

Measurement of Noise Levels in a Hospital Neonatal Unit in Costa Rica



Juan Carlos Olmo*, Paula Soto Calderon and Carolina Moya Navarro

Department of audiologist, Clinicas Audición, San Jose Costa Rica, USA

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***Corresponding author:** Juan Carlos Olmo, Department of audiologist, Clinicas Audición, San Jose Costa Rica, USA

Introduction

The present investigation refers to the issue of the measurement of the noise levels that correspond to the neonatology unit, this is due to the intention to discard or confirm if said unit exceeded the noise levels recommended by the American Academy of Paediatrics (AAP). The effects on hearing of premature babies can be of slow appearance and often go unnoticed. It should be remembered that neonates under 1500 g will remain in these units for a long time due to their weight and gestational age conditions, which makes them susceptible to further damage. In the preterm neonate there is greater sensitivity to noise, due to physiological immaturity and the vulnerability they have when facing the extra uterine environment, studies have confirmed that the neonate's brain is still immature to record and process all sensory information, which makes them extremely sensitive to noise and other stimuli from the external environment, so that at a younger gestational age their sensory and cerebral development is further compromised.

Auditory sensory stimulation can occur from the 32nd week of pregnancy and begins with sounds related to the mother's cardiovascular, respiratory, intestinal and laryngeal activity, so these stimuli are omitted in preterm infants born before this week. Preterm births do not present specific or well-organized auditory responses, unlike a term neonate. Term neonates are at greater risk for certain effects of noise when they present high-risk factors (low birth weight situations, hyperbilirubinemia). The Neonate on the other hand is exposed to stress in the Neonatal unit due to noise, poor tactile stimulation by the parents, for example the lack of caresses that transmit security, or the excessive tactile stimulation by the doctors when performing procedures invasive and not less important stress transmitted from parents to newborns because parents face feelings of pain, fear of loss, anxiety among others.

Justification

This study aims to know the intensity of existing noise levels and through a professional analysis to raise awareness of whether these levels are harmful or not for the neonates

admitted to the neonatal ward. The results of this investigation could be applicable in other areas of health, because the solutions provided can be applicable in any environment of sonic contamination, which threatens the auditory health of other patients of variable ages [1-4].

Background and Definitions

In Costa Rica, only the research carried out by the audiologist Rodríguez is documented, since 2010 the issue of noise in the neonatology units began to be treated more seriously. Academy of Paediatrics (AAP): dedicates its efforts and resources to the health, safety and well-being of infants, children, adolescents and young adults.

Purpose of the Investigation

Review the available evidence and answer the question What are the possible factors that cause the high level of noise in a hospital neonatal unit?

Design of the Investigation

A descriptive research is carried out, making measurements in three different shifts, in two visits made during two days in 2015 performing the calibration prior to taking samples with an acoustic calibrator series 036757 according to the manufacturer's protocol recording the sound level with a S PCE-322 A sound level meter, in a Frequency rating on dBA and FAST in a measurement range of 50 ~ 100 dB, is placed on a tripod with a 45 degree angulation in different corridors and units of the Neonatology area, collecting thus the noise made by the staff in their different tasks, changes of shift as well as the noise in general that occurs in the unit [5-8].

Used Materials

- i. Type 2 sound level meter from American National Standard Institute (ANSI). S mark PCEGROUP, model 322 A, series 12087542.
- ii. Acoustic Calibrator series 036757, certified number TS12 / 10216.

- iii. Acer branded computer, Intel Atom N570, Windows7.
- iv. Tripod brand ALPHA 2500 DESIGN
- v. Pencils and pencils.
- vi. White leaves.

Analysis of the Results

Table 1: Summary of measurements taken on Friday, February 20, 2015.

Place Neonatology	Day	Measurement in dB in the morning	Surplus according to AAP 45 dB	Measurement in dB in the afternoon	Surplus according to AAP 45 dB	Measurement in dB in the night	Surplus according to AAP 35 dB
Enchanted Phototherapy	Friday 20 February	59 dB	14 dB	50 dB	5 dB	69 dB	34 dB
Inmates intermediate care 2	Friday 20 February	60 dB	15 dB	53 dB	8 dB	69 dB	34 dB
Inmates intermediate care 1	Friday 20 February	49 dB	4 dB	61 dB	16 dB	50 dB	15 dB
Neo Intensive Care	Friday 20 February	51 dB	6 dB	59 dB	14 dB	52 dB	17 dB
Hallway in front of bedridden Phototherapy	Friday 20 February	57 dB	12 dB	58 dB	13 dB	68 dB	33 dB
Corridor in front of Bedridden intermediate care 2	Friday 20 February	49 dB	4 dB	57 dB	12 dB	51 dB	16 dB
Corridor in front of Bedridden intermediate care 1	Friday 20 February	54 dB	9 dB	58 dB	13 dB	52 dB	17 dB
Corridor in front of Neo Intensive Care	Friday 20 February	55 dB	10 dB	50 dB	5 dB	54 dB	19 dB

Note that all measurements exceed the maximum permissible noise levels according to the American Academy of Paediatrics. (1) 45 dB during the day, and 35 dB for the night.

Table 2: Summary of measurements taken on Saturday, February 28, 2015.

Place Neonatology	Day	Measurement in dB in the morning	Surplus according to AAP 45dB	Measurement in dB in the afternoon	Surplus according to AAP 45 dB	Measurement in dB in the night	Surplus according to AAP 35 dB
Enchanted Phototherapy	Saturday 28 February	51 dB	6 dB	60 dB	15 dB	50 dB	15 dB
Inmates intermediate care 2	Saturday 28 February	59 dB	14 dB	52 dB	7 dB	51 dB	16 dB
Inmates intermediate care 1	Saturday 28 February	49 dB	4 dB	57 dB	12 dB	60 dB	25 dB
Neo Intensive Care	Saturday 28 February	51 dB	6 dB	59 dB	14 dB	52 dB	17 dB
Hallway in front of bedridden Phototherapy	Saturday 28 February	57 dB	12 dB	55 dB	10 dB	50 dB	15 dB
Corridor in front of Bedridden intermediate care 2	Saturday 28 February febrero	58 dB	13 dB	71 dB	26 dB	53 dB	18 dB
Corridor in front of Bedridden intermediate care 1	Saturday 28 February	52 dB	7 dB	55 dB	10 dB	58 dB	23dB
Corridor in front of Neo Intensive Care	Sábado 28 febrero	55- 60dB	10-15 dB	48 dB	3 dB	59 dB	24 dB

Note that all measurements exceed the maximum permissible noise levels according to the American Academy of Paediatrics. (1) 45 dB during the day, and 35 dB for the night. In this unit, it should meet an average of 45 dB allowed during the day, while approximately it was possible to reach up to 69dB of noise present in several measurements, recorded from different areas of the research site, such as noise caused by monitors, sinks, telephone noises, staff conversing, poorly maintained equipment, air conditioning, high noise changes during staff shift changes, medical visits and visits from parents.

In the research carried out, it was found that the existing noise levels in the neonatology area of the hospital clearly exceed the permitted and standardized noise levels mentioned above with surpluses of 4 dB at 34 dB on Friday Table 1 and on

Saturday with surpluses of 3dB at 26dB Table 2. Analyzing the results, it is found greater intensity of noise in the afternoon hours and less noise during the morning hours, it was observed that during the shift changes of the nursing staff the noise levels were increased. It is found as maximum peak in the morning hours of 60dB, in the afternoon of 71dB, and minimum peak in the morning hours of 49dB, and in the afternoon of 50dB, on Friday, it is found for Saturday in the hours of the morning a maximum peak of 59dB, and in the afternoon 71 dB and as

Table 3: Summary of other measurements made in the neonatology unit of the hospital.

Place Neonatology	Measurements In dB
Nurse talking	54 dB
Hand washing	61 a 65 dB
Shift change	58 a 59 dB
Dreaming Monitor	52 a 65 dB
Opening Syringe Package	57 a 64 dB
Respirator sounding	55 dB
Crying baby	66 dB
Load cart noise	56 dB
Sound level meter inside closed incubator	54 dB
Sound level meter inside open incubator	55 dB
Phone ringing	57 dB
Taking Hiccup out of Baby	62 dB
Air conditioner	55 dB
Opening Incubator	54 dB
Moving place incubator	71 dB
Trash change	52 dB

Note that all measurements exceed the maximum permissible noise levels according to the American Academy of Paediatrics. (1) 45 dB during the day, and 35 dB for the night since this can happen at any time of the day.

Conclusion

The noise levels found in the neonatal unit are above the levels recommended by the American Paediatric Association (45 dB in the day and 35 dB in the night). Inform the staff of neonatology area about the effects of noise in neonates hearing problems should be detected as early as possible for a timely intervention, taking advantage of the plasticity of the sensory system under development, before three months of life to prevent any type of delays in the acquisition of language and other problems, this through screening (neonatal auditory screening) and audiological evaluations that may allow timely diagnosis, we cannot know at present about the hearing status of neonates who are in the ICU of the Hospital, so these do not have neonatal hearing screening. Make a noise map showing the areas where there is more noise, where it is possible to see that the neonatology unit exceeds the limits allowed by the AAP. In the investigation, it was determined that the noise levels generated in the area do not exceed eighty decibels, so it is not considered that they can damage children’s hearing. Even when the noise levels generated do not have the potential intensity to cause noise-induced loss (they do not exceed eighty decibels),

a minimum peak in morning and afternoon hours of 48 dB at 49dB (Tables 1 & 2). The stress caused to babies by noise can cause damage to their development at the neurological level. In summary according to the research carried out if a noise level higher than the normal standards for a neonatology area was found, which will give the necessary recommendations for the personnel that work and information that some are unaware of (Table 3).

they have the potential to affect the development of babies and exceed the levels recommended by the AAP.

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