perceived lack of attention to these noises by some nurses caused them upset as to them it indicated that the staff did not care if the noise was disturbing to them.

Relative’s notice board
A white board was put in the relative’s room asking for their feedback on noise. There were very few responses and these either said that noise wasn’t a problem or that noise wasn’t a concern to them at this time. It was not clear from the responses how long the related patients had been on the unit but the project team believe that the relative’s perspective may change over the patient’s journey in critical care. For example, noise may not be a concern at the beginning but may become one if the patient needs to stay in the unit for any length of time.

Observations
The observation tool was utilised on 2 occasions by a member of the project team over 30 minute intervals to overview first hand the sources of noise in one particular area of the unit (the main desk on A3North). On these occasions the sources of noise were observed to be primarily from equipment alarms, staff talking to each other and the doorbell and telephone ringing.

Staff focus groups
Two focus groups were held during February and March 2010 involving ten members of staff who had expressed an interest in being involved. The focus groups were facilitated by Jo Soldan and provided an opportunity for staff to explore their role and responsibility in relation to noise reduction and to be involved in identifying practical and behavioural solutions. During these groups both practical and behavioural/cultural plans were identified. Details of these and updates on progress with the plans are outlined below.
Practical Plans

- Silent closing bins have been introduced
- Telephone calls have been audited and the project team have worked with the reception manager to channel more calls through receptionists
- Changes to the reception and the meet and greet role of the receptionists is planned to reduce the noise from the doorbells
- Facilities were called about noisy doors and technicians have oiled noisy equipment wheels and will check regularly
- Monitors that cannot be lowered in height all now have handsets to control alarms and volumes
- Training in customer services is to be undertaken across the whole Health Board regarding customer services and this will be co-ordinated with initiatives on how to answer and direct telephone calls
- Patient leaflets have been updated to ensure the correct phone numbers are available, thereby reducing unnecessary calls
- Two sets of headphones have been purchased for patient use
- Eye masks and ear plugs are available for patient use
- Phones on unit change to ones with variable volume
- Bedside lights/mobile lighting to reduce noise at night and night levels on admissions are being sourced

Behavioural/cultural plans
Staff acknowledged that although practical changes could be made to reduce noise, some of the issues required behavioural changes. These include staff:
- Silencing unnecessary alarms and answering phones as soon as possible
- Explaining specific noises to patients to reduce anxiety
- Use headsets where appropriate
- Opening haemofilter bags in a side room
- Being mindful of patients when talking amongst selves
- Turning suction off when not in use
- Ensuring masks are fitted and alarms appropriately set for vision

In August, an experiential learning session was organised by one of the unit psychologists and supported by a practice educator (see Appendix 3) and involved 12 staff. The session was included as part of their Nursing Development Programme Part 1 and the plan is to roll the session out to future courses too.

Conclusions
At the outset of the project, the noise levels within the unit exceeded the recommendations and action needed to be taken to address this. It is a busy unit with some environmental noise origins but also a high density of staff and relatives. By considering the issue of noise and developing strategies that result in sustainable reductions in noise levels, the project team were aiming to improve both the patients’ experience of their critical care stay and their health outcomes.

The team used questionnaires and focus groups to explore sources of noise with staff and to identify those sources that are avoidable or open to modification. This process should enable a more effective uptake and acceptance of the implemented
changes by involving staff in the decision making process and by empowering them to make improvements. Both practical and behavioural solutions to issues have been identified; some of these can be addressed by quick fix solutions whilst others will require longer term work.

**Future plans**
The Trust has just undergone (mid 2010) a major managerial re-organisation and the critical care unit has merged with another unit. This has resulted in many staff changes. In addition, both members of the project team have left the Trust (one permanently, one on maternity leave). Further activity to enable behaviour change has therefore been put on hold until the unit has settled down again. Two new project leaders will be taking this work forward in the new year (2011).

**References**


Appendix 1

Staff Noise Questionnaire

Noise is a recognised problem in critical care setting known to effect patient experience and may hamper their recovery.
We are looking at noise levels in our unit, and ways of reducing this – we need your input:

How would you rate the noise levels on the unit from a staff perspective?

<table>
<thead>
<tr>
<th>Very Acceptable</th>
<th>Acceptable</th>
<th>Not really noticed</th>
<th>Unacceptable</th>
<th>Very unacceptable</th>
</tr>
</thead>
</table>

How would you rate the noise levels on the unit from a patient perspective?

<table>
<thead>
<tr>
<th>Very Acceptable</th>
<th>Acceptable</th>
<th>Not really noticed</th>
<th>Unacceptable</th>
<th>Very unacceptable</th>
</tr>
</thead>
</table>

What do you think are the main noise problems? (if you have any stories or feedback from patients or relatives that would be great)

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What would be your top tips for reducing noise?

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Staff communication is clearly very important. If our voices are identified as source of too much noise – do you have any ideas as to how we can address this other then telling each other to shut up (which is of course not recommended!)

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Thank you for your time and ideas

Please put completed questionnaire in A3 office. If you would like to help putting the sound reducing ideas into practice please put your name and contact details below and we will get back to you!

I am interested in this project and would like to help run it

I am interested in this project and would like to attend a focus group to discuss the issue of noise on the unit

Name: ____________________________________________________

How is it best to contact you? __________________________________

Nicki Haskins (Research Nurse)/Jo Soldan (Clinical Psychologist)
Appendix 2

Patient Noise Feedback

Time and Date:

Bed no:

Completed by: Patient ☐ Bedside staff (note why) ☐

**How would you rate the noise levels on the unit last night? (Please circle)**

<table>
<thead>
<tr>
<th>Very Acceptable</th>
<th>Acceptable</th>
<th>Not really noticed</th>
<th>Unacceptable</th>
<th>Very unacceptable</th>
</tr>
</thead>
</table>

**How would you rate the noise levels on the unit during the day today? (Please circle)**

<table>
<thead>
<tr>
<th>Very Acceptable</th>
<th>Acceptable</th>
<th>Not really noticed</th>
<th>Unacceptable</th>
<th>Very unacceptable</th>
</tr>
</thead>
</table>

**What noises particularly bother you/ your patient?**

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

**How did you/your patient sleep last night?**

Very well well OK badly very badly

**Do you think that noise was a factor in that?**

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

**What one thing would make most difference to noise levels for you?**

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Thank you for your help and ideas
Appendix 3

Experiential Session Plan

Aims:
- To make staff more aware of experience of patients and relatives in the context of acknowledging their own limitation and need for self care
- To raise awareness of noise on the unit and remind of good practice
- To put their experience and practical learning straight into handout to be printed and give to them. Integrating their practical experience learning with some theoretical information

Plan:
- Explain role plays – in groups of three – they can decide who does what role – patient, relative, nurse (self care if feel they will identify too much with any one role for any reason)
- Scenarios are bare bones – add as they need to (e.g. gender, how feeling etc.) All patients are ventilated though so no voice (no taking – have to use other communication) – try lip reading to communicate

10 min role plays:
- Nurse in charge (Prac Ed) walking round putting pressure on nurses (and demonstrating some bad practice to add to the experience!) (ask relative to leave and wait outside for a period of time)
- After each role play – jot down thoughts and feeling from your role on your sheet
- Do a new role play changing roles

De-role:
- Bring group together to de-role e.g. name and favourite food/ place/ after study day I am going to ...) to remind participants who they are (make a note of de-roling the practice educator also – so denoting that they were demonstrating not so good practice rather than modeling how to behave!)
- Feedback onto power point discuss noise
- Some theoretical slides for them to look at (aim to link their feedback to research evidence to validate it still further)

- Last slides are about impact on staff – remind that self -care is part of this too – and psychology role in this. Offer one to one for issues, also if role play has stirred anything up
- Reference list is available if interested in looking more into this area