

Sleep and noise in hospitals:

a rapid literature review for the
Royal Cornwall Hospitals NHS Trust





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1. Introduction

There is nothing new about the issue of noise and sleep in hospital. Writing in 1859, Florence Nightingale stated that “Unnecessary noise is the cruellest absence of care”.

Noise has been more recently defined as “a sound or sounds, especially when it is unwanted, unpleasant, or loud”¹.

In hospitals, unwanted, unpleasant or loud sounds can come from numerous sources: banging doors, clattering trolleys, beeping machines. They can also come from people – patients crying, moaning, snoring, or from staff and visitors talking, laughing, arguing.

A primary effect on patients is disrupted sleep. The Care Quality Commission says that “sleep deprivation is a major concern for patients in hospital”². A secondary effect is disruption of recovery: “Hormones responsible for physical repair and renewal are secreted during sleep, which is why sleep is a crucial factor in patient recovery”³.

Noise in hospital is not inevitable. Mitigations are possible – but attention needs to be paid to the culture of noise, as well as the practicalities of noise control.

1 Cambridge English Dictionary.

2 Care Quality Commission, 2019. Adult Inpatient Survey, Statistical release.

3 Ibid.



2. Method

Review Question

In order to give some focus to our enquiry, we established a research question as follows: “What are the causes of noise in hospital, how does noise affect patients’ sleep, and how might noise be reduced?”

Search strategy

SEARCH TERMS

The search was conducted using the following terms (listed alphabetically): environment, noise, sleep.

EXCLUSIONS

- Place: No exclusions: Evidence was taken from US and European as well as UK sources.
- Time period: No exclusions, as most of the relevant literature is recent (less than ten years old). The search was conducted up to and including the 8th November 2021.
- Sources: Evidence was not drawn from documents that are held behind journal paywalls, or other literature that would normally be for sale from booksellers. Our evidence was from open access sources (government, patient voice, charity, academic etc), as catalogued by the Patient Experience Library - the national evidence base for patient experience and engagement.
- Relevance: Search results were filtered for relevance, with only documents that explored exclusively, or mainly, noise and sleep in hospitals. We excluded other factors that can affect sleep, such as emotional distress, physical pain, light at night, room temperature, and being woken up for nursing care.

EVIDENCE BASE

The Patient Experience Library was used as the single source of evidence. This was partly a pragmatic decision: we have donated our time and expertise free of charge to the Royal Cornwall Hospitals NHS Trust, and needed to keep our costs within acceptable limits. It was also an informed decision as the Patient Experience Library specialises in literature on patient experience and acts as the UK national evidence base for patient experience.



Search results

Documents generated by our search were read manually, and included/removed based on exclusion criteria as listed above.

Relevant comments and findings were then extracted, and manually coded against the themes identified in our research question:

- Causes of noise in hospital
- How noise affects patients' sleep
- Reducing noise



3. Findings

Causes of noise in hospital

Hospitals are busy places, with much coming and going. Sounds come from multiple sources: “conversations between and among patients, staff, and visitors, as well as the sounds of slammed doors, carts that are in need of repair, phones, beepers, buzzers, and paging”⁴.

In some parts of the hospital, “beepers and buzzers” are constant, to the extent that “Medical Alarm Fatigue has become a safety issue, with a study done at The Johns Hopkins Hospital showing that in one month, there were more than 59,000 alarm conditions over a 12-day period—or 350 alarms per patient per day”⁵. It has also been found that “Electronic sounds were consistently more arousing than other sounds at the same noise dose”⁶.

Talking is essential in hospital settings - however, “Staff conversations and voice paging were also found to be highly alerting, producing a 50% chance of arousal at 50 dB in N2 and REM sleep - The arousal effects of noise on sleep include heart rate elevations, even when disruptions are brief”⁷.

An important factor in noise creation is the Lombard Reflex, when “speakers increase their vocal levels in the presence of a loud background noise and make several vocal changes in order to improve intelligibility of the speech signal. It is an involuntary response and, therefore, if the hospital corridor or nurses’ station is noisy, everyone in the vicinity will talk still louder”⁸.

It has also been found that “sound levels rise noticeably when clinical tasks are undertaken during the night and these are known to be disruptive to normal sleep routines”⁹.

But at what point does “sound” become “noise”?

For the World Health Organisation, it is a matter of decibels: “According to recommended noise levels in healthcare settings set out by the World Health Organisation, the average sound level in rooms where treatment is occurring should be 35 decibels (dB) or less and at the patient’s bedside it should be no more than 45 dB”¹⁰.

4 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.

5 Ibid.

6 Ecophon Saint Gobain, 2017. Impact of noise in healthcare A research summary

7 Ibid.

8 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.

9 Healthcare Play Specialist Education Trust, 2015. Exploring the impact environments have on children and young people’s experience of healthcare: a review of the literature.

10 Ibid.



But perceptions and tolerance of noise can be very personal. For this reason, it might be worth bearing in mind the common dictionary definition of noise as “a sound or sounds, especially when it is unwanted, unpleasant, or loud”¹¹.

How noise affects patients’ sleep

Disturbed sleep is not just an inconvenience. It can also inhibit recovery.

The Care Quality Commission has reported that “Hormones responsible for physical repair and renewal are secreted during sleep, which is why sleep is a crucial factor in patient recovery”¹². In spite of this, “sleep deprivation is a major concern for patients in hospital. Factors such as noise, light and clinical care provided to a patient during the night can reduce the ability for patients to rest”¹³.

An American study states that “Although sleep is critical to patient recovery in the hospital, hospitalization is not restful, and inpatient sleep deprivation has been linked to poor health outcomes”¹⁴.

Furthermore, “The risk to a patient subject to monitoring equipment that triggers the startle response, causing agitation and sleep disturbance is well documented”¹⁵. Evidence of risk can be found in heart rates and blood pressure: “irritations and startle responses were easier measured on heart monitors and blood pressure gauges than by listening to where the volume was”¹⁶.

Disturbed sleep has a specific effect on babies: “Sleep is important for neurodevelopment and there are studies indicating that high sound levels affect preterm infants negatively, altering sleep states or behavioural states”¹⁷.

Children, too, are adversely affected by lack of sleep. “Sleep is known to be extremely important for children’s holistic well-being and all children need good quality sleep for normal growth and development (NHS Choices 2013c) particularly for emotional well-being and mental health (McGrath n.d.). Conversely, a lack of sleep can result in extremes of behaviour (NHS Choices 2013c) and impaired immune function and hormone regulation (Linder and Christian 2011). For children who are ill, the restorative and healing benefits of sleep are particularly important (Herbert et al 2014) and therefore, establishing an environment that is conducive to sleep for all children in hospital should be a priority”¹⁸.

11 Cambridge English Dictionary.

12 Care Quality Commission, 2019. Adult Inpatient Survey, Statistical release.

13 Ibid.

14 Arora, V. et al, 2019. Effectiveness of SIESTA on Objective and Subjective Metrics of Nighttime Hospital Sleep Disruptors. Journal of Hospital Medicine.

15 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.

16 Ibid.

17 Ecophon Saint Gobain, 2017. Impact of noise in healthcare A research summary

18 Healthcare Play Specialist Education Trust, 2015. Exploring the impact environments have on children and young people’s experience of healthcare: a review of the literature.



Because of these effects, “Preservation of patients’ sleep should be a priority for contributing to improved clinical outcomes for patients who are hospitalised”¹⁹. Indeed, “Protecting sleep from acoustic assault in hospital settings is a key goal in advancing the quality of care”²⁰.

Reducing noise

Measures for reducing noise in hospitals could be categorised as “practical” and “cultural”.

PRACTICAL MEASURES

Practical measures focus on specific sources of noise and seek to reduce or eliminate them. For example, “Checking and adjusting monitors to avoid unnecessary alarms will undoubtedly reduce unnecessary noise exposure and distraction”²¹.

In one noise reduction programme, “A period of observation at night identified noisy equipment which could be adjusted to reduce noise levels: door slow closures were fitted by estates, sticker printers were no longer used, foam pads were added to bin lids to reduce banging on closure, staff were taught how to reduce the patients call bell volume at night”²².

Practical education for staff was an important factor in another initiative aiming to reduce sleep disruption. Although not noise related, the study found that “overnight vitals, medications, and phlebotomy were identified as major barriers to patient sleep”. Further investigation found that “physicians did not know how to change the default vital signs order ‘every 4 hours’ or how to batch-order morning phlebotomy at a time other than 4:00 am”²³.

One hospital has found an alternative to patient call bells: “Chase Farm has made further changes to reduce noise throughout the hospital. Patients have call buttons that alert staff through their smartphones, instead of using buzzers. Staff can either respond to the call or let it buzz through to the next health professional free to deal with the alert. Patients can then speak directly to the clinician, allowing them to triage the query depending on its urgency”²⁴.

Another “introduced a period of time on the ward known as ‘quiet time’, a planned period of time where no noise can be made on the ward. This was in response to patients who complained the ward was too noisy”²⁵.

In another hospital, “Sleep promotion posters were displayed and ‘quiet time’ proposed between 10.30pm – 7am. During this time blinds were closed, lights in corridors and patient

19 Ecophon Saint Gobain, 2017. Impact of noise in healthcare A research summary

20 Ibid.

21 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.

22 Reducing noise at night on a hospital ward: A case study of NOISELESS: (Less Noise More Sleep). 2017.

23 Arora, V. et al, 2019. Effectiveness of SIESTA on Objective and Subjective Metrics of Nighttime Hospital Sleep Disruptors. Journal of Hospital Medicine Vol 14 No 1.

24 The King’s Fund, 2019. Clicks and mortar Technology and the NHS estate

25 NHS Confederation, 2010. Feeling better? Improving patient experience in hospital.



bays dimmed, volume on telephones and equipment alarms reduced if appropriate, and staff encouraged to place 'I am noisy' stickers on equipment that required attention. Patients were provided with a 'sleep well' pack which contained an eye-mask, different types of ear plugs, advice on sleep hygiene, 'do not disturb' bed magnets and 'I am noisy' stickers. Herbal and decaffeinated teas were made available in addition to standard night-time drinks"²⁶.

Some practical noise reduction measures can improve the physical as well as the auditory environment. For example, "there are simple alterations that can be made to enhance the environment i.e. the use of ceiling tiles to reduce noise but also to provide visual stimulation and a means of distraction"²⁷.

With all of this, it is important to note that tackling practical measures for noise reduction may not be simply a matter of going round with a decibel meter. As noted above (Causes of noise in hospital), perceptions of noise are as much personal as technical. One report suggests that "While using a decibel meter may provide insight into how loud is loud, the reality of loudness is best understood and accessed as it is heard in real time. This requires [investigators] to literally go to units they do not work in and observe what they hear. They should note what they hear at the farthest room from the nurses' station and the nearest, from the elevator and every entrance, from the inside of a patient room, and simply walking down the hall. Further, this should happen at different times of day, during different shifts because the very character of the unit changes over the full 24-hour day"²⁸.

CULTURAL MEASURES

It can be argued that the primary purpose of a hospital is to make sick people better. Evidence shows that noise and sleep disruption inhibit good recovery. They are therefore arguably contrary to the primary purpose of the hospital.

An important point here is that noise does not happen by accident. It has been stated that "Noise that disrupts the primary purpose of an organization exists only because there are underlying cultural norms that permit and tolerate the disturbance". This paper goes on to say that "The solutions to the hospital noise issues can be found inside the culture, exactly where they are birthed. Yes, mechanical fixes are needed and can help, as can acoustic improvements. However, what are left are the people". Furthermore, "Unless...the accountability for the auditory environment is with the staff, the noise issue will belong to no one"²⁹.

26 Reducing noise at night on a hospital ward: A case study of NOISELESS: (Less Noise More Sleep). 2017.

27 Healthcare Play Specialist Education Trust, 2015. Exploring the impact environments have on children and young people's experience of healthcare: a review of the literature.

28 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.

29 Ibid.



Another study found that “It is important that staff from all levels and departments of the organisation commit and work together to facilitate quality improvement projects. It was especially important to involve patients and all team members including representation from estates, domestic services and portering. Significant reductions in night-time noise levels are a challenge as hospitals are noisy places. However, raising awareness of the problem amongst staff is an important first step”³⁰.

Another comparative study aimed to reduce sleep disruption on one ward through practical measures and on another by also involving staff. It found that “addition of nursing education and empowerment in the SIESTA-enhanced unit was associated with fewer nocturnal room entries and improvements in patient-reported outcomes compared with those in the standard unit”. The authors conclude that “even when sleep-friendly orders are present, creating a sleep-friendly environment likely depends on the unit-based nurses championing the cause”³¹.

Another states that “educating hospital staff about the factors that can affect children’s sleep, particularly noise levels and entering and exiting rooms, is a modifiable environmental factor which could make a difference to children’s experience of hospitalisation”³².

Finally, one report suggests setting up a “Sound Environment Committee”, but warns that the committee alone “cannot fix the noise problem. Noise must be managed, modeled, and be subject to a cultural norm that supports healing”³³.

30 Reducing noise at night on a hospital ward: A case study of NOISELESS: (Less Noise More Sleep). 2017.

31 Arora, V. et al, 2019. Effectiveness of SIESTA on Objective and Subjective Metrics of Nighttime Hospital Sleep Disruptors. Journal of Hospital Medicine.

32 Healthcare Play Specialist Education Trust, 2015. Exploring the impact environments have on children and young people’s experience of healthcare: a review of the literature.

33 Mazer, S. 2016. Hospital Noise & the Patient Experience. Healing Healthcare Systems.