

Coaching Program Effect on Nurses' Knowledge and Practice Regarding Caring Child Undergoing Cardiac Catheterization

Seham Mohammed Elmwafie¹, FatmaSayedAbdelaziz² & Hanan Mohammed Tork³

¹ Assistant Professor of Pediatric Nursing Department, Faculty of Nursing, Beni-Suef University, Egypt.

² Lecturer of Pediatric Nursing Department, Faculty of Nursing, Beni-Suef University, Egypt.

³ Assistant Professor of Pediatric Nursing Department, Faculty of Nursing, Zagazig University, Egypt

Abstract

Background: Coaching in nursing is one of the most promising approaches for promoting nurses personal and professional development. **Aim:** The study aimed to investigate the coaching program effect on nurses' knowledge and practice regarding caring child undergoing cardiac catheterization. **Method:** Quasi-experimental research design was used in this study. **Setting:** This study implemented in the pediatric department, Cardiac Intensive Care and cardiac catheterization Units at Beni-Suef University and Health Insurance Hospitals. **Sample:** A Purposive sample consisted of sixty nurses divided into experimental (30) and control groups (30) from the above-mentioned setting: **Tools of data collection:** Three tools were used; **Tool (I):** Structured interviewing questionnaire consisted of two parts: **Part (1):** Personal characteristics of the nurses. **Part (2):** Nurses' knowledge questionnaire. **Tool (II):** Performance checklist and **Tool (III):** Coaching Practice Rating Scale, used by the nurses as a self-evaluation instrument to reveal on the degree to which their coaching practices. **Results:** Post the coaching program applied, the total knowledge scores were significantly higher in the experimental group than in the control group ($t=3.94$, $p=.001$). As well, the performance scores were significantly higher in the experimental group than in the control group ($t=4.26$, $p<.001$) and the coaching practice scores were significantly higher in the experimental group than in the control group ($F=5.89$, $p<.001$). **Conclusion:** The coaching program is a very effective method for improving nurses' knowledge and performance in caring for children undergoing cardiac catheterization, as well as enhancing their coaching practice. **Recommendation:** Continuous application of the coaching program for nurses caring for children is essential to improving their performance and coaching skills.

Keywords: *Cardiac catheterization, Child, Coaching technique, Knowledge & Performance.*

Introduction

Pediatric interventional cardiology has undergone notable advancement recently. More children born with congenital heart disease (CHD) are surviving due to improved medical care, and their mortality rate has dropped as a result of recent improvements in CHD diagnosis, medical care, and surgical methods. To give those children the best care possible, there are many different treatment plans for the wide range of congenital heart diseases. Open heart surgery, medical treatment, and catheterization are some of these methods of treatment (Mohamed & Elsisi., 2018).

Cardiac catheterization (CC) is one of the most well-known and prominent invasive procedures. It is regarded as the gold standard of care prior to the start of therapy and for ongoing evaluation of treatment options. It also plays a critical role in diagnostic accuracy.

Pediatric cardiac catheterization is becoming more frequently used for therapeutic purposes than for diagnostic ones, especially for minor congenital heart disease repair. Since meaningful and accurate data

must be collected for pre-surgical assessments of children with CHD to better guide clinical decisions and maximize the safety and effectiveness of surgery, diagnostic CC in children is still playing a key role in some challenging patients (Feldes et al., 2021). Attributable to the invasive character, therapeutic and diagnostic treatments have specific hazards. According to several studies, therapeutic procedures have a higher rate of dangers than diagnostic ones (Moustafa et al., 2016).

Cardiovascular catheterization in children was related with a number of risks, including hypoventilation, oxygen desaturation, apnea, and even bradycardia. This necessitates either endotracheal intubation or cardiopulmonary resuscitation. Vascular problems can also include hemorrhage, hematoma, arteriovenous fistula, pseudo aneurysm, thrombosis, and occlusion, as well as femoral artery lesions during cardiac catheterization (Abdeldafie, 2018).

Lack of knowledge and practice from all pediatric cardiac catheterization team including pediatric cardiologists, radiologists, and nurses can lead to unplanned cardiac surgery and death due to

catheterization complications. Nurses who are able to promptly identify indication and complications are in the optimal position to prompt critical action and improve child outcomes. Thus, nurses those are competent in the care of a child before and after cardiac catheterization are able to minimize morbidity and mortality rates for these children within the post-operative period (Gorka et al., 2019). Children enduring cardiac catheterization are usually cared for by nurses, who have an assortment of duties and tasks in relation to the treatment of these children, which works as a team member with surgical health experts. The nurse assumes a particular position, therefore, there will be a higher need for increased surgical support for the care of underlying medical issues that are anticipated to emerge due to the lack or limits of adequate instruction and preoperative preparation (Tokel et al., 2018).

Most studies have mentioned that nurses must attend the training course on cardiac catheterization, in order to develop their skills by giving nurses the opportunity to complete graduate studies with educational sessions to enhance the nursing care provided to the child and his family during a cardiac catheterization procedure (Hassan & Aburaghif., 2016). Coaching is one of the few options put in place to enhance the creation of deliberative professional development (Mohamed & Elsisi., 2018). This can benefit students, graduates and working nurses. This approach is a form of support for individuals seeking to reach their full potential, establish goals and means to reach them, as well as build their knowledge and skills (International Coach Federation., 2018).

Coaching enable nurses to reinforce present knowledge and enhance the development of new competencies. Coaches inspire an environment of support and encouragement where the learner develops knowledge and skills. Nurses can apply it to develop in their professions and increase job satisfaction. Organizations are still looking into ways to retain senior nurses, give junior nurses chances and provide all nurses with support and practical assistance (Elnagar et al., 2020).

Nurses who want to assist children in achieving their objectives often realize that health coaching is a useful technique. As well, nurses who received coaching reported greater satisfaction and fulfillment in their current positions (Twigg et al., 2013). The declaration of the World Health Organization indicates that provision in the area of nursing utilizing the process of coaching in order to increase the professionalism of nurses. Moreover, the coaching style is one approach of promotes the nurse's and the hospital's best performance (Herawati et al., 2018).

Significant of the study:

Recently, growing attention has been given to coaching and professional development, particularly in nursing (Narayanasamy & Penney, 2014). In one study, the method of coaching nursing leaders was described. In another, undergraduate students who were also nursing students were asked to participate in a controlled trial to see if peer coaching could improve the trainers' motivation and sense of competence for carrying out a certain task (Abdalla et al., 2022).

Cardiology care units' nurses are challenged not only to provide the best possible care for the child, but also to help the parents through an uncertain knowledge and practices. Coaching is an opportunity to consciously plan nurses' professional development based on the needs and expectations of personal, child and family (Lee & Oh, 2018). Therefore, this study conducting to introducing a coaching program for the nurses dealing with children undergoing cardiac catheterization to enhance their knowledge and skills and explore the determinants of their influence on nursing professionals and child well-being.

Aim of the study

This study aimed to investigate the coaching program effect on nurses' knowledge and practice regarding caring child undergoing cardiac catheterization.

Research hypotheses

1. Nurses in the experimental group will have higher mean scores of knowledge and performance in relation to a caring child undergoing cardiac catheterization after attending coaching program sessions than nurses in the control group.
2. There will have significant differences in pre-post knowledge, practice scores between the experimental and control groups about nursing coaching knowledge and technique.

Subject & Methods

Research design:

This study used a quasi-experimental design (pre/post-test) with experimental and control groups.

Research Setting

This study, conducted in the Department of Pediatrics, Cardiac Intensive Care (CICU) and Catheterization Units at the University Hospital of Beni-Suef and the Hospital for Health Insurance.

Subject

A Purposive sample of sixty nurses enrolled from the above-mentioned setting. Then the sample divided to experimental and control groups which assigned randomly. They recruited based on the following criteria; both genders included, having at least 6 months of experience in cardiology units, regardless of their age, and qualifications.

Sample size

In order to calculate the effect size for this study, the researchers used this calculation (significance level $[\alpha] = .05$, power $[1-\beta] = .80$, effect size $[d] = .80$ with the independent-sample t-test, using the G* Power program. The minimum reported sample size in each group was 29. However, assuming a 25-35% dropout rate and based on the dataset, the researchers determined that a minimum of 30 participants would be required for the experimental group.

Tools of data collection

This study employed three tools to obtain data pre and post the coaching program.

Tool (I): Structured interviewing questionnaire it was developed by the researchers in the light of reviewing related reference (Aziz & Pary., 2021) it consisted of two parts: Part (1): Personal characteristics of the nurses such as age, qualification, years of experience and previous training courses; **Part (2):** Nurses' knowledge questionnaire, it included 15 open ended questions about CHD definition, causes, manifestation, diagnosis, methods of treatment and pediatric cardiac catheterization definition, indication, complications, and nursing role pre and post cardiac catheterization. In addition to five questions about nursing coaching definition, steps, benefits, types and effective coaching role of nurses as a coach for the child and their family. Each question was allotted a score of two for correct answer, one for incomplete answer and zero for wrong/ unknown answer. Nurses' level of knowledge based on cut of value was Good = 75- ≤100% and Low ≤75%.

Tool (II): Performance checklist, it was created by the researchers after considering relevant reference (Bowden & Greenberg., 2016) to evaluate the nurses' practices regarding the care of children pre and post cardiac catheterization, it included complete assessment and examination to the child before operation, bleeding sings, skin characteristics for coldness or warmth, puncture site characteristics, vital signs, give prescribed medication, checking fluid balance and post catheterization pain assessment, fluid and electrolyte balance. Each procedure divided into sub-items. Nursing practice levels were classified as done (one) and not done (zero).

Total ratings were divided into competent and incompetent categories based on the responses of the actual nurses. Total scores were categorized to competent 75 to 100% and incompetent < 75%.

Tool (III): Coaching practices rating scale. Nursing professionals utilize the coaching practices rating scale as a self-evaluation tool to consider how closely their coaching practices align with the coaching characteristics. It was adapted from (Rush & Shelden., 2006). The scale consists of 14 statements (such as acknowledging the learner's existing

knowledge and skills as a basis for improving their knowledge and skills, and working with the learner to identify desirable skills and a timeline for the coaching process, developed with the learner an action/motor plan needed to achieve the desired ability after each coaching session.

The researcher evaluated the scoring system for each item as; if it is No opportunity to measure (0), if it is none of the time (1), if it is some of the time (2), if it is about half the time (3) and if it is most of the time (4) and all of the time (5).

The total score ranged from 14 to 70, classified into either: The competent level from above 65% and the incompetent level below 40 %.

Validity and reliability

The research tools were submitted to five experts in the field of pediatric nursing who reviewed its elements, tested the effectiveness of the tool's content, and evaluated its clarity, completeness, relevance, simplicity, and accuracy. Based on this revision, necessary changes were made and a pilot study was conducted on 10% of the sample to validate and confirm the clarity of the tool and to estimate the time required for completion. Nurses participated in the pilot study were excluded from the main study sample.

Reliability of the tools was tested using Chronbach's alpha coefficient test. Its value was $a=0.72$ for knowledge assessment questionnaire, $a=0.89$ for performance checklist and $a=0.78$ for coaching practice scale. All study tools were used pre and post the coaching program.

Ethical considerations

Formal an approval for data collection was obtained from the hospital administrators by submitting a formal letter from the Dean of the Beni-Suef Faculty of Nursing. Before data collection began, each nurse received a possible explanation of the purpose, procedure, benefits and nature of the study. Informed consent was obtained from the nurse prior to the data collection, reaffirming that the data would be confidential and used only for research purposes.

Field of work

The study was conducted during the period from the beginning of March -2022 to the end of August -2022. The study data collection enrolled through three phases:

Firstly, pre-coaching intervention phase

Immediately after receiving the approval, the researchers explained the objectives and points of the study tools to all nurses in the experimental and control group. The total number of the studied sample (60 nurses). The experimental group composed of 30 nurses and control group composed of 30 nurses. Prior to the implementation of the coaching program, the researchers began interviewing each nurse

individually, which took approximately 20-30 minutes to assess their knowledge and observe their practices regarding the care of the child undergoing cardiac catheterization and their abilities. Coaching score recorded based on the nurses' responses. The pre-test data collection tools included elements on the general characteristics of nurses, their knowledge, performance related to the care of children undergoing cardiac catheterization (tools I, II) and coaching practices were assessed using (tool III).

Secondly, coaching technique application:

At this stage, researchers use the GROW modeling technique (Whitmore., 2002). The most common coaching strategy model is the GROW model (Goal, Reality, Options, Will). The GROW model follows a collaborative troubleshooting process that involves identifying the root cause of the problem, finding a solution, and executing it. This model is known as a simple and useful approach that focuses on the behavior of coaches during the coaching process, helping them achieve their goals and solve problems.

It includes four stages:

1. G for Goal: The goal is what the nurses want to achieve, it should be defined as clearly as possible.
2. R for Reality, Nurses at this stage describes the current situation and how far they are from their goals.
3. O for obstacles and options: What impediments (barriers) prevent nurses from achieving the goal? Once these barriers are identified, the helper can find ways to overcome them and find the options.
4. W for will for way forward: Once options are identified, they must be translated into action steps that nurses take to achieve the goal.
5. During the experimental intervention, all experimental group nurses were included in the group coaching program, the program consisting of 8 coaching sessions, including telephone or individualized coaching sessions and group discussions. The program was administered to the experimental group according to the GROW coaching model.

The first session of the coaching program was based on content sections that the nurses did not understand or on which insufficient information was provided. In group coaching, the researchers established and confirmed detailed goals the subjects wanted to achieve in each subject in phase G (goal setting) before the start of education on a particular topic in the caring children undergoing cardiac catheter, such as a definition of congenital heart disease, enumerate clinical manifestations of CHD, describe cardiac catheterization methods, identify coaching in nursing, etc. In the R (Reality) stage, the researchers identified the difficulties and obstacles to the practical

application of the theme of "care intervention guidelines for children with cardiac catheterization" through framing questions. In O (options) stage the researchers motivated education by talking about what to know and do about each topic of the program and organized coaching sessions based on participants' needs and the latest guidelines in care of children, who are undergoing cardiac catheterization. In the final stage of W (will), the researchers validated the content and encouraged participants to practice coaching with confidence in their workplace. During the coaching process, there are no ready-made solutions by the coach. While, the coach accompanies the entire process by listening carefully to the participant and asking open-ended questions designed to help the participant develop the best way to achieve the set goal based on their resources. The coaching sessions made it possible to sensitize the participants, to ask questions and to propose exercises allowing them to look at a given situation from another angle.

The researchers give training sessions for experimental group to improve their knowledge and performance. The main content of the training was the knowledge regarding CHD, cardiac catheterization indication, complications, health education for child and family procedures of caring child pre and post CC and nursing care for child undergoing cardiac catheterization. As well, sessions regarding coaching technique. The coaching sessions take place in different ways, including face-to-face meetings and via internet tools (such as Whats-App), by telephone or mixed. The coaching topics covered several areas, e.g. professional development in the care of children undergoing cardiac catheterization, management and emphasis on child care, nurses' resources and values.

Final phase, program evaluation (post coaching)

At the end of the coaching program sessions, the researchers begin to evaluate the training. Use continuous feedback to gain invaluable insights. Researchers regularly reviewed questionnaires in which nurses shared their progress, experiences, accomplishments, or challenges they might face. This continuous feedback as follow-up between sessions was done to monitor and evaluate the effectiveness of the coaching. Additionally, nurses provided a worksheet and/or action item, they support work practices in a coaching session. All the questionnaires completed by the nurses as they progress use the same pre-test tools. The practices of the participants were tested during the post-evaluation at the end of the 8 coaching sessions. The control group received no coaching sessions.

Data analysis

Data collected were edited, organized, tabulated, and analyzed using SPSS (Statistical Package for the Social Science Software) version 20 on an IBM-compatible computer. Numerical data (quantitative data) were tabulated using mean, standard deviation ($X \pm SD$) and analyzed by applying and paired t-test for normal distributed variables. Conversely, qualitative data were expressed as frequency and percentage. In addition, other statistical test such as independent t-test was used as a parametric significance test for comparing two samples. As well as Chi-square test was used. A P value of 0.05 was used to determine significance with a statistically significant $P \leq .05$ and a highly statistically significant $P \leq .001$.

Results**Table (1): Characteristics of the participants in the experimental and the control groups (n=60).**

Characteristic	Experimental (n=30)	Control (n=30)
	No (%)	No (%)
Age (years)		
20-<25	3(10.0)	8(26.7)
25- <35	16(53.3)	21(70)
35- ≤ 45	11(36.7)	1(3.3)
Mean ± SD	28.12± 2.56	26.02±3.32
Gender		
Male	17(56.7)	19(63.3)
Female	13(43.3)	11(36.7)
Education level (years)		
Diploma of nursing	23(76.7)	2(6.6)
Technical Nursing Institute	3(10.0)	18(60.0)
Bachelor in nursing science	4(13.3)	10(33.3)
Working experiences years		
1-<3	3(10.0)	3(10.0)
3-<5	4(13.3)	22(73.3)
5- ≤10	23(76.7)	5(16.7)
Mean ± SD	4.13±2.14	3.89±1.92
Previous Attending Training about pediatric cardiac catheterization		
Yes	6(20.0)	22(73.3)
No	24(80.0)	8(26.7)
Previous attending coaching program / courses		
Yes	0(0.0)	0(0.0)
No	30(100.0)	30(100.0)

Table (2): Percentage distribution the level of nurses' knowledge about congenital heart disease and cardiac catheterization in the control and the experimental groups pre – post coaching program (n=60).

Items	Pre-coaching				P – value	Post- coaching				P – value
	Control		Experimental			Control		Experimental		
	Good %	Low %	Good %	Low %		Good %	Low %	Good %	Low %	
Definition of CHD	33.3	66.7	26.7	73.3	0.26	30.0	70.0	66.7	33.3	.001*
Classification of CHD	10.0	90.0	13.3	86.7	0.23	16.7	83.3	63.3	36.7	.001*
The methods of CHD treatment	16.7	83.3	26.7	73.3	0.49	33.3	66.7	70.0	30.0	.001*
Most common causes, factors for CHD	23.3	76.7	33.3	66.7	0.19	36.7	63.3	76.7	23.3	.001*
Clinical manifestation of CHD	26.7	73.3	16.7	83.3	0.41	30.0	70.0	56.7	43.3	.001*
Total knowledge about CHD	26.7	73.3	23.3	76.7	0.53	30.0	70.0	66.7	33.3	.001*
Definition of CC	36.7	63.3	43.3	56.7	0.19	43.3	56.7	90.0	10.0	.001*
Types of CC	10.0	90.0	26.7	73.3	0.23	26.7	73.3	76.7	23.3	.001*
Indication of CC	26.7	73.3	46.7	53.3	0.39	43.3	56.7	73.3	26.7	.001*
Contraindication CC	33.3	66.7	36.7	63.3	0.23	33.3	66.7	63.3	36.7	.001*
Complication CC	16.7	83.3	30.0	70.0	0.33	30.0	70.0	73.3	26.7	.001*
Methods of CC for a child	33.3	66.7	53.3	46.7	0.17	53.3	46.7	76.7	23.3	.001*
Nursing interventions for the child pre and post CC.	26.7	73.3	40.0	60.0	0.65	43.3	56.7	86.7	13.3	.001*
Health education for the child undergoing CC.	30.0	70.0	43.3	56.7	0.36	46.7	53.3	76.7	23.3	.001*
Total knowledge about CC	50.3	49.7	43.3	56.7	0.29	56.7	43.3	93.3	6.7	.001*

Chi-square test was used; highly significant at < .001;
CHD= congenital heart diseases; CC= cardiac catheterization

Table (3): Percentage distribution the levels of nurse's knowledge about nursing coaching among the control and the experimental groups pre – post coaching program (n=60).

Items	Pre-coaching				P – value	Post- coaching				P – value
	Control (n=30)		Experimental (n=30)			Control (n=30)		Experimental (n=30)		
	Good %	Low %	Good %	Low %		Good %	Low %	Good %	Low %	
Coaching definition	3.3	96.7	6.6	93.7	.89	23.3	76.7	93.7	6.6	.000*
Nursing coaching	3.3	96.7	3.3	96.7	.85	13.3	86.7	96.7	3.3	.000*
Steps of coaching	0.0	100	0.0	100	.84	30.0	70.0	100	0.0	.000*
Effective coaching in nursing practice	0.0	100	0.0	100	.84	23.3	76.7	100	0.0	.000*
Benefit of coaching	3.3	96.7	3.3	96.7	.83	10.0	90.0	96.7	3.3	.000*
Total knowledge	3.3	96.7	6.6	93.7	.74	30.0	70.0	93.7	6.6	.000*

*Highly significant at <.001; Chi-square test was used

Table (4): Comparison of the nurses' competent performance score regarding caring children before cardiac catheterization between the control and the experimental groups pre – post coaching program (n=60).

Items	Pre-coaching (N=30)		P – value	Post- coaching (N=30)		P – value
	competent			competent		
	Control	Experimental		Control	Experimental	
Preparation for cardiac catheterization						
Explain procedure, operation to parent and answer all questions.	33.3	36.7	.170	23.3	76.7	.000*
Complete assessment and examination to child before operation	23.3	30.0	.431	13.3	86.7	.000*
Check vital signs	40.0	43.3	.134	40.0	70.0	.000*
Administer prescribed medication	56.7	60.0	.185	50.7	76.7	.000*
Give the child all needed instructions	23.3	20.0	.249	23.3	90.0	.000*
Follow infection control policy	40.0	43.3	.185	43.3	70.0	.000

*Highly significant at $< .001$; Chi-square test was used

Table (5): Comparison of the nurses' competent performance level regarding caring children after cardiac catheterization among the control and the experimental groups pre –post coaching program (n=60).

Items	Pre-coaching (N=30)		P – value	Post coaching (N=30)		P – value
	Competent			competent		
	Control	Experimental	Control	Experimental		
Regular check insertion site of catheter for bleeding or hematoma	60.0	56.7	.511	66.7	76.7	.001*
Observe skin of extremities	33.3	36.7	.185	33.3	60.0	.001*
Check vital signs every 15 minutes	20.0	23.3	.249	26.7	56.7	.001*
Measurement weight daily	23.3	26.7	.297	23.3	66.7	.001*
Regular change dressing	13.3	16.7	.233	13.3	70.0	.001*
Place child on supine position after operation	63.3	60.0	.234	60.0	90.0	.001*
Immobilize child 4 hours after operation	63.3	66.7	.223	63.3	86.7	.001*
Frequent check pulse in lower extremities	33.3	30.0	.249	26.7	66.7	.001*
Observe child for pain	23.3	26.7	.297	30.0	70.0	.001*
Measure intake and output regularly	30.0	23.3	.431	43.3	90.0	.001*
Give prescribed medication	70.0	73.3	.297	70.0	86.7	.001*
Observe any complication occur to child after operation	23.3	26.7	.297	26.7	70.0	.001*
Use strict infection control measures to prevent infection	23.3	30.0	.431	23.3	56.7	.001*
Place pressure dressing on site	60.0	66.7	.451	56.7	90.0	.001*
Give instruction to parent before discharge	26.7	30.0	.511	16.7	90.0	.001*
Total Score	43.3	36.7	.185	46.7	76.7	.001*

*Highly significant at $< .001$

Table (6): Mean and SD of total nurses knowledge and performance regarding caring child undergoing cardiac catheterization among the control and the experimental groups pre – post coaching program (n=60).

Variables	Group	Control (n=30)	Experimental (n=30)	t-test	p- value
		M±SD	M±SD		
Total Knowledge about CHD and CC	Pre	7.67±1.49	6.20±1.13	1.97	.032
	post	9.48±2.11	18.70±3.4	3.94	.001*
Coaching knowledge	Pre	1.04 ±0.19	1.00±.66	0.23	.74
	post	1.30±0.51	8.63±1.67	3.28	.001*
Total performance	Pre	11.87±1.49	10.47±3.45	.981	.185
	Post	16.47±0.45	29.47±3.45	4.26	.001*

t-test was used *highly significant at $< .001$; CHD= congenital heart diseases; CC= cardiac catheterization

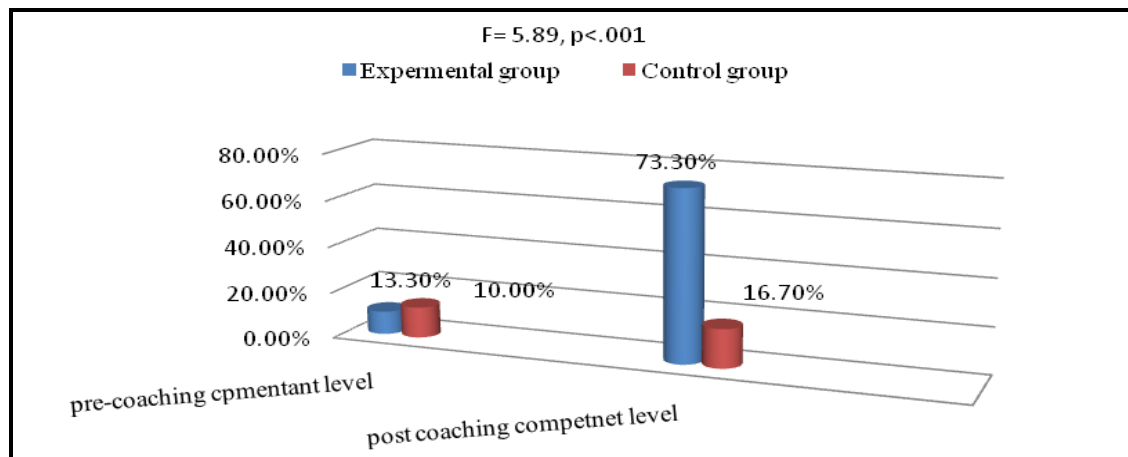


Figure (1): Percentage distribution of total nurses competent level of coaching practices among the experimental and the control groups pre and post coaching program (n=60).

Table (1): Shows that the mean age of the nurses in the experimental group was 28.12 ± 2.56 years and 26.02 ± 3.32 years in the control group. Furthermore, 43.3% of the experimental groups were female and 63.3% of the nurses in the control group were men. Their mean work experience was 4.13 ± 2.14 years in the experimental group and 3.89 ± 1.92 years in the control group. Furthermore, this table documented that 80.0% and 26.7% of the experimental group and the control group, respectively, did not receive training in pediatric CC and all of them had no previous nursing coaching courses.

Table (2): Describes that pre coaching program there were no statistical significant differences between nurses in the control and the experimental groups related their level of knowledge about CHD and CC ($p > 0.05$). While, there were significant differences in post knowledge score between the control group (30.0%; 56.7%) and the experimental (66.7%; 93.3%) about CHD and CC respectively. The Knowledge values were significantly higher in the experimental group than in the control group after the coaching program intervention ($p < 0.001$).

Table (3): Reveals that prior to the coaching program there was no significant difference in the total good knowledge score between the experimental and control groups in relation to their knowledge about nursing coaching, where $p = 0.74$. Although, after applying the coaching program, the level of knowledge scores was significantly higher in the experimental group compared to the control group ($p < .001$).

Table (4): Illustrates the nurses' competent performance score regarding caring children before cardiac catheterization, it can be noticed that pre coaching program there is no statistical significant differences between control and experimental groups in relation to their level of performance in all items ($p > 0.05$). While, the experimental group nurses showed significant improvements ($\sim \geq 75\%$) in their performance compared to the control group in each performance ability test after coaching program intervention. There was a statistically significant high difference in the experimental group's performance level compared with the control group ($p < .001$).

Table (5): Indicates that before the application of the coaching program there were no statistical significant differences between control and experimental groups in their competent level of performance in relation to caring child after cardiac catheterization where p -value = .185. While, less than half (46.7%) of nurses in the control group had a competent level compared to 76.7% of the experimental group post the coaching program intervention. There was high statistical

significant improvement in the performance of the experimental group compared to the control group ($p < 0.001$).

Table (6): Represents that the experimental group who received the coaching program showed a statistically significant increase in their total level of knowledge about CHD, CC, and coaching $t=3.94$ & 3.28 respectively, $p < 0.001$. In addition, all performance scores for caring children undergoing CC areas were significantly higher in the experimental group than in the control group $t=4.62$, $p < 0.001$.

Figure (1): Clarifies that just over three quarters (73.3%) of the nurses surveyed in the experimental group had a competent level of practical total coaching skills after coaching program intervention, while 16.7% of the control group had a competent level of practical skills of total coaching skills. There was high statistically significant difference in the experimental group's level of coaching practice versus the control group ($F = 5.89$, $p < .001$).

Discussion

According to the Act on Profession of Nurse and Midwife and provisions of the European Federation of Nurses Associations, nurses have a lifelong learning obligation. They could continue their professional development by following special training, specialist and qualification courses based on the educational programs (Kształcenia et al., 2018; European Federation of Nurses Associations, 2018).

Coaching in nursing is defined as a dual relationship between the nursing supervisor and the nurses that aims to improve nurses' skills and knowledge in relation to expected job performance (Batson & Yoder., 2012). It is considered a key behavior that health care organizations have to encourage for nurses administrator to develop their nursing staff and reach to high level of determination (Pousa., 2014; Steelman & Wolfeld., 2018).

Clinical coaching can be used to support nurses in a variety of situations. It helps the nurse provide feedback, set goals and monitor progress towards the goals (Kabeel., 2016). Practicing coaching in nursing field remains vital, not only for the development of nurses, but also for the organization (Bleich., 2016; Billings et al., 2014). Therefore this study was done to investigate the coaching program effect on nurses' knowledge and practice regarding caring child undergoing cardiac catheterization.

Concerning the interviewed nurses years of experience, it was noted that a high percentage of nurses in the experimental group had experience of

more than five years to less than ten years and nearly three quarters of the nurses in the control group had experience of less than five years. This may be due to the fact that the highest percentages of nurses surveyed were young. These findings were in agreement with (Bakhet., 2017) who looked at nurses' knowledge assessment of patient safety after cardiac catheterization at the Sudan cardiac center and found that half of the participants had work experience more than five years and less than ten years. Moreover, (Hasballah et al., 2019) illuminated that more than half of nurses working in Cardiac Catheterization Unit their experience less than five years.

The results of the present study showed that more than two-thirds of the nurses in the experimental group had obtained a nursing diploma degree, while more than half of the nurses deployed in the control group had graduated from a nursing technical institute. This result was paralleled with (Thabet et al., 2019) who examined the impact of the development and implementation of standards of care on the outcomes of patients undergoing cardiac catheterization and found that the nurses in the study group were graduated from nursing diploma, nevertheless more than two fifth of the control group were graduated from technical nursing institute.

In relation to attending training courses about caring child undergoing CC, the results of this study documented that the majority of nurses in the experimental group not attending any training. This result was in the same direction with (Sameen., 2018) who found that most of the study subject not attended any training about cardiac catheterization. In addition, more than half of nurses in the control group mentioned attendance training courses about cardiac catheterization. This may be attributed to their hospital focusing on courses related to cardiac catheterization. This result is agreed with (Abo El-ata et al., 2020) who found that most of the studied group mentioned attendance courses about cardiac catheterization training.

It was evident from the current study that pre coaching program the highest percentage of the nurses in both the experimental and the control group had low level of knowledge in relation to congenital heart diseases. Meanwhile, nearly half of nurses in the control group had good knowledge in relation to cardiac catheterization. This may be due to that most of nurses in the experimental group didn't receive previous training about CHD and CC, while nurses in control group reported attending previous training in relation to cardiac catheterization .This results disagreed with (Ali et al., 2022) they confirmed that more than two-thirds of the nurses surveyed had

adequate knowledge on the types of congenital heart diseases.

Furthermore, the results of this study indicated that there was a significant increase in the good score level of nurses' knowledge in the experimental group compared to the control group after applying the coaching program. This may be due to the good feedback and motivation of nurses to improve their knowledge about heart disease and caring for the child undergoing catheterization. This point of views of the researchers is supported by (Degavi., 2013) who done study on staff nurses working in ICCU of Heart Foundation of KLEs about effectiveness of planned teaching programmed on knowledge regarding cardiac rehabilitation and found that about half of the studied group pretest had poor level of knowledge while scores of the nurses' knowledge posttest were satisfactory.

Concerning the nurses' knowledge about the definition of cardiac catheterization, the study findings illustrated that the great majority of the experimental group nurses had good score of knowledge compared with pre coaching program. This difference might be clarified by the reality that coaching technique can help nurses in earning the essential knowledge to successfully manage the child with cardiac catheterization. The finding of the present study is disagreed with (Sharif et al., 2018)Who stated that the majority of nurses have good score of knowledge about definition of cardiac catheterization pre program intervention .

Regarding nurses' knowledge about indication of cardiac catheterization more than half of the control group had low level of knowledge about indication of CC pre and post program compared with the experimental group more than two third of them had a good knowledge about indication of cardiac catheterization. This finding may be related to the nursing coaching technique, which improves self-confidence and independence in the role of nurse, increases job effectiveness, and encourages new information. This result was supported by (Henedy & El-Sayad., 2019) who found that more than half of the nurses surveyed had sufficient knowledge of the indication for cardiac catheterization.

Regarding the knowledge of the studied nurses on the contraindications and complications of CC, these results showed that the knowledge of the nurses in the experimental group improved statistically very significantly after the implementation of the coaching program compared to the pre coaching program. As well there were no statistically significant differences in the knowledge level between nurses in the control group pre-post coaching program. This finding may be attributable to that the coaching program helped nurses update their knowledge and obtain more

information about cardiac catheterization. This finding was in line with (Mohamed & Elsisi., 2018) who mentioned that more than two third of the nurses had satisfactory level of knowledge towards contraindications and complications of cardiac catheterization post program implementation.

In examining the nurses' total knowledge of cardiac catheterization, the result of this study documented that more than half of the nurses in the experimental and the control groups had a low level of overall knowledge of CC pre coaching program intervention. Furthermore, after the coaching program, the vast majority of the nurses in the experimental group scored good level of the general knowledge about CC compared to the control group. This result corresponded to (Wondimu., 2022) who found that significant improvement of the nurses' knowledge about cardiac catheterization post program implementation .

In the light of the present study findings the reasons for lack of nurses' knowledge regarding caring of child undergoing cardiac catheterization, this might be related to lack or absent of continuous supervision and evaluation, and less educational interaction between multidisciplinary health care team members especially nurses- physicians.

The present study found that the highest percentage of the nurses in the experimental and the control groups had low knowledge about nurse coaching, with no statistical differences between the two groups prior to the application of the coaching program. This finding can be illustrated by the fact that all nurses not received a coaching program from their organization to support their role as coach in order to meet the expectations they are coaching. These findings were in similar with (Eid & Abou Ramadan., 2020) who study the effect of the coaching educational program for head nurses on nurses' self-efficacy, and found that pre program, all head nurses had low coaching knowledge level in total and in all dimensions.

Regarding the coaching knowledge of the nurses after the application of the coaching program, there was a statistically significant improvement in the knowledge level of the experimental group nurses on definition, steps, benefits, nursing coaching compared to the pre--coaching program ($P < 0.001$). As well this result did not show statistical differences in knowledge level of the nurses in the control group. This finding may be attributed to that coaching program can help nurses acquire essential knowledge about nursing coaching and it was effectively help them knew new approach in nursing field and also, nurses were more interested to gain knowledge about coaching in clinical field. This result was congruent with (Elnagar et al., 2020) who stated that all studied nurses had an improvement in their knowledge about

coaching post program. Also, (Abdalla et al., 2022) found that more than two third of studied participant had satisfactory level of knowledge about coaching post program implementation.

Moreover, these study results discovered statistical significance positive difference between nurses' coaching practice competent score post program in the experimental group than in the control group. This could be due to that nurses practices directly influenced by their knowledge besides knowledge is the baseline for the practices and essential to achieve best practices. This study is in agreement with (Ammentorp & Kofoed., 2010) who investigated the effect of coach training in improving the self-efficacy of neonatal nurses: a pilot study reporting that coaching is a process that facilitates personal growth and providing information and skills to awaken the trainee's potential abilities. They added that the ongoing feedback provided for each measurement in this coaching program could have helped build nurses' confidence and gain new skills.

The results of this study documented that there was a statistically significant improvement in the nurses' competent practices level with regard to child care prior to cardiac catheterization in the experimental group than in the control group after the coaching program application in all items of the performance checklist. This may be because group coaching can facilitate effective learning by providing suitable feedback to the group with a one-on-one focus on the specific needs and capabilities of that person. This result was supported by (Aziz&Pary.,2021) who mention that there is an enhancement in the nurses practice regarding caring child undergoing cardiac catheterization after receiving the educational program than pre program implementation. Also, this result agreed with (Henedy & El-Sayed., 2019) who found that more than half of the nurses studied had a proficient level of practice related to cardiac catheterization. Previous health care studies have reported that the coaching method to be helpful for improving practical or health management skills (Allen et al., 2008; Ammentorp & Kofoed., 2010).

In terms of nursing performance, there were statistically highly significant differences in all areas of cardiac catheterization child care skills between pre and post implementation of the coaching program in the experimental. Meanwhile, there was no statistical difference in the performance level of the control group pre-post program. This finding may be because the coaching technique is a valuable tool to help nurses increase their potential and improve their practice and can be used for staff development. This result agreed with (Mohamed & Elsisi., 2018) who found that a great majority of studied nurses had a

good performance post program intervention. Also, (Byrne et al., 2017) supported these findings and revealed that the experimental group participants who received clinical coaches in the nursing and midwifery practice program showed an increase in their performance score, which was statistically significant ($p < .001$).

Furthermore, all performance scores for the coaching areas were significantly higher in the experimental group than in the control group ($p < .001$). In this regards (Hill et al., 2015) stated that coaching is a process that facilitates self-growth and provides information and skills to awaken the trainee's own potential abilities.

Conclusion

The study concluded that the nursing coaching program is a highly effective way to improve the nurses' knowledge and performance in caring for children undergoing cardiac catheterization, as well as improving their coaching skills technique. Finally, this research provides evidence that the coaching program improved nurses' skills and autonomy in the caring role, productivity, and the development of new knowledge and skills.

Recommendations

- 1- Continuous application of the coaching program for nurses caring for children to improving their performance and coaching skills is crucial
- 2- Raising the awareness of the pediatric nurses through in-service training sessions about the pediatric cardiac catheterization standers of care is essential.

References:

- Abdalla, A., Mohammed, Y., & Abdelmonem, H. (2022): Effect of Health Coaching Intervention on Mothers' Performance in Care of their Children with Beta Thalassemia. Assiut Scientific Nursing Journal. 10(31)43-56. <https://doi.org/10.21608/asnj.2022.137423.1378>
- Abdeldafie, Y. (2018): Pediatric cardiac catheterization: experience of Sudanese center. International Journal of Current Research. 10 (9), pp.73817-73819. <https://doi.org/10.24941/ijcr.32415.09.2018>
- Abo El-ata, A., Shehab, M., & El-Zayat, R. (2020): Assessment of nurses performance regarding care of patients undergoing cardiac catheterization. Port Said Scientific Journal of Nursing, 7(2), 107-120.
- Ali, A., Al-Waly, M., Mukhlif, H., & Mansi, H. (2022): Types of Congenital Anomalies among Children at Bint Al-Huda Teaching Hospital in Al-

Nasiriyah City, South of Iraq. Bahrain Medical Bulletin, 44(1), 792-794.

- Allen, M., Iezzon, L., Huang, A., Huang, L., & Leveille, G. (2008): Improving patient-clinician communication about chronic conditions: Description of an internet-based nurse E-coach intervention. NursingResearch. 57(2):107-112. <https://doi.org/10.1097/01.NNR.0000313478.47379.98>.
- Ammentorp, J., & Kofoed, E. (2010): Coach training can improve the self-efficacy of neonatal nurses. A pilot study. Patient Education and Counseling 2010;79(2):258-261. <https://doi.org/10.1016/j.pec.2009.08.015>.
- Aziz, S., & Pary, M. (2021): Assessment of nurses knowledge and practices regarding pediatric cardiac catheterization at sulaimani cardiac hospital. 111-123. <https://doi.org/10.33899/mjn.2022.171435>.
- Bakhet, B. (2017): Assessment of the Knowledge among Nurses about Patient Safety after Cardiac Catheterization in Sudan Cardiac Center. Shandi University Graduate College and Scientific Research for MSc Nursing Program Assessment. Master thesis, Shendy University. <http://hdl.handle.net/123456789/848>.
- Batson, D., & Yoder, H. (2012): Managerial coaching: A concept analysis. Journal of Advanced Nursing, 68(7), 1658-1669. <http://doi:10.1111/j.1365-2648.2011.05840>.
- Billings, M., Kowalski, K., & Serio, J. (2014): Using coaching to create empowered nursing leadership to change lives. The Journal of Continuing Education in Nursing, 45, 12-13.
- Bleich, R. (2016): A gift to self: Leadership coaching. The Journal of Continuing Education in Nursing, 47, 11-13.
- Bowden, V., & Greenberg, S. (2016): Pediatric nursing procedures, 3rd edition, Lippincott Williams & Wilkins, China, 458- 788.
- Byrne, A., Thompson, L., Schafer, K., Elks, M., Jaspers, J., & Welch, A. (2017): Clinical coaches in nursing and midwifery practice: facilitating point of care workplace learning and development. Collegian Journal. 24(4). Available at: <http://www.elsevier.com/locate/coll>.
- Degavi, G. (2013): Effectiveness of planned teaching programme (PTP) on Knowledge Regarding Cardiac Rehabilitation among staff Nurses working in ICCU of Heart Foundation of KLEs Dr. PrabhakarKore Hospital & MRC Belgaum (Doctoral dissertation, KLE University, Belgaum, Karnataka). Asian Journal of Nursing Education and Research ISSN: 2349-2996, 2231-1149.
- Eid, W., & Abou Ramadan, A. (2020): Effect of Coaching Educational Program for Head Nurses on

- Nurses' Self-Efficacy. IOSR Journal of Nursing and Health Science, 9(2), 15-25. www.iosrjournals.org.
- **Elnagar, S., Abd El Salam, A., & Abdel-Sadik, B. (2020):** Effect of Coaching Technique on Nurse`s Performance in Care of Children Suffering from Thalassemia. Journal of Nursing and Health Science (IOSR-JNHS), 9(4), 23–35. <https://doi.org/10.9790/1959-0904052335>.
 - **European Federation of Nurses Association. (2018):** [cited 2022 August 27]. Available from: www.efnweb.org
 - **Feltes, T., Bacha, E., Beekman, R., Cheatham, J., Feinstein, J., Gomes, A., Hijazi, Z., Ing, F., De Moor, M., Morrow, W., Mullins, C., Taubert, K., & Zahn, E. (2021):** Indications for cardiac catheterization and intervention in pediatric cardiac disease: A scientific statement from the American Heart Association. Circulation, 123(22), 2607–2652. <https://doi.org/10.1161/CIR.0b013e31821b1f10>
 - **Gorka, E., Kunecka, D., Szylińska, A., & Ptak, M. (2019):** Coachingi mentoring w praktycepielęgniarskiej. Pomeranian J Life Sci, 65(1):98-104. doi: 10.21164/pomjlifesci.547.
 - **Hasballah, S., Shaor, O., Mohamed, M., & Mohamed, A. (2019):** Assess Nurses' Knowledge and Attitude for Patient Safety in Cardiac Catheterization Unit. Assiut Scientific Nursing Journal, 7(19), 151–159. <https://doi.org/10.21608/asnj.2019.74145>.
 - **Hassan, N., & Aburaghif, L. (2016):** Effectiveness of an Educational Program on Nurse's knowledge concerning Complications of Cardiac Catheterization among Children at Al-Nassirhya Heart Center. KUFA journal for nursing science, 6 (3), 243-245.
 - **Henedy, M., & El-Sayad, E. (2019):** Nurses' Knowledge and practice regarding patient's safety Post Cardiac Catheterization. IOSR Journal of Nursing and Health Science, 8(3), 43–52. <https://doi.org/10.9790/1959-0803074352>.
 - **Herawati, D., Nurmalia, D., & Dwiantoro, L. (2018):** The effectiveness of coaching using Sabra (situation, background, assessment, recommendation) communication tool on Nursing Shift Handovers. Belitung Nursing Journal. 4(2). Available at: <http://belitungray.a.org/BRP/index.php/bnj/>.
 - **Hill, B., Richardson, B. & Skouteris, H. (2015):** Do we know how to design effective health coaching interventions: a systematic review of the state of the literature. Am J Health Promot. 29(5).
 - **International Coach Federation. (2018):** Available from: <https://icf.org.pl/coaching/>. [cited 2022 August 10].
 - **Kabeel, A. (2016):** Impact of Coaching Program on Nurse Manages' Awareness Regarding Coaching Leadership. Med. J. Cairo University, 84(1), 1481-1487. www.medicaljournalofcairouniversity.net.
 - **Kształcenia, C., Podyplomowego, P., Położnych, I., Wynikow, A., Państwowych, E., Rzeprowadzonych, W., & Wiosennej, S. (2018):** The Art & Science of Coaching, Center of Postgraduate Education For Nurses and Midwives, Poland. [cited 2022 May 08]. Available from: www.ckppip.edu.pl.
 - **Lee, J., & Oh, O. (2018):** Effects of a first aid coaching program on first aid knowledge, confidence, and performance of child care teachers. Child Health Nursing Research, 24(3), 310–318. <https://doi.org/10.4094/chnr.2018.24.3.310>
 - **Mohmed, A., & Elsis, M. (2018).** Effect of Nursing Guidelines for Nurses on Occurrence of Selected Post Therapeutic Cardiac Catheterization Complications among Children. The Medical Journal of Cairo University, 86(6), 2127–2139. <https://doi.org/10.21608/mjcu.2018.57138>.
 - **Moustafa, G., Kolokythas, A., Charitakis, K., & Avgerinos, D. (2016):** Diagnostic Cardiac Catheterization in the Pediatric Population. Current Cardiology Reviews, 12(2), 155–162. <https://doi.org/10.2174/1573403x12666160301120955>
 - **Narayanasamy, A., & Penney, V. (2014):** Development in nursing practice. British Journal of Nursing, 23(11), 568–574.
 - **Pousa, C. (2014):** The Influence of Coaching on Employee Performance: Results From Two International Quantitative Studies. Performance Improvement Quarterly, 27(3), 75–92. <http://DOI:10.1002/piq.21175>.
 - **Rush, D., & Shelden, M. (2006):** Coaching Practices Rating Scale. 2(2).
 - **Sameen, F. (2018):** Nurses' Knowledge Regarding Patients Safety After Diagnostic Cardiac Catheterization in Azadi Teaching Hospital in Kirkuk City. Kirkuk University Journal-Scientific Studies, 13(4), 45–56. <https://doi.org/10.32894/kujss.2018.13.4.4>.
 - **Sharif, H. Salih, A. Sailh, N., & Salim, B. (2018):** Nurses' Knowledge Regarding Cardiac Catheterization at General Hospital in Rania City. Kurdistan Journal of Applied Research, July, 183–187. <https://doi.org/10.24017/science.2018.2.31>
 - **Steelman, L., & Wolfeld, L. (2018):** The Manager as Coach: The Role of Feedback Orientation. J Bus Psychol, 33, 41–53. <https://doi.org/10.1007/s10869-016-9473-6>.
 - **Thabet, F., Ghanem, M., Ahmed, A., & Abd-Elmouhsen, A. (2019):** Effect of Developing and Implementing Nursing Care Standards on outcome of Patients Undergoing Cardiac Catheterization.

8(1), 42–54. <https://doi.org/10.9790/1959-0801054254>.

- **Tokel, K., Gümüş, A., Ayabakan, C., Varan, B., & Erdoğan, İ. (2018):** Complications of cardiac catheterization in children with congenital heart disease. *Turkish Journal of Pediatrics*, 60(6), 675–683. <https://doi.org/10.24953/turkjped.2018.06.008>
- **Twigg, D., Pendergast, D., Flückiger, B., Garvis, S., Johnson, G., & Robertson, J. (2013):** Coaching for Early Childhood Educators: An insight into the effectiveness of an initiative. *Eric*, 4(1), 73. www.education.monash.edu.au/irecejournal/
- **Whitmore, J. (2002):** Coaching for performance: Growing people, performance and purpose. 3rd ed. London: Nicholas Brealey Publishing;78-123.
- **Wondimu, A. (2022):** Assessment of Nurses Knowledge and Practice Regarding Patient Care after Cardiac Catheterization at Selected Hospitals in Addis Ababa, Ethiopia. A Research Thesis Submitted College of Health Sciences School of Nursing and Midwifery Department of Nursing.