# Subjective responses to noise levels in inpatient hospital wards

N. Shiers[1], B. Shield[2], R. Glanville[1]

[1] Medical Architecture Research Unit, London South Bank University, London, UK, shiersn@lsbu.ac.uk

[2] The Acoustics Group, London South Bank University, London, UK,

## INTRODUCTION

Over the past 40 years there has been a growing body of research into the acoustic environment in hospitals providing evidence of the detrimental effects of noise on patient and staff well-being (Fife & Rappaport 1976; Topf & Dillon 1988), and of a significant rise in hospital noise levels (Busch-Vishinac et al. 2005). However, most of the evidence concerning the impact of noise has focused on specialist areas of care, with relatively little research into noise levels and acoustic conditions in general inpatient hospital wards, particularly in the UK.

The current study therefore aims to address some of the gaps in knowledge in the area of inpatient care, in order to provide better understanding of the importance of the acoustic design of hospitals, and its relationship with the comfort and well-being of staff and patients. A series of questionnaire, noise and acoustic surveys have been carried out in a range of wards in three major UK hospitals.

This paper will present the preliminary findings of questionnaire surveys completed by staff and patients in a surgical and medical ward at one of the three study hospitals. The responses provide insight into the causes of noise annoyance and disturbance, and highlight the differences between patient and staff perceptions and between different types of ward.

## THE QUESTIONNAIRE STUDY

Questionnaires were designed and piloted to assess the perceptions of staff and patients regarding the general noise environment, annoyance and disturbance caused by noise and the noise sources that cause most annoyance or disturbance. The two wards involved in the current study were located in the same five story hospital ward block and were identical in terms of layout, internal finishes and construction. Bed numbers were similar with 30 and 26 beds on the medical and surgical wards respectively. Patient accommodation was generally within a four or six bed bay, with four single rooms on each ward. The type of care offered and patient gender were the main differences between the wards, the medical ward specializing in care of the elderly and treatment of infections relating to gastroenterology, and the surgical ward offering elective orthopedic procedures. Patient accommodation in the medical ward was predominantly male with a single bay set aside for female patients; the opposite was the case in the surgical ward.

Staff and patients in both wards were asked to complete questionnaire surveys. With the help of the ward clerks, questionnaires were distributed to those patients who had been on the ward for over 24 hours and were judged to be physically and mentally fit enough to complete the survey. In total 40 patients completed the questionnaire in the medical ward and 42 in the surgical. Staff response was good in the medical ward with 18 questionnaires completed, but response in the surgical ward was rather poor, with only 7 staff completing the survey.

In parallel with the questionnaire surveys, acoustic surveys have been carried out in the same wards.

## STAFF PERCEPTIONS

The staff questionnaire was designed to look specifically at noise annoyance and noise interference with the ability to work effectively.

### Noise annoyance

General feelings of annoyance were investigated by asking staff to what extent they were annoyed by noise. Figure 1 shows that the highest percentage of staff in the medical ward were moderately annoyed by noise (43 %), but this was not the case in the surgical ward, where the majority (56 %) of those questioned felt only slightly annoyed by noise.

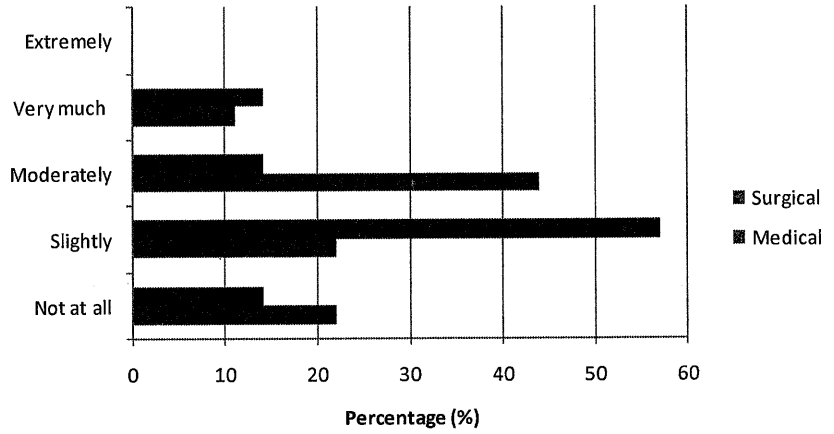


**Figure 1:** Percentages of staff annoyed by noise

Staff were asked to rate the annoyance of various noise sources (identified from the objective study) on a scale of 0 to 4, with 0 indicating 'not at all annoying' and 4 indicating 'a great deal'. Figure 2 shows the percentages of staff who rated a noise event with a 2, 3 or 4, and therefore could be said to be more than a little annoyed by the event.

It can be seen that the most annoying noise events for the staff on the medical ward were visiting time, medical equipment alarms and the internal telephone. This is similar for the surgical ward, except that there the nurse call is also rated by a high percentage of respondents.

Discrepancies of 20-30 % can be seen between the medical and surgical ratings for cleaning, people talking and staff talking. These events were found to be annoying by staff on the medical ward, but to a much less extent in the surgical ward.

Doors banging and external noise are rated more highly in the surgical ward. There is a particular heavy, ill-fitting fire door at the end of this ward that was mentioned during initial discussions with the ward manager. When this door bangs shut the noise travels down the full length of the ward corridor. With regards to the external noise, the surgical ward was surveyed during the summer months when the weather was warmer, whereas the medical ward was surveyed in the spring. This may account for the difference in external noise annoyance, as more windows may have been open in the warmer weather.

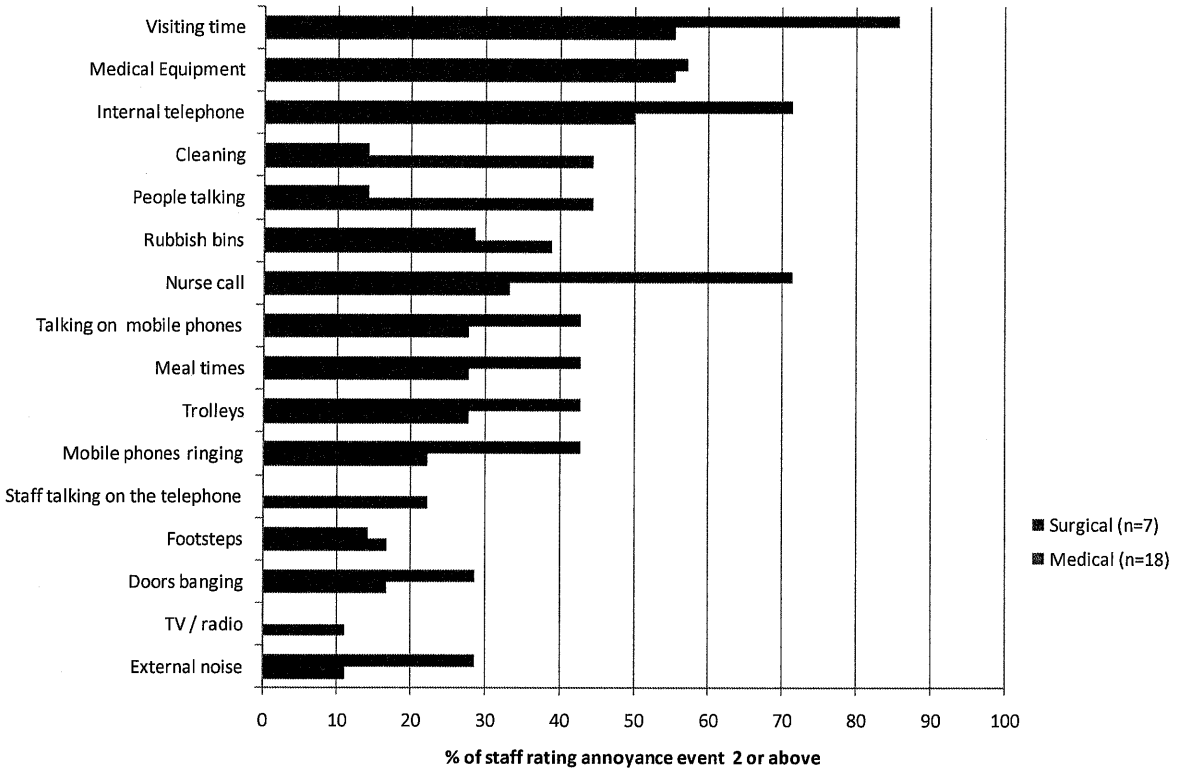


**Figure 2:** Percentages of staff annoyed by specific noise events

For 10 out of 16 noise sources, the percentage of those annoyed on the surgical ward is higher than on the medical ward. This could of course be simply down to the smaller sample size, and the possibility that only those staff who felt strongly about noise felt inclined to complete the questionnaire. However, other factors could also account for this difference. Medical and surgical wards are different, and as such may attract staff with different types of personality. Surgical wards are very busy with constant admissions for day or even half day procedures. Operations are booked in advance and efficiency and timing are key. Medical wards are slower paced and it is possible that staff annoyance of particular events could be less extreme.

## Noise interference

Respondents were asked to what extent noise interfered with their ability to work effectively. As can be seen in Figure 3, opinion of the respondents in the surgical ward was very split, whereas the majority of medical ward staff chose 'slightly' or 'not at all'. This could again be due to the smaller sample size and differences suggested in the above section.

Staff were also asked to rate how much each noise event interfered with their ability to carry out their job effectively (again the rating scale of 0 'not at all' to 4 'very much' was used). Figure 4 shows the percentage of staff who rated a noise event with a 2, 3 or 4, indicating that the event interfered to some extent with their ability to carry out their job effectively.

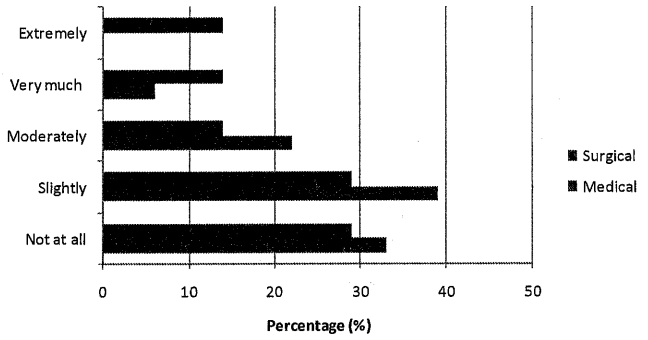


**Figure 3:** Staff perceptions of the extent to which noise interferes with work

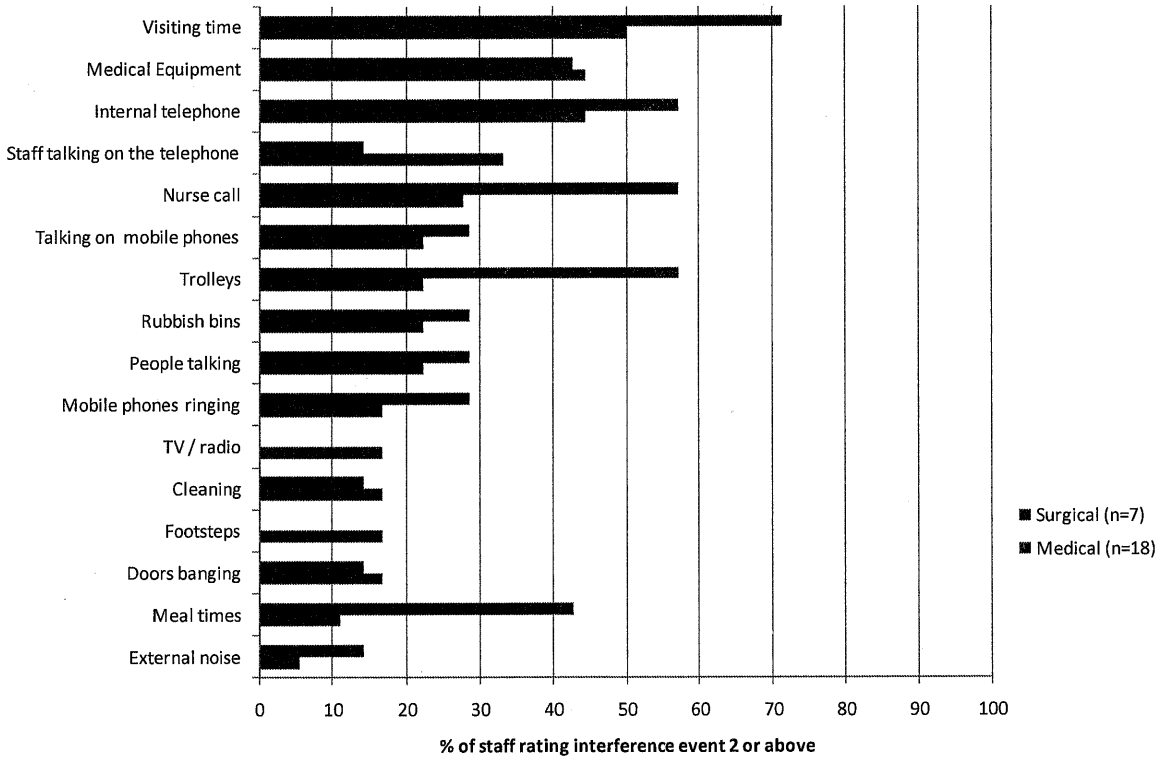


**Figure 4:** Percentages of staff experiencing interference with work by noise events

As with the noise annoyance ratings, visiting time, medical equipment alarms and the internal telephone were all rated as interfering with work by over 40 % of respondents in each ward.

There are several anomalies worth noting. The nurse call is once again rated by a high percentage of surgical staff as well as the trolleys and meal times; however, none of these are rated by a high percentage of medical staff. Trolleys are used in both wards a great deal, but in the surgical ward patients are often being wheeled through the ward to and from surgery and X-ray. It is unclear why meal times would be more disruptive to staff in the surgical ward.

## PATIENT PERCEPTIONS

A patient questionnaire was designed to investigate patient perceptions of day time noise annoyance and night time noise disturbance. The questionnaire sought to iden-

tify the particular sources of noise that may annoy or disturb patients. Patients were additionally asked about sounds they might find comforting, and their views on privacy.

### Day time noise annoyance

Patients were asked how they perceived the day time noise environment on the ward. Figure 5 details the responses, which are almost evenly distributed between 'quiet' and 'a little noisy'. Interestingly, when asked whether they were actually annoyed by noise, only 13 % of patients in the medical ward felt annoyed, and 29 % of patients on the surgical ward.

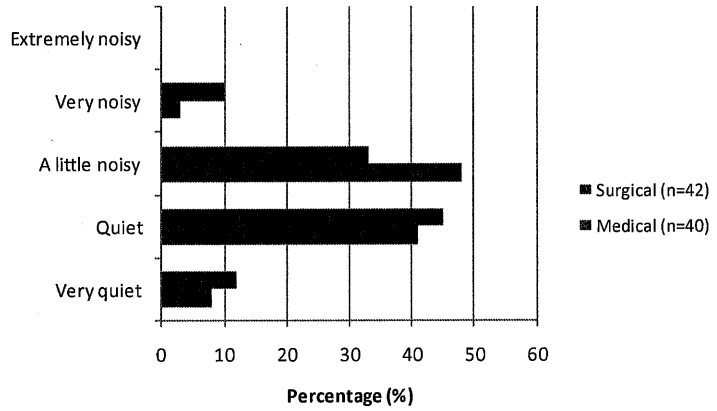


**Figure 5:** Patient perceptions of the day time ward noise environment

The patients who had indicated that they were annoyed by noise during the day, were then asked to rate the annoyance of various noise sources on a scale of 0 to 4, with 0 indicating 'not at all annoying' and 4 indicating 'a great deal'. With a relatively small number of people annoyed by day time noise the sample size was low (n=5 for the medical ward and n=11 for the surgical ward). Figure 6 shows the percentage of patients within this sample who rated a noise event with a 2, 3 or 4, and hence are more than a little annoyed by the event.

It can be seen that patients crying out, trolleys, internal telephones and rubbish bins (to a lesser extent in the medical ward) appear to be sources of annoyance in both wards. One particular difference is that doors banging is rated by nearly 60 % of patients on the surgical ward, but by no one on the medical ward. As discussed in the staff questionnaire section, there is one particularly heavy fire door at the end of the ward corridor which was mentioned as a problem in initial discussions with staff.

Other noticeable differences are the annoyance caused by visiting time, footsteps, nurse call and external noise. All these events are only cited by patients in the surgical ward. As discussed previously, external noise may be more of a problem during the study period in the surgical ward as the weather was warmer and more windows would have been open. Talking on mobile phones and tv/radio are the only events that are cited by medical patients only. This could be due to a lack of enforcement of mobile phone policy, and the non-compulsory use of headphones.

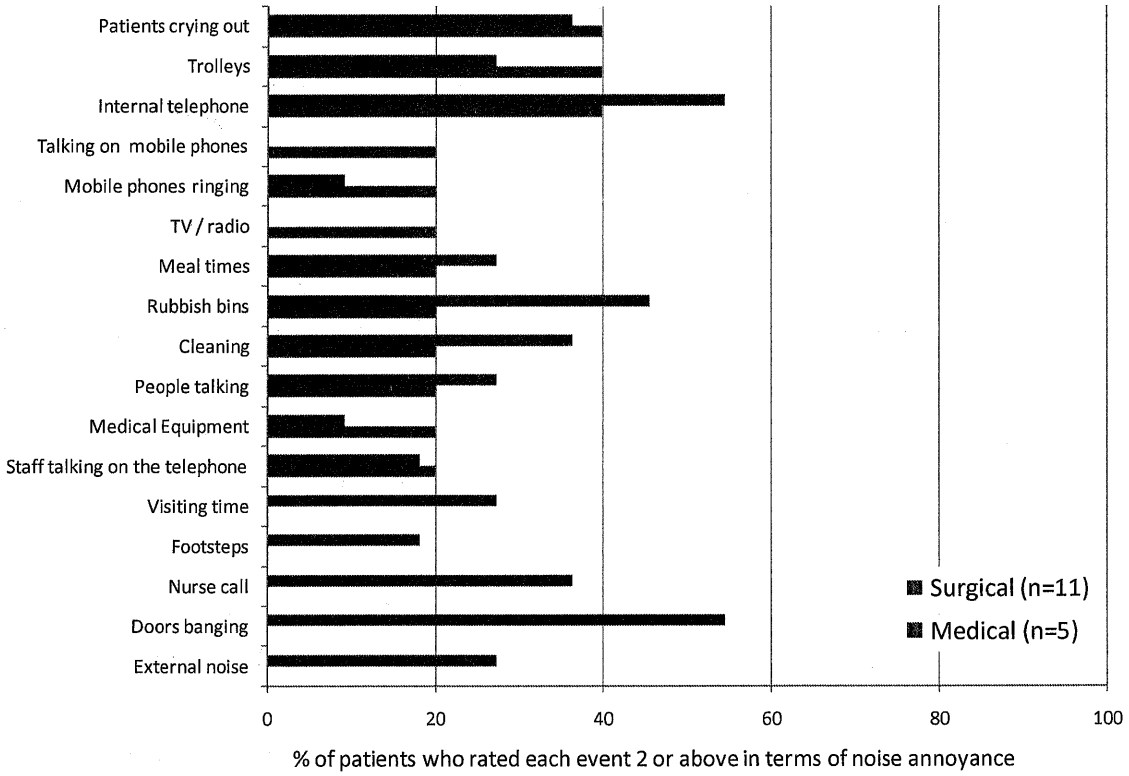


**Figure 6:** Percentages of patients annoyed by specific noise events

## Night time noise disturbance

Patients were also asked how they perceived the night time noise environment on the ward. Figure 7 details the responses, where again the majority of the responses were split between 'quiet' and 'a little noisy', but with a noticeably higher percentage (18 %) in the medical ward choosing the 'very noisy' category than during the day.

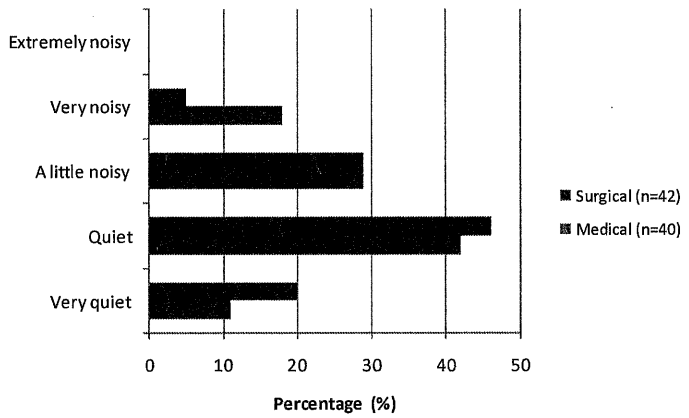


**Figure 7:** Patient perceptions of the night time ward noise environment

When asked whether they were disturbed by noise at night, 58 % of patients in the medical ward felt they were, compared with 51 % of patients on the surgical ward.

Patients who had indicated that they were disturbed by noise during the night were asked to rate the annoyance of various noise sources on the same scale of 0 to 4.

Sample sets were higher than for the day time annoyance (n=23 for the medical ward and n=19 for the surgical ward). Figure 8 shows the percentages of patients within this sample who rated a noise event with a 2, 3 or 4, and thus were more than a little disturbed by the event.

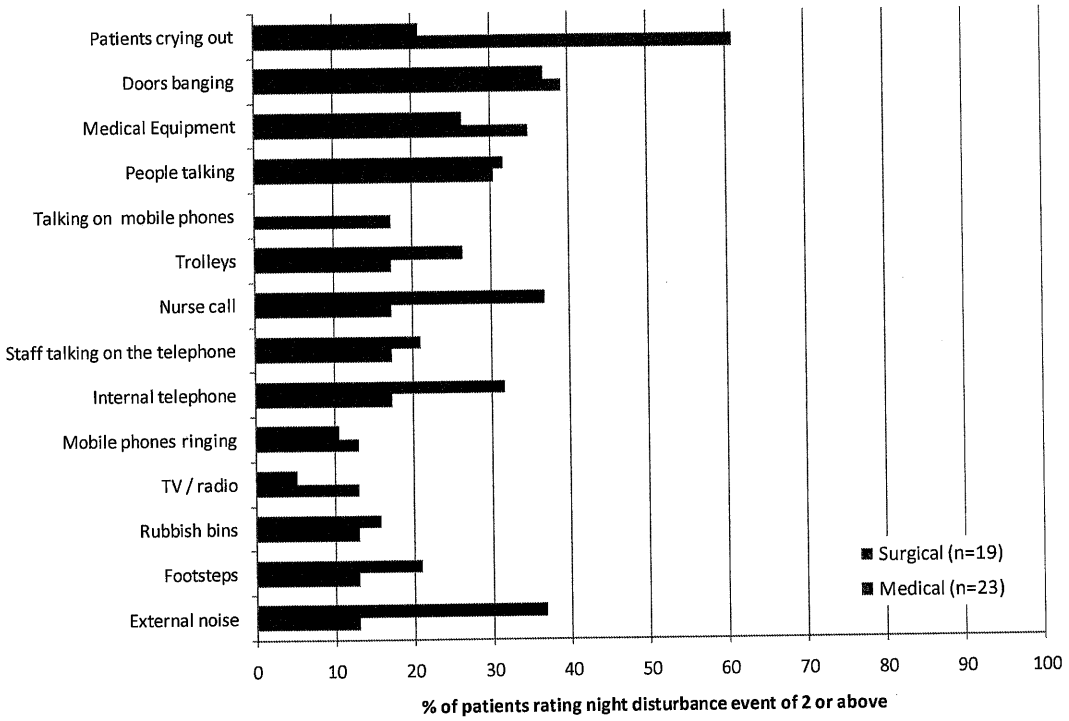


**Figure 8:** Percentages of patients disturbed by specific noise events

It can be seen that certain events which were rated as annoying by surgical patients only during the day, cause a level of night time disturbance in both wards. Doors banging, the nurse call, footsteps and external noise, are all rated as disturbing (although slightly less so on the medical ward).

One noticeable difference is that 'patients crying out' seems to be much more of a problem on the medical ward during the night. This is possibly related to the number of elderly patients suffering from confusion and dementia on this ward, who tend to cry out more often.

'Talking on mobile phones' is still cited as a disturbance only on the medical ward. Again this may indicate a lack of policy enforcement by the staff on this ward.

## Positive sounds

Looking at sound in a positive rather than in a negative light, patients were asked if there were any sounds that they actually found comforting. Over 70 % of patients in both wards left the answer blank, but there were thirteen completed responses. Several respondents cited external noise such as birds or traffic as it made them feel as though they were not completely cut off from life outside the ward. Music on the radio was felt to be comforting, as was the sound of the approaching tea trolley. Knowing that staff were close at hand for care and support was also cited by a number of respondents.

### Privacy

Conversation privacy was investigated by asking whether the patient felt that they could have a private conversation at their bedside. 75 % of patients in single rooms said that they felt they could speak privately, with lower percentages in the multi bed bays of 67 % and 64 % in the medical and surgical wards respectively. Out of those who felt they could speak privately, around 40 % said they felt they could talk in their normal voice, with 60 % needing to lower their voice or taking some other precautionary measure – similar percentages were found in both wards.

## CONCLUSIONS

Results from the questionnaires confirm that noise is a problem for both staff and patients. Over half the patients questioned felt that they were disturbed by noise during the night, a time when they should be able to rest and recuperate. Staff responses indicate that they are not only annoyed by noise, but that it impacts on their ability to carry out their job effectively.

Some noise sources cited by patients and staff alike could be improved with simple changes to behavior and enforcement of hospital policies, for example being aware of the impact of cleaning; of loud conversations; and ensuring that calls are not made on mobile phones and that phones are set to silent mode on the ward. Other sources of disturbance, for example banging doors, are the result of poor maintenance. Equipment noise and design is a major issue. Nurse call systems, internal telephones and medical equipment are continually cited by staff and patients as sources of annoyance and disturbance. It should be possible, through collaboration between manufacturers and system users, to design and locate equipment so that noise problems are minimized.

In this hospital the ward construction and layout also appear to have a negative impact regarding patient disturbance. The kitchen, ward clerk's desk and nurse station, which generate noise annoying or disturbing to patients, are all situated very close to patients' beds. External noise could be attenuated through the use of double glazing with mechanical ventilation; however, with some patients expressing positive views on being able to hear the world outside, this solution might not be ideal.

Further work involves relating the questionnaire responses to objective acoustic data in order to identify those aspects of noise which affect perceptions and suggest ways of mitigating adverse effects on staff and patients.

## ACKNOWLEDGEMENTS

The authors wish to thank the UK Engineering and Physical Sciences Research Council and Arup for funding this study, and the staff and patients in the hospitals.

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