

Impact of Simulation-Guided by Training Lines on Nurses' Performance Caring for Children with Cochlear Implantation

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Abstract

Background: Pediatric cochlear implantation improves the quality of life for hearing-impaired children by enhancing communication. Simulation-based education links classroom learning to real-world practice, enabling nurses to provide high-quality care for children with cochlear implants. **This study aimed to** evaluate the impact of simulation-guided training lines on nurses' performance caring for children with cochlear implantation. **Methods:** A quasi-experimental research design was used (pre/post & follow-up). **Setting:** The study was conducted in the Ear, Nose, and Throat inpatient and outpatient clinics at Sohag University Hospital were selected from October, 2023 to March, 2024. **Subjects:** A convenient sample composed of all 50 nurses who are working in the previously mentioned settings. **Tools for data collection:** (1) a structured interview questionnaire sheet and (2) An observational checklist was utilized to assess nurses' practice and collect data. **Results:** Regarding knowledge and practice, there was a very statistically significant difference among the nurses ($P < 0.001$). The study's findings showed that, before the implementation of the simulation-guided training lines, two-thirds of the nurses were poorly informed about cochlear implantation, and more than half of them had incompetent levels of practice in this area. Following the implementation of simulation-guided training lines, the vast majority of the examined nurses had a good level of knowledge, and the majority of them had a competent level of practice. When compared to pre-simulation guided by training lines, nurses' performance showed a very statistically significant difference and improvement ($P \leq 0.001$). **Conclusion:** Simulation guided by training lines had a positive impact on nurses' knowledge and practice with cochlear implant surgery. **Recommendations:** Incorporating simulation-based training for nursing staff across diverse specialties can significantly enhance their knowledge and competence in cochlear implantation, ultimately leading to improved patient care and outcomes.

Keywords: Children, Cochlear implantation, Nurses' Performance, Simulation-guided by training.

Introduction

Hearing loss is a medical condition known as severe and profound childhood hearing loss that can affect brain development and various aspects of a person's life (Podury et al., 2023). Untreated hearing loss in children can affect more than just the development of spoken language. Child's life could be negatively impacted by the impact of communication, social interaction, self-image, cognitive, and academic achievement (Desoky et al., 2021).

The prevalence of neonatal permanent sensorineural HL ranges from 0.1% to 0.6%, with an overall prevalence of 0.2% (Busse et al., 2020). Around 12.5% of children aged 6 to 19 experience varying degrees of hearing

impairment. Additionally, approximately 38 to 42% of students who become deaf due to viral infections or congenital syndromes often have cognitive, language, learning, emotional, neurological, or physical disabilities (WHO, 2024).

Desoky et al., (2021) found that school-aged children with hearing impairments are potentially five times more susceptible to emotional disturbances that impact their ability to maintain normal social relationships. Also, Shukla et al., (2021) reported that hearing loss can lead to various psychosocial impacts, ranging from social isolation and depression symptoms to risk of psychosocial disability and falls.

Rehabilitation plays a vital role in enabling children with hearing loss to reach

their full potential. This includes interventions such as cochlear implant training, speech and language therapy to improve auditory skills and communication, as well as teaching sign language and other methods of sensory substitution (WHO, 2024).

A cochlear implant (CI) is a biocompatible and durable external electronic medical device that stimulates the spiral ganglion cells of the auditory nerve to restore sensorineural hearing loss. It provides auditory access to spoken sounds that cannot be provided with sound amplification through traditional hearing aids (Fahmy et al., 2022).

Early CI implementation increases spoken language acquisition and encourages engagement in mainstream schools. This technology has advanced quickly since 1989 when the USA Food and Drug Administration approved cochlear implants for youngsters with severe to profound hearing loss. Cochlear implantation is the treatment of choice for children diagnosed with severe-to-profound hearing loss in the majority of developed countries (Binos et al., 2021).

The benefits of CI have been proven in several trials, including better hearing, speech perception, and language development. Additionally, CIs appear to be supportive of the psychosocial requirements for social participation, such as empathy. The use of CI in children can at least partially undo the consequences of hearing loss in the brain (Lieu et al., 2020).

Literature concerning the nurse's involvement in auditory health, particularly in cochlear implant (CI) treatment, is limited. Nursing care commences during the preoperative phase by furnishing guidelines and reinforcing the decision-making process. This extends through the intraoperative and postoperative periods, encompassing preparation of caregivers for home care (Vieira et al., 2012).

Nurses hold a pivotal role in cochlear implants, preoperatively, they prepare patients for surgery by reviewing medical histories and monitoring vital signs. During surgery, nurses assist in patient positioning and ensure the operating room is equipped. In the postoperative phase, nurses

monitor patients closely for alertness, signs of bleeding or infection at the incision site, change mastoid dressings as prescribed, and communicate any concerns promptly to the surgical team to ensure patients undergo surgery safely and recover effectively (Krogmann and Khalil, 2023).

The pediatric nurses had a crucial role in educating mothers/parents/caregivers regarding cochlear implants surgery to improve knowledge and practice toward caring for children after surgery, this will enable them to provide care for their children, and improve their quality of life (Moradi et al., 2022).

Incorporating simulation based training into nurses' education can help trainee nurses to apply theoretical knowledge in a realistic setting (Pun, 2023). It aims to develop important skills such as critical thinking, decision-making, and communication to provide high-quality patient care (Cant & Cooper, 2017).

The simulation-based approach is one of the most effective teaching strategies that enhances learning outcomes and improves nurses' performance (Elshama, 2020). A well-planned and organized simulation exercise could aid in the development of critical reflection and clinical competence (Akselbo and Aune, 2023).

In the context of nursing science, simulation serves as a valuable tool for instructional purposes, enabling the development of both theoretical and practical skills among learners (Alexander et al., 2019). Simulation offers a unique opportunity for trainees to develop their clinical skills within a realistic, interactive, and communicative healthcare environment without compromising patient safety or risking errors. Replicating of training allows nurses to practice and hone their skills through hands-on experience and hone their abilities in a controlled, low-risk environment, free from the stress of actual patient care. (Koukourikos et al., 2021; Pun, 2023).

Significance of the study:

One of the most prevalent congenital anomalies is hearing loss After hypertension

and arthritis, it is the third most common chronic disability. In the world, hearing impairment affects. Over 5% of the world's population or 430 million people have hearing loss (including 34 million children) (WHO, 2024). Nearly 75% of cases live in developing countries (Khalifa, 2020). The primary regions significantly impacted are South Asia and Africa, where the prevalence rate is nearly four times higher than in high-income areas (WHO, 2024).

There isn't a database that tracks the scope and dissemination of the hearing impairment problem in Egypt. There have been a few scholarly studies limited to certain age groups or geographical regions. Children's hearing loss was found to be more common in Alexandria (5.3%), rural areas (4.5%), and Ismailia governorate (13.7%) (Nada et al., 2021).

Simulation-based clinical education activities using pediatric patient simulators in nursing, these activities go beyond simply handling mannequins and include the use of gadgets, skilled professionals, lifelike virtual environments, and role-playing. A crucial component of nursing education is a clinical simulation, which is described by the National Council of State Boards of Nursing as "an activity or event replicating clinical practice using scenarios, high-fidelity manikins, medium-fidelity manikins, standardized patients, role-playing, skills stations, and computer-based critical thinking simulations (AbdElbaky, 2018). So, this study was applied to evaluate the impact of simulation-guided by training lines on nurses' performance caring for children with cochlear implantation.

Aim of the study

To evaluate the impact of simulation-guided by training lines on nurses' performance caring for children with cochlear implantation through:

- Assess nurses' knowledge about cochlear implantation
- Assess nurses' practices about cochlear implantation
- Design and implement simulation-guided by training lines depending

on the nurse's needs.

- Determine the effect of simulation-guided by training lines on nurses' knowledge and practices caring for children with cochlear implantation.

Research Hypotheses

Nurses' knowledge and practices about cochlear implantation are expected to improve post simulation-guided by training lines implementation

Subject and methods

Research design

The aim of the current study was achieved using a quasi-experimental research design (one group pre/post/follow-up tests).

Settings

The study was applied in the Ear, Nose, and Throat inpatient and outpatient clinics at Sohag University Hospital.

Subjects

A convenient sample composed of all nurses (50) who are working in the previously mentioned settings.

Inclusion criteria: The inclusion criteria for sampling were:

- 1-Nurses who are willing to engage in the study.
- 2-Nurses on hand at the time of data collection

Tools for data collection

Two tools were used for collecting data in this study.

Tool (I): Structured interview questionnaire sheet: It was developed by the researchers after reviewing the national and international related literature (Khalifa & Khalifa, 2020; Issa et al., 2018). This tool is divided into two parts as the following:

Part (1): It was concerned with nurses' "demographic data. It consisted of five items. It is presented in Arabic and includes age, gender, level of education, residence, and years of experience.

Part (2): A structured questionnaire sheet

was used to assess nurses' knowledge of cochlear implantation. This tool was developed by the researchers after reviewing the national and international related literature (Muller et al., 2023; Warner-Czyz et al., 2022; Nada et al., 2021). It was designed by the researchers to assess nurses' knowledge about cochlear implantation such as the meaning of hearing impairment, etiology, severity, signs, and symptoms of hearing impairment, the definition of a cochlear implant, cochlea location, cochlear implant process, the ideal age for cochlear implant, the specifications of people who are qualified for cochlear implants, the advantages, disadvantage of cochlear implantation, the side effects and complications of cochlear implantation, and how can the results of the operation be better utilized.

Scoring system

Each right response received one point, whereas the wrong response received zero. The nurses' knowledge was divided into three categories: Poorer than 50%, fairer between 50% and 75%, and better than 75% (Hegazy & Abusaad, 2019).

Tool II: An observational checklist was utilized to assess nurses' practice in caring for children with cochlear implantation (pre/post-test). It was developed by researchers subsequent to a comprehensive review of both local and international literature (Warner-Czyz et al., 2022; Nada et al., 2021), it encompassed questions concerning various aspects of care, including feeding, nutrition, hygiene, speaking, communication and education, Incision care, other instructions as do not blow nose, when need to sneeze or cough, do not try to stop it, and open mouth, and do not pinch nose. Also, Hearing aid use, communication mode, educational placement and family situation surrounding the implanted child. Finally, follow-up care is a key part of the treatment and safety and seek immediate medical care if have a fever with a stiff neck or a severe headache, have signs of infection, such as increased pain, swelling, warmth, or redness, red streaks leading from the incision, pus draining from the incision, fever, and bleed through the bandage.

Scoring System:

A score of one was given for "done" satisfactorily and a score of zero for "not done". These scores were converted to percentage scores by adding together the scores for each step and dividing by the number of steps. As a result, the practices were deemed competent if their scores were below 85% and incompetent if they were over 85%

Validity and reliability:

Five pediatric nursing professionals evaluated the tools' content validity and feasibility, clarity, relevance, and applicability. Cranach's Coefficient Alpha was used to assess the internal consistency of the research tools, tool I ($r = 0.878$) and tool II ($r = 0.923$).

Ethical considerations

Written approval was obtained from the Ethics and Research Committee of the Faculty of Nursing, Sohag University, Egypt. An official letter from the Dean of the nursing faculty at Sohag University served as the official authorization document to explain the goal of the study and obtain their approval and cooperation for carrying it out. After explaining the current study's purpose and advantages, nurses gave their informed consent to participate in it. The study's nurses were informed by the researchers that they had the option to withdraw from participation at any moment. They also received assurances of the confidentiality of their data.

Pilot study:

To assess the tools' clarity, objectivity, viability, and application as well as to identify potential challenges and issues that the researcher might encounter and that might obstruct the collection of data, a pilot study using 10% of the entire sample (5 nurses) was carried out. The time required for data gathering was also estimated, which was helpful. There were no modifications made. The nurses who took part in the pilot study were included in the study.

Field of work

The director of Sohag University Hospital gave his approval. The study was carried out

between the first of October 2023 and the last day of March 2024. The interview began with the researchers greeting each nurse individually, introducing themselves, and outlining the purpose and scope of the study. The study was carried out in the four stages listed below:

I-Assessment Phase

The researchers started by introducing themselves to nurses giving them a brief idea about the aim and nature of the study. Each nurse was interviewed according to their work schedule by the researchers individually in the clinical to gather the characteristics of the nurses using a tool (I) part (1).

Participants were instructed to complete all of the items on the knowledge questionnaire sheet within the allotted 30 minutes (**tool I, second part**). The questionnaires were then gathered to be evaluated before the training as a knowledge pretest.

As for, the researchers observe the nurses' practice before implementing the training as a practice pretest using **tool II**.

II. Planning phase:

Based on the results of the previous phase, the objectives, priorities, and expected results were developed to address the practical requirements and knowledge gaps of the nurses about cochlear implantation. The researchers prepared five sessions for the nurses they were researching—two theoretical and three practical.

The simulation- guided by training lines:

The creation and revision of a simulation-guided by training lines were completed. The sessions on cochlear implantation comprised both theoretical and practical components.

The main objective of simulation- guided by training lines sessions-:

The nurses were supposed to gain knowledge and practice at the end of the sessions that would enhance their performance regarding cochlear implantation.

Specific goals for the program:

- Define hearing impairment and cochlear implantation.
- list the etiology, types, signs & symptoms, and severity of hearing

impairment

- Enumerate the goal of a cochlear implantation.
- Discuss cochlear implant process
- Know the ideal age for cochlear implant and eligibility criteria people who are qualified for cochlear implants
- List the advantages and disadvantages of cochlear implantation
- Nursing care for optimizing cochlear implant outcomes revolves around enhancing care coordination and communication.

III. Implementation phase:

Through five sessions, which included three theoretical and two practical (each lasting around 30 to 45 minutes); simulation- guided by training lines was used to improve nurses' knowledge and practices regarding cochlear implantation.

Each session began with the researchers gathering background about the previous session, and each session ended with a summary from the researchers.

Five to six nurses in each subgroup were divided up among the nurses who were the subject of the study.

The researchers visited the study settings 3 days per week from 9 a.m. to 1 p.m. using the previously mentioned study tools, each nurse was individually interviewed.

After examining the relevant literature based on the evaluation of the real needs of the studied nurses, the simplified booklet was used as supportive material and distributed to nurses in the Arabic language to cover all topics on the knowledge and practice regarding cochlear implantation.

To apply for simulated-based training, many teaching approaches were used, including lectures, small group discussions, photographs, brainstorming, demonstrations, and re-demonstrations using the necessary tools and a simulation manikin that was available in a hospital teaching class faculty clinical lab. Several teaching tools were used, including handouts, PowerPoint, graphics, flipcharts, and illustrated videos about blood transfusion. **The theoretical and practical sessions were carried out as the following:**

The first session (Theoretical): The researchers introduced themselves at the start of this session, welcomed the nurses, expressed gratitude for their participation in the study, and described the goals of these instructional sessions. The following topics were covered in the first session: definition of hearing impairment, etiology, types, signs, and symptoms, severity, the definition of a cochlear implant, cochlea location, and cochlear implant process.

Second session (Theoretical): The topics included discussions on the optimal age for cochlear implantation, eligibility criteria, the advantages and benefits of cochlear implants, as well as potential side effects associated with the procedure.

Third session (Theoretical): During these sessions, the nurses under study received instructions on potential complications of cochlear implantation, the effect of MRI on cochlear implantation, duration of cochlear implantation, strategies for optimizing post-operative outcomes.

Fourth session (Practical): In this session, nurses received clinical demonstrations and re-demonstrations on various aspects of cochlear implantation in the faculty clinical lab regarding feeding, nutrition, hygiene, speaking, communication, and Incision care. They were also instructed on important precautions such as avoiding nose blowing, allowing sneezing or coughing freely, and refraining from pinching the nose. Additionally, guidance was provided on hearing aid usage, communication modes, educational placements, and understanding family dynamics surrounding the implanted child. Emphasis was placed on the significance of follow-up care for treatment safety, with instructions to seek immediate medical attention in case of symptoms such as fever with a stiff neck or severe headache, signs of infection, or bleeding through the bandage.

During this session, a simulated manikin was utilized for training purposes. Following the demonstrations in the faculty lab sessions, trainees transitioned to pre-selected settings at Sohag University Hospitals to undergo real-time re-demonstrations under the observation of researchers. This practical approach aimed

to bolster their confidence and validate their competency in providing care for children undergoing cochlear implantation.

Fifth session (Practical): The researchers began by gathering feedback from the previous sessions and responding to any queries about cochlear implantation before handing out the post-test and thanking each participant's nurse for their participation in the study.

IV-Evaluation phase:

The impact of simulation- guided by training lines on nurses' performance caring for children with cochlear implantation was measured by the researchers as following:

- The researcher assesses nurses' knowledge and practice three times by using **tools I (part 2) & tool II** according to their working schedule and compares the result before and after the applied training as follows:
 - The first (pre-test) was conducted before implementing the training.
 - The second (post-test) was done immediately after implementing the training.
 - The third (follow-up) was conducted after one month of training.

Statistical analysis:

SPSS for Windows version 20.0 (SPSS, Chicago, IL) was used to conduct all statistical analyses. Continuous data were normally distributed and were expressed in mean \pm standard deviation. Quantitative data were reported as mean and SD and analyzed using a t-test for comparison of the same group on the pretest and posttest. Quantitative data were represented using numbers and percentages. Pearson correlation was used to explain the relationship between normally distributed numerical variables. A P-value of 0.05 was used to establish the significance as follows: A P-value less than or equal to 0.001 was considered to be highly statistically significant.

Results:

Table 1 reveals that 56% of the nurses who participated in the study were over the age of 25 with a mean age of $25.8 \pm .69$ years, and 84% of them were female. 66% of the nurses who were studied had a technical institute of nursing. In terms of experience, 50% of them had between 5 – <10 years.

Figure (1) illustrates that the majority (84%) of the nurses in the study not attended training sessions regarding cochlear implantation.

Table (2) portrays an improvement in nurses' knowledge of cochlear implantation with a highly significant difference detected between pre/immediate post and one-month post- simulation- guided by training lines implementation ($P < 0.001$).

Figure (2) demonstrates that before to obtaining the simulation- guided by training lines, 78% of nurses had a poor knowledge level about cochlear implantation. However, one month following receiving simulation-guided by training lines, their level of knowledge improved to a good level among (94.0%) of them, and one-month post- after simulation- guided by training lines implementation (90.0%). There was a significant improvement in nurses' knowledge level post immediate and post one-month of simulation- guided by training lines implementation.

Table (3), there was a highly statistically significant difference and improvements in all items of nurses' practice before, immediate after, and one month after the simulation-guided by training lines implementation ($P < 0.001$).

Figure (3) depicts that nurses' practice levels regarding cochlear implantation had improved immediately post, and one month post the implementation of simulated- guided by training lines. It shows that 72% of the nurses had incompetent practice levels before the implementation of simulated- guided by training lines compared to 8% post guided by training lines, while 96% of them had competent practice levels post one month of simulation- guided by training for implementation.

Table (4): demonstrates that a statistically significant positive correlation was detected between nurses' knowledge and practice scores pre, immediately post, and one month post the implementation of simulated-guided by training lines ($P \leq 0.001$).

Table (5): Shows a significant correlation between nurses' knowledge and practice

regarding Cochlear implantation and their selected demographic data (age, gender, **qualifications**, and **Years of experiences**).

Table (1): Demographic characteristics of the studied nurses (n. =50)

Demographic characteristics	No.	%
Age (Years)		
< 25 years	28	56
25 - ≥ 36 years	22	44
Mean ± SD	25.8 ± .69	
Gender:		
Male	8	16
Female	42	84
Qualifications:		
Technical Institute of Nursing	33	66
Baccalaureate degree in nursing	17	34
Years of experience:		
< 5 years	15	30
5 – <10 years	25	50
10 - ≥15 years	10	20

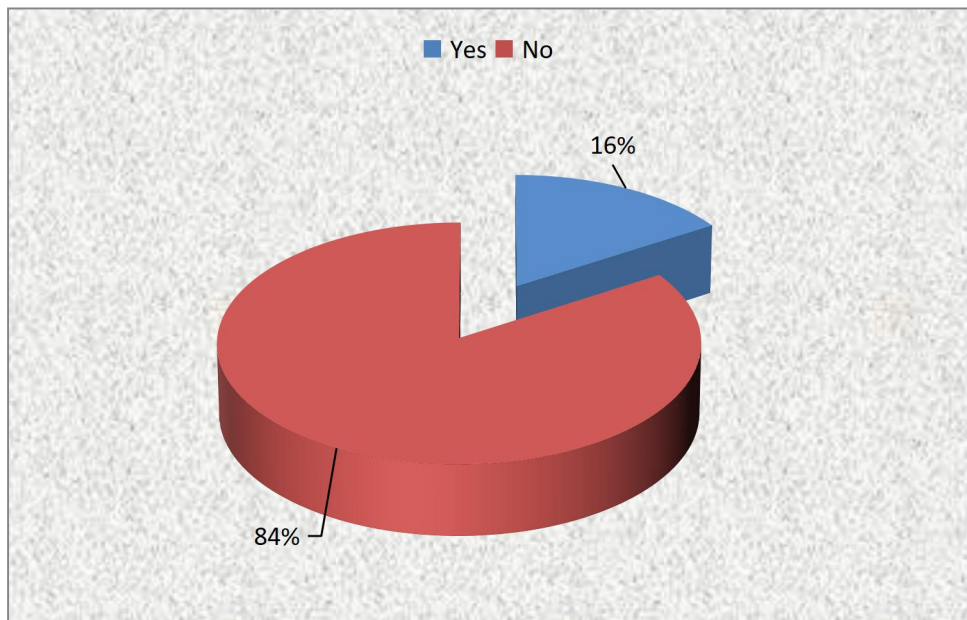
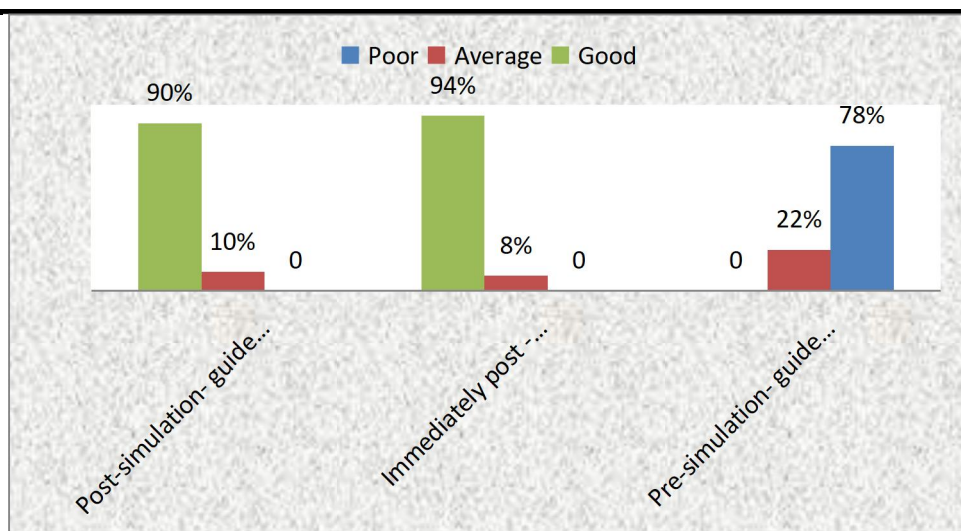
**Figure (1): Nurses distribution regarding attending training courses about cochlear implantation (n=50).**

Table (2): Difference in nurses' knowledge regarding blood transfusion pre, immediately post, and one month post- simulation- guided by training lines (n. =50)

Nurses' knowledge Regarding cochlear implantation	Pre- simulation- guided by training lines		Immediately post- ulation- guided by training lines		One month post- simulation- guided by training lines		F	P-value
	No	%	No	%	No	%		
meaning of hearing impairment,								
- Correct	31	62.0	50	100	50	100	116.7	<0.001**
- Incorrect	19	38.0	0	0.0	0	0.0		
signs, and symptoms of hearing impairment								<0.001**
- Correct	23	46.0	48	96.0	47	94.0	142.6	
- Incorrect	27	54.0	2	4.0	3	6.0		
the definition of a cochlear implant								<0.001**
- Correct	27	54.0	48	96.0	46	92.0	132.7	
- Incorrect	23	46.0	2	4.0	4	8.0		
cochlea location, cochlear implant process								<0.001**
- Correct	25	50.0	47	94.0	46	92.0	127.5	
- Incorrect	25	50.0	3	6.0	4	8.0		
The ideal age for cochlear implant								<0.001**
- Correct	24	48.0	49	98.0	48	96	119.6	
- Incorrect	26	52.0	1	2.0	2	4.0		
The specifications of people who are qualified for cochlear implants								<0.001**
- Correct	21	42.0	48	96	47	94.0	97.9	
- Incorrect	29	58.0	2	4.0	3	6.0		
The benefits of cochlear implantation								<0.001**
- Correct	25	50.0	47	94.0	46	92.0	127.5	
- Incorrect	25	50.0	3	6.0	4	8.0		
The side effects of cochlear implantation								<0.001**
- Correct	20	40.0	48	96	48	96.0	90.8	
- Incorrect	30	60.0	2	4.0	2	4.0		
The advantages of cochlear implantation								<0.001**
- Correct	19	38.0	48	96	47	94.0	97.5	
- Incorrect	31	62.0	2	4.0	3	6.0		
Complications of cochlear implantation in some cases								<0.001**
- Correct	18	36.0	48	96	49	98.0	93.2	
- Incorrect	32	64.0	2	4.0	1	2.0		

(**) highly statistical significance at $p < 0.001$



(**) Highly significant at $P < 0.001$

Figure (2): Total nurses' knowledge level regarding cochlear implantation pre, immediately post, and post one-month of simulation-guided by training lines (n=50)

Table (3): Difference in nurses' practice scores regarding cochlear implantation pre, immediately post, and one month of simulation-guided by training lines implementation (n=50)

Nurses' practice	Pre-simulation-guided by training lines				Immediately post-simulation-guided by training lines				One month post-simulation-guided by training lines				F	P
	Incompetent		Competent		Incompetent		Competent		Incompetent		Competent			
	No	%	No	%	No	%	No	%	No	%	No	%		
Incision care	34	68.0	16	32.0	1	2.0	49	98.0	5	10.0	45	90.0	125.22	0.000**
Feeding	23	46.0	27	54.0	0	0	50	100	2	4.0	48	96.0	115.8	0.000**
Nutrition	29	58.0	21	42.0	2	4.0	48	96.00	4	8.0	46	92.0	186.6	0.000**
Hygiene	34	68.0	16	32.0	1	2.0	49	98.0	5	10.0	45	90.0	124.44	0.000**
speaking, communication and education	23	46.0	27	54.0	0	0	50	100	2	4.0	48	96.0	116.5	0.000**
Hearing aid use	29	58.0	21	42.0	2	4.0	48	96.00	4	8.0	46	92.0	185.33	0.000**
educational placement and family situation surrounding the implanted child	23	46.0	27	54.0	0	0	50	100	2	4.0	48	96.0	118.45	0.000**
other instructions	29	58.0	21	42.0	2	4.0	48	96.00	4	8.0	46	92.0	186.22	0.000**
Follow-up care	34	68.0	16	32.0	1	2.0	49	98.0	5	10.0	45	90.0	124.11	0.000**

** A highly statistically significant difference ($P \leq 0.001$)

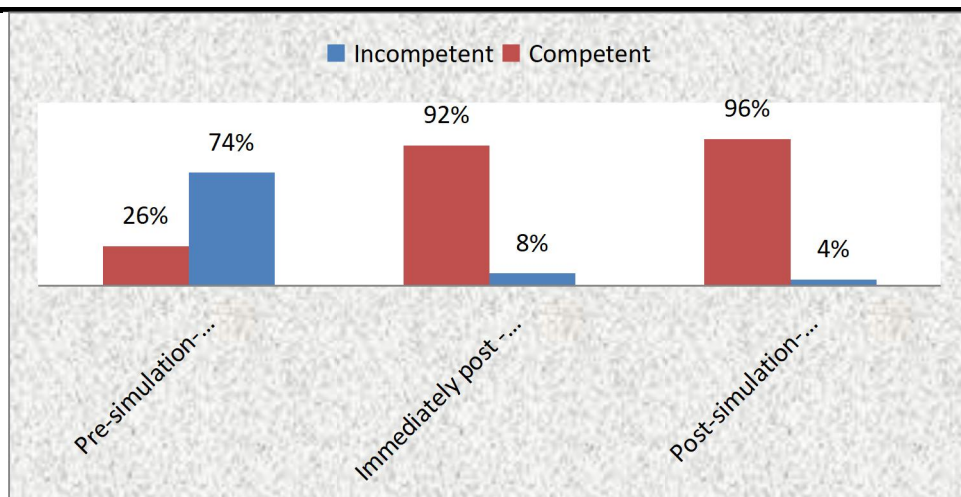


Figure (3): Total nurses' practice regarding cochlear implantation pre, immediately post, and one month of post-simulation- guided by training lines implementation (n=50)

Table (4): Correlation coefficient between total nurses' knowledge and practice regarding cochlear implantation pre, immediately post, and one month of post-simulation- guided by training lines implementation (n=50)

Variables	Total knowledge score			
	Pre- simulation- guided by training lines (n= 50)		post-one month of simulation- guided by training lines (n= 50)	
	R	P	r	P
Total practices score	0.535	0.000**	0.716	0.000**

(**) Correlation is highly significant at the <0.001

Table (5): Correlation between total nurses' knowledge and practice regarding Cochlear implantation and their demographic data (n= 50).

Items		Knowledge	Practice
Age	R	.539-	.376
	P – value	.0001**	.007**
Gender	R	.538	.502
	P – value	.0001**	.0001**
Qualifications	R	-.561	.425
	P – value	.0001**	.001**
Years of experiences	R	.448	.490
	P – value	.0001**	.0001**

** . Correlation is significant at the 0.01 level* . Correlation is significant at the 0.05 level

Discussion

Nursing educators can aid future nurses in preparing for real-world practice by using a variety of methods, including simulation. Performance refers to how well a certain task performs when measured against accepted benchmarks for accuracy, completeness, cost, and speed. A growing body of evidence indicates that inadequate nursing performance is related to poor outcomes, especially in critically ill babies (**Gomes et al., 2020**).

An efficient way to instruct nurses without endangering them is through simulation training. Simulation training is regarded as an effective teaching approach because it gives students the chance to put their newly acquired skills to use while receiving immediate feedback in a friendly setting. As nurses are exposed to high-risk medical scenarios more frequently in simulated settings, they can form habits that will help them handle emergencies more expertly and with greater enjoyment (**Baayd et al., 2023**).

One of the most prevalent disabilities is hearing impairment, which affects children and their families for the rest of their lives (**Dazert et al., 2020**). Nurses and other professionals should maintain the degree of parental participation as well as the timing, quality, and quantity of care services they get. The cochlear implant surgery impact on children with severe and/or profound hearing loss extends beyond the improvement in hearing and language skills and speech production and perception (**Zhang et al., 2020**). Hence, the study was done to evaluate the impact of simulation- guided by training lines on nurses' performance caring for children with cochlear implantation.

Results of the current study revealed that less than three fifths of the nurses who participated in the study with a mean age of $25.8 \pm .69$ years, and the majority of them were female. This may indicate that more than half of nurses had limited experience in management of children with hearing loss and cochlear implantation. So, increasing nurse's level of knowledge through in-service education was promptly needed

Since nursing was previously only

offered to girls in Egyptian institutions a few years ago, this fact may help to explain the high proportion of females and help to explain the findings of the current study.

The findings can be attributed to that females in Eastern communities prefer to work in nursing proficiency as it is suitable for their nature.

Regarding educational level, it was revealed that about two thirds of the nurses who were studied had a technical institute of in nursing. This is because academic programs at technical institutes typically last for two years, while bachelor's degree programs in nursing take four years to complete. Given the economic conditions in the region, families often prefer technical institutes as they offer a shorter duration and lower costs.

In terms of experience, results of the current study revealed that half of them had between 5 – <10 years of experience. This may indicate that these nurses are more likely to be involved in direct patient care compared to older nurses who may be engaged in administrative tasks. This finding is supported by **Ahmed & Kafal, (2019)** who found that nearly two- thirds of the studied nurses were in the age group from 20 to less than 30 years.

The results of this study showed that the majority of the nurses in the study not attended training sessions regarding cochlear implantation which may be related to lack of experienced staff. According to the study's findings, it supported the researchers' hypothesis that simulated-guided by training should be implemented for nurses.

The findings represented an improvement in nurses' knowledge of cochlear implantation with a highly significant difference detected between pre/immediate post and one-month post- simulation- guided by training lines implementation. From the researchers' point of view, this indicates how successful the use of simulated- guided by training lines was. This demonstrated the critical requirement to comprehend the simulated- guided by training lines implementation's goal of knowledge improvement. The current outcome might be brought about by nurses' interest and their inability to retain knowledge, in addition to a lack of refresher programs in pre phase, while

they attempt to improve their knowledge in post phase. Additionally, the fact that nurses have such a high level of knowledge may be a result of the beneficial effects of simulation-guided by training combined with theoretical learning sessions. This finding is corroborated by **Cerra et al., (2018)** who investigated the "Effects of high-fidelity simulation-based on life-threatening clinical condition scenarios on learning outcomes" among undergraduate and postgraduate nursing students and found that simulation training enhanced nursing students' performance and knowledge.

A study conducted in London by **Chou et al., (2022)** supports the findings of the current study and reported that there was an improvement in clinical knowledge following the simulation of scenarios. These findings were similar to **Aylward et al., (2022)** who added that educational intervention improved knowledge among the studied caregivers.

Results of the current study revealed that before to obtaining the simulation-guided by training lines, more than three quarters of nurses had a poor knowledge level about cochlear implantation. However, one month following receiving simulation-guided by training lines, their level of knowledge improved to a good level among most of them, and one-month post- after simulation-guided by training lines implementation was vast majority has improved. There was a significant improvement in nurses' knowledge level post immediate and post one-month of simulation-guided by training lines implementation. From the researchers' point of view, it reflected the positive effects of simulation-guided by training lines implementation. This was in line with **Koukourikos et al., (2021)** who reported that inclusion of simulation in the education process help nurses to provide high quality of health care, critical thinking, and optimal decision-making skills.

There was a highly statistically significant difference and improvements in all items of nurses' practice before, immediate after, and one month after the simulation-guided by training lines implementation. According to the researcher, nurses must develop their abilities to meet the unique needs of children to decrease complications during hospitalization and demonstrate the value of simulation-

guided by training lines implementation. Additionally, this outcome can be explained by the fact that a high degree of knowledge has a good impact on the level of practice.

On the other hand, the current study found that nurses' cochlear implantation practice levels had improved both immediately and a month after the use of simulated training lines. This demonstrate the impact of simulated-based training on practice among the researched nurses, according to the researchers, and it was successful in raising the scores of practice level among the studied nurses. Regarding contentment, this outcome might be a result of the simulation training being a secure learning environment where new nurses can master skills that advance their knowledge and practices.

This was consistent with other studies by **Gomes et al., (2020)**, who investigated "Clinical simulation for the teaching of wound evaluation and treatment," and found that it enhanced performance. Additionally, **Beal et al., (2017)** discovered that clinical simulation was a beneficial tactic for raising the performance of the students they studied when compared to other training methods.

In the same line, **Aloush, (2019)** found that there is an improvement in the majority of items in his study post using simulation training, which aimed to compare the effectiveness of lecture-based education versus simulation in educating student nurses and reported that the simulation approach is widely recognized to improve practical abilities compared to theoretical knowledge. Additionally, the study done by **Sok et al., (2020)** was similar to the present study in terms of using simulation-based approach but differed in the type of training course implemented. It reveals that the simulation-based training program significantly increase nurses' knowledge and skills and decreased stress in clinical setting.

The current study's findings showed that a statistically significant positive correlation was detected between nurses' knowledge and practice scores pre, immediately post, and one month post the implementation of simulated-guided by training lines. According to the researchers, the application of simulated-guided by training lines was linked to an

increase in knowledge level that assisted the nurses in mastering the performance of clinical skills. This result is in line with the findings of **Abd Elbaky, (2018)** who studied "Impact of a simulated education program on nurses' performance of invasive procedure at intensive care units" and reported that a positive correlation was detected between knowledge and general performance post the simulation education program.

The authors suggest that a strong connection exists between nurses' knowledge and their ability to develop new skills and put them into practice based on that good practice is the result of theoretical understanding. Nurse trainees can gain hands-on experience in a controlled and supportive environment through simulations, allowing them to build confidence and readiness for the practical aspects of their training. This was in agreement with Nelson, (2016) who mentioned that simulation establishes a bridge between theory and clinical practice that develop critical thinking and clinical decision-making skills thus lead to substantial learning experiences.

The current study's findings showed that a significant correlation between nurses' knowledge and practice regarding Cochlear implantation and their selected demographic data (age, gender, qualifications, and years of experiences). From the researchers' point of view, it explained by those nurses with older age, more years of experiences, and high qualifications had more knowledge and practice than others.

Conclusion

Based on the results of this study, it can be said that simulation- guided by training lines enhanced nurses' knowledge and practice with cochlear implantation. There was a significant positive correlation was detected between nurses' knowledge and practice scores pre, immediately post, and one month post the implementation of simulated- guided by training lines. As a result, the study's goal was accomplished and its hypotheses were confirmed.

Recommendations

Based on the current study findings, it can be recommended that:

- Incorporating simulation-based training

for nursing staff across diverse specialties can significantly enhance their knowledge and competence in cochlear implantation, ultimately leading to improved patient care and outcomes

- Offer simulation-based pre-service and in-service training programs for newly hired nurses to raise their performance levels.
- Motivate nurses to attend workshops, conferences, and training sessions on the care of children having cochlear implantation.
- It is need to do additional research to carry out a comparable study with a larger sample size in diverse contexts for the findings to be generalized.

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