

Device for Measurement of light levels within the Intensive Care Unit

Background: Taking into consideration the stressful intensive care unit (ICU) environment in which patients find themselves, it is no surprise that they often report trouble sleeping. Under normal circumstances, light plays an important role in establishing and maintaining circadian rhythms via melatonin. However, these cycles are disrupted due to excessive noise and light in the ICU, which is thought to negatively influence patient outcomes. While noise levels have often been studied and found to exceed the recommended levels in the ICU, light levels have not received the same attention. One major difficulty in examining light levels is that it is largely dependent on the physical structure of the area measured (e.g., presence or absence of windows, single- vs multi- patient rooms, etc), making comparisons in the literature difficult. While commercially available light meters exist, they are costly, making the use of multiple meters simultaneously challenging. Based on this knowledge, we would like to develop a small, affordable, easily implementable, and long-term light meter which can be installed in various locations throughout the ICU. The goal would then be to conduct a small study examining the different light levels measured under various conditions (e.g., room with windows vs without windows, single- vs multi-patient room, etc). This would be an important contribution to the literature, as it is difficult to find real-world, long term, baseline recordings.

In terms of methodology there are many aspects to consider, such as the type of recording (lux vs volts), size of the device (power and storage), and accuracy (to be tested against a certified light meter). These aspects would be considered in a first step and a prototype developed. Using this prototype, a small but relevant real-world study would be carried out in the ICU allowing the student to learn how to implement a study from step one, to dealing with real-world limitations during the implementation, and finally making conclusions based on the data collected.

Aim:

In this proposed project, the student will be tasked with

- 1) Technical development of a device to detect light levels in the ICU (lux or volts)
- 2) Analysis of data collected from various patient rooms (e.g., room with windows vs windowless) to determine if differences in light levels/duration exist

Workload:

Literature Review of the subject 10%

Technical Development of the light meter 50%

Collection of Data in the ICU 15%

Data Analysis of the different meters 25%

Requirements:

Experience with Raspbian/Arduino operating systems

Programming experience required

Experience with electrical circuits a plus



Figure 1: Patient and room in the ICU

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