

## Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room

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### Abstract:

**Background:** Maternal infections around delivery are one of the main factors contributing to maternal mortality worldwide, competency outcomes and performance assessment model is an outcomes-based approach to designing, implementing infection control measures at delivery room. **Aim of the study** was to evaluate the effect of implementing competency outcomes and performance assessment model on maternity nurses' performance regarding infection control measures at delivery room. **Design:** A quasi- experimental study design was utilized. **Setting:** The study was conducted at the delivery room in Benha university hospital. **Sample:** A convenient samples of 70 maternity nurses at delivery room. **Tools:** Four tools were distributed: A structured interviewing questionnaire, an observational checklist for nurse's performance regarding infection control measures at delivery room, nurse competency scale and nurse's satisfaction questionnaire. **Results:** there was a highly statistically significant difference among total mean scores of all domains of studied nurses' knowledge and total mean scores of all practices of studied nurses' performance regarding infection control measures as well as nurses' competency scores in implementing infection control measures at delivery room pre and post model implementation. Most of studied nurses were satisfied after implementing competency outcomes and performance assessment model. **Conclusion:** there were a highly statistical significant improvements in nurses' total knowledge, total mean scores of all practices of studied nurses' performance regarding infection control measures, competence score and satisfaction level post competency outcomes and performance assessment model compared to pre. **Recommendations:** distribute the present study results of competence assessment and performance model as an updated data for improving the hospital infection control measures.

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**Key words:** Competency outcomes and performance assessment model, infection control measures at delivery room, performance.

### Introduction

Approximately one tenth of all maternal fatalities worldwide are caused by maternal infections that occur during childbirth. These infections are among the top causes of maternal mortality globally (Wahdan, et al., 2019). In addition to acute morbidities and fatalities brought on by infections during or after childbirth, persistent pelvic pain, fallopian tube obstruction, and secondary

infertility are examples of long-term impairments that may arise (Isik, et al., 2021). The most crucial area of focus in an obstetrics delivery room is infection control, which is defined as the actions taken by nurses to lower the danger of infectious agents spreading to women (Ali, 2019).

The use of personal protective equipment, environmental controls, waste management, managing patient-care equipment, and

## **Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

avoiding needle stick injuries are all included in infection control procedures. Apart from the conventional measures for isolation, safety management and prevention of exposure (**Douedi and Douedi, 2023**).

Adequate knowledge along with the correct procedure performance is required to follow the standard aseptic technique which is an efficient and effective means to prevent infection either to labored women or maternity nurses (**Jarelnape, 2023**). A study by **Goniewicz et al., (2021)** suggests that competency-based training is essential for healthcare professionals to effectively handle standard infection control measures by focusing on specific skills that address the challenges of managing such situations. Education and training programs can greatly enhance the competency outcomes and performance assessment model (**Ara, et al., 2019**).

Competency outcomes and performance assessment model (COPA model) is defined as the most common approach for training at work. Such kind of training can be considered an effective way for enhancing the nursing performance as well as more competence establishment about the standardized infection control measures (**Muzeya and Julie, 2020**).

Maternity nurse has the professional and legal responsibility to integrate competency outcomes and performance assessment model regarding infection control measures into the routine care. Which include performing hand hygiene, use of personal protective equipment's sharps safety, safe injection practices, sterile instruments, safe management of the care environment and safe disposal of waste are the most important interventions to prevent transmission of infection and recommended as quality

standards in all health institutions (**Abdelrazig, 2020**).

Maternity nurse satisfaction is “a positive emotional state resulting from the appraisal of the experiences.” nurse satisfaction is positively and mutually related to COPA model implementation. Nurse satisfaction is affected by desire to use skills and abilities. Nurses' satisfaction can be assessed at the global level or at the individual level (**Xu and Fan, 2023**).

### **Significance of the study**

Infection encountered in the delivery room represents a prevailing challenge and obstacle experienced by healthcare facilities in various nations globally. The presence of infection poses a significant public health concern across all communities. The maternal mortality ratio in Egypt for the year 2017 was approximated to be 37 fatalities per 100,000 live births. Among these mortalities, approximately 20% were attributed to post-operative morbidities (**Demographics, 2021**).

The prioritization of decreasing maternal mortality is emphasized in the third objective of the 2030 Sustainable Development Goals, which aims to attain overall health and well-being for all individuals. The WHO's publication on Strategies for Ending Preventable Maternal Mortality is concentrated on diminishing the disparities that lead to variations in the availability and standard of healthcare services and is crucial for optimizing the effectiveness of nursing personnel in implementing infection control protocols necessary for guaranteeing topnotch care provisions. In practice, Competency-outcomes and performance model is an outcomes-based approach to designing, implementing, assessing, and evaluating the

nurse's performance in applying the infection control measures (**Khan and Ramachandran, 2020**). implementing recent approaches for continuously improve the performance of nursing staff toward infection prevention is important role to integrate the nursing research into clinical practices and to produce valuable improvements in quality of care and nurses' satisfaction. And conducting recent study is a valuable guide to maternity nurses in applying standard infection control measures at delivery room.

### **Aim of the study**

The aim of this study was to evaluate the effect of implementing competency outcomes and performance assessment model on maternity nurses' performance regarding infection control measures at delivery room. It was achieved through:

- Assessing maternity nurses' knowledge, performance, and level of competence regarding infection control measures at delivery room.
- Designing and implementing competency-outcomes and performance model regarding infection control measures at delivery room.
- Evaluating the effect of competency-outcomes and performance model on maternity nurses' knowledge, performance, level of competence and satisfaction regarding infection control measures at delivery room.

### **Research Hypotheses:**

- **H1:** Maternity nurses' knowledge and performance regarding infection control measures will be improved after receiving competency-outcomes and performance model than before.
- **H2:** Maternity nurses' competency score regarding infection control measures will be

higher after receiving competency-outcomes and performance model than before.

- **H3:** Maternity nurses will have higher satisfaction scores regarding implementing competency-outcomes and performance assessment model.

### **Operational definition:**

**The COPA model:** The maternity nurses must adhere to eight important steps. the eight core competencies outcomes and performance assessment model in implementing infection control measures at delivery room including assessment and intervention, communication, critical thinking, human caring and relationship, management, leadership, teaching, and knowledge integration.

**Nursing performance:** refers to indicators of intellectual and physical practices to achieve work goals and achieve organizational standards and goals. The extent of nursing performance's commitment to the competency-based training model for infection prevention and following clinical skills and practices.

### **Subjects and method**

#### **Study design:**

A quasi- experimental (a single group pretest-posttest) study design was utilized to fulfill the aim. A quasi-experimental approach tries to establish a causal association between an independent and dependent variable (where the dependent variable is competencies outcomes and performance assessment model, and the dependent variable is nurses' performance regarding infection control measures at delivery room). All subjects had baseline measurements for the dependent variables before and after the study intervention to determine how much the dependent variables had changed (**Flannely, et al., 2018**).

## **Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

### **Setting:**

The study was conducted at obstetrics delivery rooms in Benha university hospital, Egypt which received a high flow rate of admitted pregnant women for normal labor and cesarean sections operations. The delivery room located in the underground contains normal labor room with three delivery beds and the operating room with capacity of two surgical rooms for planned or emergency cesarean section, emergency complications as dilatation and curettage, postpartum hemorrhage.

### **Sampling:**

- **Sample type:** A convenient sample.
- **Sample size:** The sample consisted of 70 maternity nurses (30 nurses in normal delivery room and 40 nurses in operating room (cesarean section delivery).

### **Tools of data collection:**

Four tools were utilized for data collection

#### **Tool I: A structured interviewing questionnaire:**

Researchers designed it after conducting a thorough review of relevant literature pertaining to the study (Naga, et al, 2021; Osman, et al, 2023), and sectioned two parts:

**Part (1):** the general characteristics of studied nurses. It included (age, educational level, experience` years, residence, attended any training program regarding infection control measures).

**Part (2):** Nurses' knowledge regarding infection control measures at delivery room, consisted of two sections A- infection in general (6 domains) as definition of infection, nosocomial infection, chain of infection, the routes of transmission, the places of exit, the causes of infection. B- Standard infection control measures (37 domains) as surgical

hand hygiene (5 domains), protective clothes (6 domains), safe injection and handling of sharp instruments (7 domains), waste disposal (6 domains) disinfection (9 domains) sterilization (4 domains).

### **Scoring of knowledge:**

Each item received a score of (2) for a correct answer, while a score of (1) was assigned for an incorrect answer. The total knowledge score was determined by adding up the scores from different domains. The overall knowledge score for nurses ranged from (43-86). The classification of nurses' knowledge score was as follows:

- Inadequate knowledge when total scores < 75% (< 65 points).
- Adequate knowledge when total scores  $\geq 75\%$  ( $\geq 65$  points).

**Tool II: An observational checklist for nurse's performance regarding infection control measures at delivery room,** it was adapted from (Kening and Groen, 2023) and included 70 practices performed under eight main procedures as putting and removing head cover (2 practices), wearing, and taking off over shoes (3 practices), surgical hand washing (19 practices), surgical gloving (13 practices), surgical gowning (12 practices), masking (10 practices), handling sharp instruments (5 practices), cleaning and sterilization (6 practices).

### **Scoring system:**

Each practice was scored as (2) for correct practice, while (1) for incorrect practice. The total score of practices (70 items) were the summed of all observations scores and presented as satisfactory performance when the score was  $\geq 75\%$  ( $\geq 105$  points), and unsatisfactory performance when it was <75% (<105 points).

**Tool III: Nurses' Competency Scale:** It was adapted from (Meretoja, et al., 2004 & Alharbi, et al., 2019) to assess maternity nurse competency level regarding infection control measures at delivery room. The researchers made modifications to align with the nature of the study such as addition of some items and exclusion of other steps not applicable; it includes 7 domains with (28 items) as follow: helping role "4 items" (Planning care for implementing competency assessment model of infection control measures, modifying of infection control measures according to nurse's needs, decision-making guided by ethical values, organizing own workload and time management principles for meeting responsibilities), teaching coaching "2 items" (Taking proactive actions to preserve and develop my professional skills regarding infection control measures, Coaching others in duties within the responsibility area), diagnostic function "2 items" (integration of infection control measures during nursing care in the delivery room, identifying needs of women undergoing normal delivery or surgical procedures as cesarean section, dilatation, and curettage), managing situation "7 items" (Prioritizing practices flexibly regarding applying infection control measures in different situations as in emergency situations, arranging debriefing sessions for the care team according to changing situations, promoting flexible team cooperation in emergency cases, identifications warning situation posing a threat to women after delivery, emergent action in any possible complication for women as assessing the woman for signs of injury, Planning care consistently regarding maintaining standard infection control measures during providing nursing care, keeping surgical equipment sterilized), ensuring quality "3 items" (familiar with hospital policy and rules, familiar with hospital vision, mission and goals, able to identify areas

in nursing care that need further development), therapeutic interventions "6 items" (Incorporating relevant knowledge to provide optimal care in applying infection control measures as (Hand hygiene, personal protective equipment for health care staff and patients, disinfection and sterilization, minimize risk of sharp injuries, waste management, delivery room preparations) during routine care, evaluating systematically the presence of infected cases and work role competencies "4 items" (acting autonomously, aware of the resources limits, working responsibly according the financial resources, utilizing information technology in the work to support safe care for women at delivery room and improve the outcomes).

**Scoring system:**

Each item was categorized into a three-point Likert scale continuum. Each item was given a score (2) if it used often, a score (1) if it was used sometimes, and a score (0) if it was not used. The total competency score was set by adding the item-by-item scores. The range of obtained scores was between 0 and 56, with higher scores indicating more competency.

**Total competency score was classified in to two levels:**

- Competent: if the total scores ( $\geq 80\%$  - 100%) = (Score from 45 to 56)
- Incompetent: if the total scores ( $< 80\%$ ) = (Score from 0 to 44).

**Tool (IV): Nurses' satisfaction with competency outcomes and performance assessment model (COPA model).** It was adapted from (Kreem & Al Kassar 2021; Reza et al., 2019). This tool examined nurses' satisfaction regarding COPA model, which was used after implementing the program and includes 11 questions as following. (the training content is effective, the objectives of the model are cleared, the content of the practical training is standardized, , the



## **Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

teaching methods used are attracted and varied, a suitable environment has been created for the program, the training sessions is appropriate, sufficient time was given to each session, additional time was given to ask questions to the researchers, the COPA model helped in active participation in the sessions, the COPA model does not overburden the nursing care assigned to it, the COPA model positively contributed to the nurses' competence toward infection control measures at the delivery room.

### **Scoring system**

The items were estimated according to a three continuum of the Likert scale ranged from (3) satisfied, (2) fairly and (1) unsatisfied. By summing the scores of the items, the total score gives the overall satisfaction score, and classified into three levels:

- Satisfied: when total score > 75%
- Fairly when total score 60 -75 %.
- Unsatisfied when total score < 60 %

### **Tools validity and reliability**

The content validity of the data collection tools was evaluated by a panel of three experts in Obstetrics and Gynecology Nursing, two professors from the Faculty of Nursing at Benha University, and one professor from the Faculty of Nursing at Ain Shams University. The tools were thoroughly revised by this esteemed group to ensure their accuracy and relevance. Essential adjustments were made based on insightful feedback received such as modify some words of nurse competence scale to give the most appropriate meaning and suitable for the sample understanding and add the tool III to highlight the effect of applying competency outcomes and performance assessment model in clinical setting. The tools' reliability was assessed using the Cronbach's Alpha coefficient test, which highlighted that

the internal consistency of each tool as following:

<b>Tool</b>	<b>Cronbach's Alpha value</b>
<b>Tool I- part 2:</b> Nurses' knowledge tool	0.92
<b>Tool II:</b> An observational checklist for nurse's performance.	0.77
<b>Tool III:</b> Nurses' Competence Scale	0.80
<b>Tool IV:</b> Nurses' satisfaction tool	0.75

### **Ethical considerations**

The following ethical considerations were taken into account prior to the study's implementation: Before doing the current study, obtain written approval from the Benha University Nursing Faculty's Ethical Committee REC-OBSN-P42. Before the study was applied, its purpose was described. Every sample was asked for written permission to take part in the study. There would be no negative effects from the study on the body, society, or mind. Preserve the sample's dignity, self-worth, and anonymity. In addition to the flexibility to discontinue taking part in the study at any moment.

### **Pilot study**

The pilot study was done on 10% of the total number (7nurses) to assess tools' applicability and clarity as well as the feasibility of fieldwork and any potential barriers. The length of time required to finish the tools was also determined by the pilot study. No changes were made because the tool's items were understandable and clear and pilot sample were included in the main study.

### **Field work**

In order to achieve the objective of this study, several phases were executed, including the interview and assessment phase, planning phase, implementation phase, and evaluation phase. These phases spanned a period of nine months, commencing in June 2023 and concluding in February 2024.

### **Interviewing and assessment phase:**

After reviewing relevant national and international literature about COPA model and standardized infection control measures at delivery room, the tools for data collection were prepared then conduct pilot study which conducted in the following consequences:

The researchers talked to each nurse, introduced themselves to them, as well they informed them about the purpose of the study, how long it would last, and what would be done, and obtain the verbal approval to participate in the study before data collecting. Next, each nurse was asked to fill in tool one (The structured interviewing questionnaire) on their own to get the baseline data. On average, it took between 15-20 minutes to finish each interview with a nurse. After that, the researchers observe nursing performance in applying infection control measures at delivery room at (preparation, during delivery and after delivery) and recorded the competence scale sheet according planned organized steps tool II & tool III which took about 30 – 45 minutes, Meanwhile the pretest was collected, and this data base addressed the nurses needs during pre-assessment.

### **Planning phase:**

Based on the results obtained from the pretest of assessment nurses' knowledge, an observational checklist for nurse's performance regarding infection control measures and nurses' competence scale, the researchers designed the educational booklet in

Arabic to facilitate the retained of provided information and adherences of nurses' practices. Competency outcomes and performance assessment model has been developed for maternity nurses using plain Arabic language in order to suit their level of understanding. The model includes specified sessions with pre-determined content, various teaching methods, and instructional media. Objectives have been formulated to be achieved after completion of competency outcomes and performance assessment model. The general objective was: following the completion of competency outcomes and performance assessment model sessions, each maternity nurses will be able to gain essential knowledge and competent performance regarding infection control measures at delivery room.

### **Implementation phase:**

The researchers conducted visits to the mentioned location on three separate days each week (Saturday, Monday, and Wednesday) from 9:00 AM to 12:00 PM. During these visits, introduced themselves and provided an explanation of the study's objectives; the researchers prepared the different methods for theoretical session as lecture, group discussion, brainstorming and power point presentation. While the practical sessions were conducted using demonstration and re-demonstration for nurses. Duration of each session was 45-60 min. Number of participants of each session was five. The period of discussion given the studied nurses a chance to ask questions and be clarified by the researchers, at the end of the session a booklet prepared by the researchers was distributed among all nurses. The training was done to participants during off-duty hours of nurses in a hospital room equipped with audiovisual technologies specified for teaching purposes. The performance assessment model will be conducted through eight sessions (two

## Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room

sessions for theoretical session and six sessions for practical).

**The First session:** it objected to establish an effective communication between nurses and researcher, explain the eight core competencies outcomes and performance assessment model including assessment, intervention, communication, critical thinking, human caring and relationship, management in providing infection control measures at delivery room. leadership, teaching, knowledge integration and explain the items of educational booklet about concept of infection, types of hospital acquired infection, chain of infection, routes of transmission, the signs, and symptoms of infection besides the infection control measures.

The researchers supported the information with clear pictures. At the end of the session, the researchers gave the nurses the opportunity to express feedback on the session and allowed the nurses to ask questions and have them answered by the researchers.

**The Second session:** the researchers demonstrated the first core competence (assessment and intervention) and the second core competence (communication) which highlighted the methods of collecting, assessment, analysis, and communicating data with authorized infection prevention unit in the hospital to plan organized data sheet about structure of delivery room, rounded personnel and their professional responsibilities, available equipment and instruments, process of autoclaving besides waste and disposal. Then the researchers teach the participants the standard infection control measures to plan a routine care following the safety and protection practices as surgical hand washing technique, putting and removing on overhead and wearing and taking off over shoes, masking, gowning and gloving.

**The Third session:** It objected toward applying the third core competency (critical thinking) as the researchers teach the participants how to integrate gathered data from multiple sources in applying prevention control measures; prioritizing anticipates and creating alternatives for potential problems happen as the challenges as shortage of staffing or inadequate supplies and equipment and the researchers discussed the process of making decision based on scientific inquiry to overcome these challenges.

**The Fourth session:** the researchers demonstrated the fourth, fifth and six core competences (Human Caring and Relationship), (management) and (leadership) respectively in this session which valued the role of participants in applying standard infection control measures following the COPA model steps as cultural respect of the patients, cooperative interpersonal relationship, relationship-based care and working in a team to maintain patient safety procedures as, preparation of patient for operation, preparation of delivery room (cleaning of surgical instruments and devices, and sterilization of surgical bed & operating table).

**The Fifth session:** started by following the seventh core competence (teaching) as the researchers demonstrated Then nurses re-demonstrated the provided procedures in last sessions targeting health promotion, safety protection and provide effective care supporting patient and/or family goals for life and wellness.

**The Sixth session:** the researchers completed the seventh core and demonstrated. The procedure of scrubbing the site of operation with antiseptic solution and the procedure of perform urinary catheter and nurses re-demonstrated the same procedures.



**The Seventh session:** the researchers demonstrated the procedure of handling sharp instruments during the obstetric operation and procedure of dealing with sharp instruments after operation, handling linen, drainages care, perineal care, care of catheter, perform intravascular device and give medication and fluids. The nurses demonstrated the same procedures.

**The Eighth session:** the researchers demonstrated the objective of the eighth core competency (knowledge) which aimed to apply polices of Standard infection control measures in routine health care, provide specialty-focused care for vulnerable groups of patients with diarrhea, vomiting, fever, or respiratory symptoms. And finally emphasized the importance of follow the standard infection control measures as it utilized as evidence-based practices. The nurses re-demonstrated the practiced procedures in the previous sessions.

By the end of each training day, 30 minutes were scheduled to thank the participants and close the session.

#### **Evaluation phase:**

Immediately after the training of competency outcomes and performance assessment model was implemented, the researcher used the same format of the pretest to evaluate effect of COPA model on nurses' knowledge (tool I), performance (tool II) and competency level regarding infection control measures at delivery (tool III). As well as, nurses' satisfaction regarding COPA model was evaluated posttest only by (tool IV).

#### **Statistical analysis:**

The data was verified before being entered into the automated system. Analysis and tabulation were performed using SPSS version 24 for the Statistical Package for the Social Sciences. Various descriptive statistics

were calculated, including mean, standard deviation, frequency, and percentage rates. In addition, statistical tests such as Pearson correlation coefficient, paired t-tests, and chi-square test were used. The results showed that a p-value  $> 0.05$  indicates no statistically significant difference, a p-value  $< 0.05$  indicates a statistically significant difference, and a p-value  $\geq 0.001$  indicates a highly statistically significant difference.

#### **Study limitations:**

Sometimes interviewing nurses and implementation of the model sessions were protracted as many nurses were busy with working duties.

#### **Results:**

**Table (1):** Demonstrates that 55.7% of the studied nurses were in the age group  $25 < 30$  years with mean age was  $30.1 \pm 7.27$  years, 62.8% of the studied nurses were studied at the technical institute of nursing and 48.6% had  $5 < 10$  years of experience with mean year of experience  $8.92 \pm 4.66$  years. As regards residence, 52.9% of the studied nurses live in rural areas.

**Figure 1:** Illustrates that 58.6% of the studied nurses didn't attend any training program related to infection control measures at delivery room.

**Table (2):** Denotes that there were highly statistically significant difference among total mean scores of all domains of studied nurses' knowledge about infection control at delivery room pre and post the COPA model implementation with (p-value $<0.001$ ). It was revealed that total mean score of studied nurses knowledge was raised from  $62.91 \pm 6.99$  pre COPA model implementation to  $72.08 \pm 4.50$  post COPA model implementation.

**Figure (2):** Presents that, (57.1%) and (87.1%) of studied nurses had adequate

## Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room

knowledge regarding infection control at delivery room pre and post the COPA model implementation respectively.

**Table (3):** Indicates that, that there was a highly statistically significant difference among total mean scores of all practices of studied nurses' performance regarding infection control measures at delivery room pre and post the COPA model implementation with (p- value<0.001). It was revealed that total mean score of studied nurses' performance was raised from  $115.10 \pm 9.82$  pre-COPA model implementation to  $128.34 \pm 4.10$  post COPA model implementation.

**Figure (3):** Shows that, (61.4%) and (88.6%) of studied nurses had satisfactory performance in applying infection control measures at delivery room pre and post the COPA model implementation respectively.

**Table (4):** Displays that, there was a highly statistically significant difference among mean scores of nurses' competency regarding infection control measures at delivery room pre and post the COPA model implementation with (p- value<0.001). It was revealed that total mean score of studied

nurses' competency was raised from  $33.87 \pm 3.66$  pre-COPA model implementation to  $42.61 \pm 4.27$  post COPA model implementation.

**Figure (4):** Shows that, (68.6%) and (88.6%) of studied nurses showed competent performance regarding infection control measures at delivery room pre and post the COPA model implementation respectively.

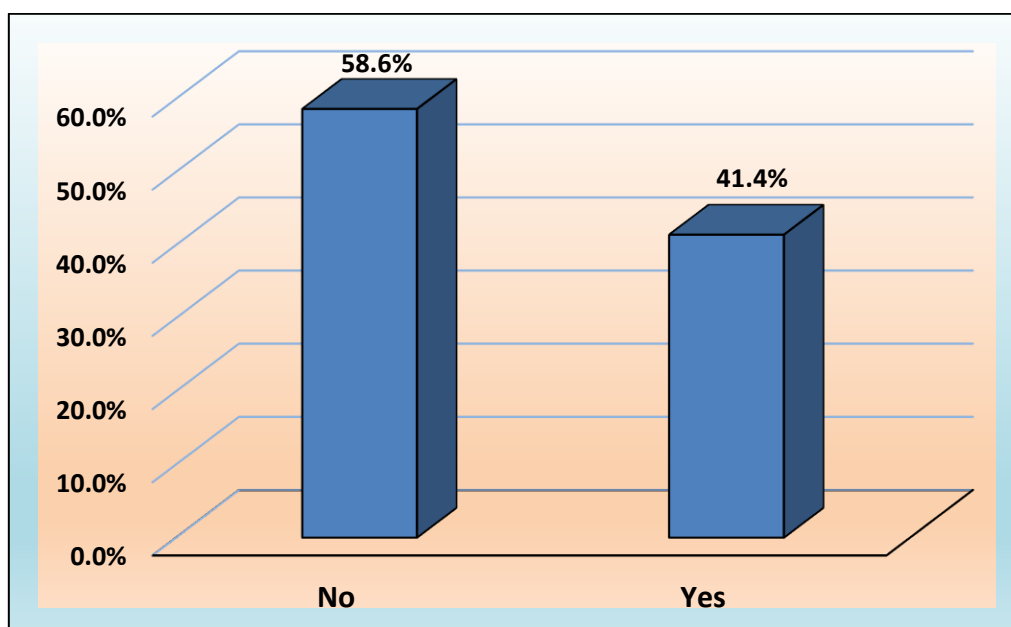
**Table (5):** Shows the higher scores (100.%, 95.7%, 90.0%) of the studied nurses were satisfied with implementing competency outcomes and performance assessment model regarding infection control at the delivery room.

**Figure (5):** Shows that 88.6% of studied nurses were satisfied after implementing competency outcomes and performance assessment model.

**Table (6):** Reveals that; there was a highly significant statistical positive correlation between total performance score, total knowledge score and total nurses' competency score regarding infection control measures at delivery room pre and post the COPA model implementation with ( $P \leq 0.001$ ).

**Table (1): Distribution of the studied nurses according to their general characteristics (n=70)**

General characteristics	NO.	%
<b>Age (year)</b>		
20-<25	5	7.1
25-<30	39	55.7
30-<35	14	20.0
≥ 35	12	17.2
<b>Mean ± SD</b>	<b>30.1 ± 7.27</b>	
<b>Educational level</b>		
Nursing diploma	20	28.6
Nursing technical institute	44	62.8
Nursing Bachelor	6	8.6
<b>Experience years</b>		
1-<5	14	20.0
5-<10	34	48.6
10-<15	10	14.3
≥ 15	12	17.1
<b>Mean ± SD</b>	<b>8.92 ± 4.66</b>	
<b>Residence</b>		
Rural	37	52.9
Urban	33	47.1



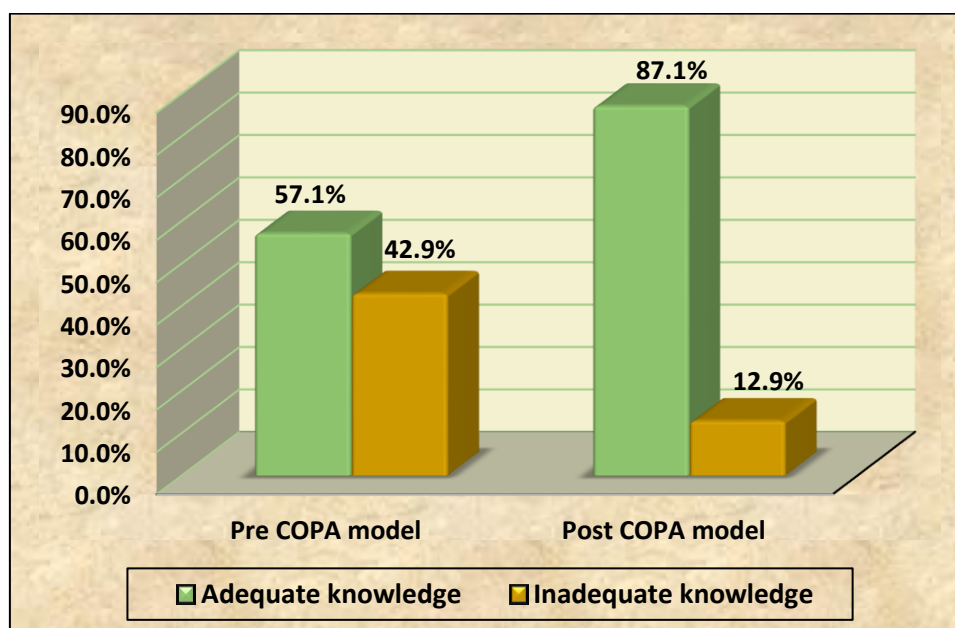
**Figure 1: previous training program related to infection control measures at delivery room (n=70)**

**Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

**Table (2): the Mean scores of studied nurses' knowledge regarding infection control at delivery room pre and post the COPA model (n=70).**

Knowledge domain	Min./Max. score	Pre COPA model	Post COPA model	Paired t- test	p-value
		Mean ± SD	Mean ± SD		
General Knowledge regarding infection	6/12	8.78±1.08	10.20±1.09	9.78	0.000**
<b>Standard infection control measures</b>					
Surgical hand hygiene	5/10	7.42±0.84	8.82±0.70	21.33	0.000**
Protective clothes	6/12	8.98±0.95	10.41±1.08	10.76	0.000**
Safe injection and handling of sharp instruments	7/14	10.08±1.56	11.20±1.13	11.28	0.000**
Waste disposal	6/12	8.87±1.10	10.31±1.22	9.86	0.000**
Disinfection	9/18	13.30±1.39	14.41±0.92	7.03	0.000**
Sterilization	4/8	6.45±0.75	6.71±0.70	15.59	0.000**
<b>Total score</b>	<b>43/86</b>	<b>62.91±6.99</b>	<b>72.08±4.50</b>	<b>16.83</b>	<b>0.000**</b>

\*\*A Highly Statistical significant  $p \leq 0.001$

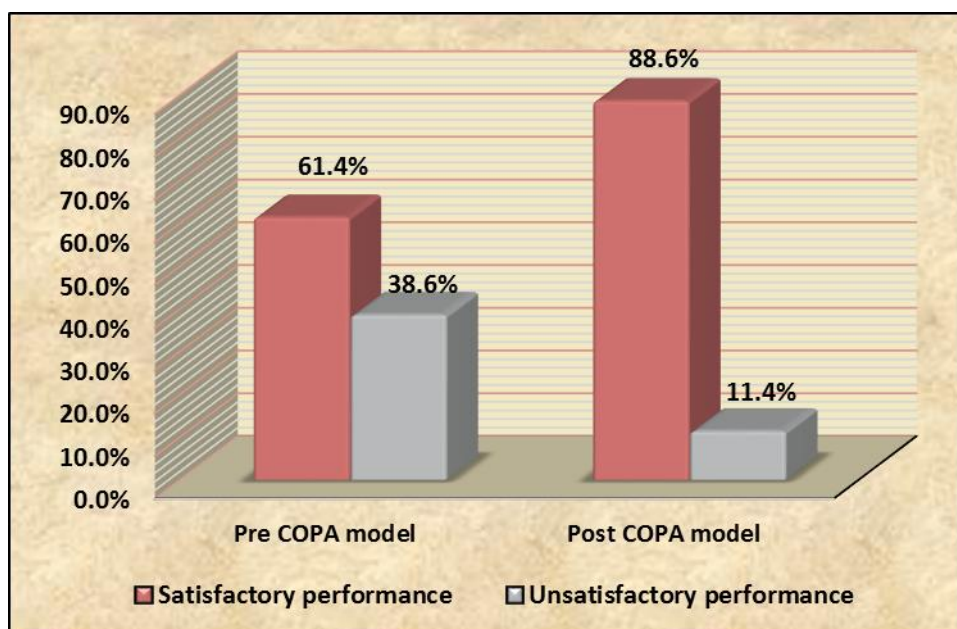


**Figure (2): Percentage distribution of studied nurses regarding their total knowledge about infection control at delivery room pre and post the COPA model (n=70).**

**Table (3): The Mean scores of the studied nurses' performance regarding infection control measures at delivery room pre and post the COPA model (n=70).**

Procedures	Min./Max. score	Pre COPA model	Post COPA model	Paired t test	p-value
		Mean ± SD	Mean ± SD		
Putting and removal head cover	2/4	2.85±0.51	3.71±0.45	20.34	0.000**
Wearing and taking off overshoes	3/6	4.35±0.85	4.92±0.68	6.51	0.000**
Surgical hand washing	19/38	32.10±3.35	34.91±1.36	6.87	0.000**
Surgical gloving	13/26	21.58±1.89	23.80±1.43	9.66	0.000**
Surgical gowning	12/24	19.64±2.14	22.01±1.33	10.63	0.000**
Masking	10/20	16.18±1.24	18.72±1.10	20.09	0.000**
Handling sharp instruments	5/10	8.34±0.99	9.02±0.70	5.35	0.000**
Cleaning and sterilization	6/12	10.02±1.22	11.21±0.75	7.69	0.000**
<b>Total score</b>	<b>70/140</b>	<b>115.10±9.82</b>	<b>128.34±4.10</b>	<b>15.58</b>	<b>0.000**</b>

**\*\*A Highly Statistical significant  $p \leq 0.001$**



**Figure (3): Percentage distribution of studied nurses regarding their total performance score about infection control measures at delivery room pre and post the COPA model (n=70).**

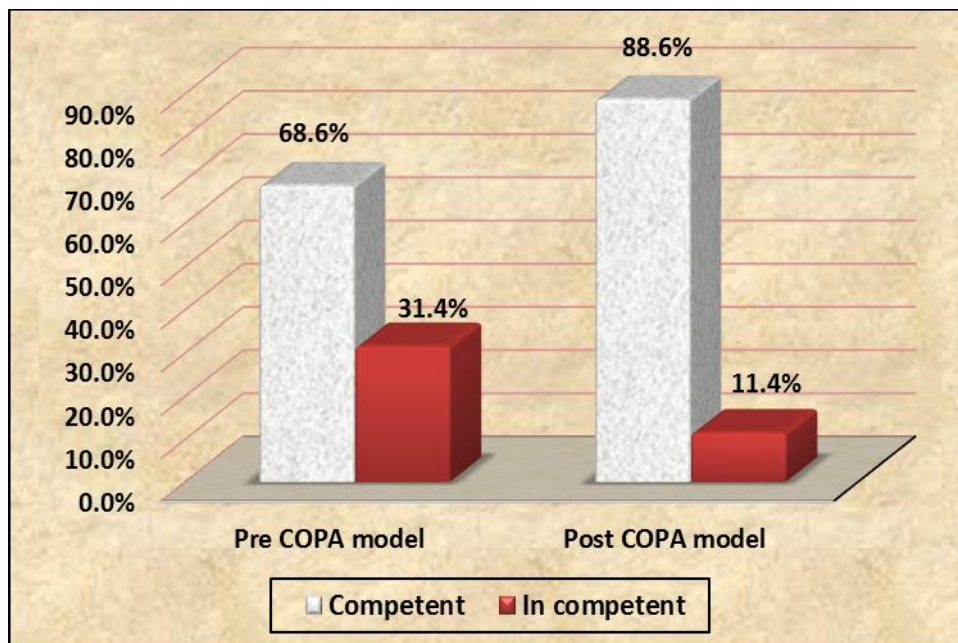


**Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

**Table 4. The Mean scores of the studied nurses `competence scale pre and post and competency outcomes and performance assessment model (n =70).**

Competency domains	Min./Max. score	Pre COPA model	Post COPA model	Paired t test	p-value
		Mean ± SD	Mean ± SD		
Helping role	0/8	4.91±0.73	6.05±0.93	8.08	0.000**
Teaching – coaching	0/4	1.98±0.57	3.14±0.64	13.54	0.000**
Diagnostic functions	0/4	2.07±0.54	3.24±0.69	14.40	0.000**
Managing situations	0/14	9.95±1.24	10.32±1.30	6.38	0.000**
Therapeutic interventions	0/6	3.10±0.45	4.68±0.87	13.88	0.000**
Ensuring quality	0/12	7.05±1.07	8.87±1.63	18.88	0.000**
Work role	0/8	4.78±0.61	6.28±0.88	11.69	0.000**
<b>Total score</b>	<b>0/56</b>	<b>33.87±3.66</b>	<b>42.61±4.27</b>	<b>25.78</b>	<b>0.000**</b>

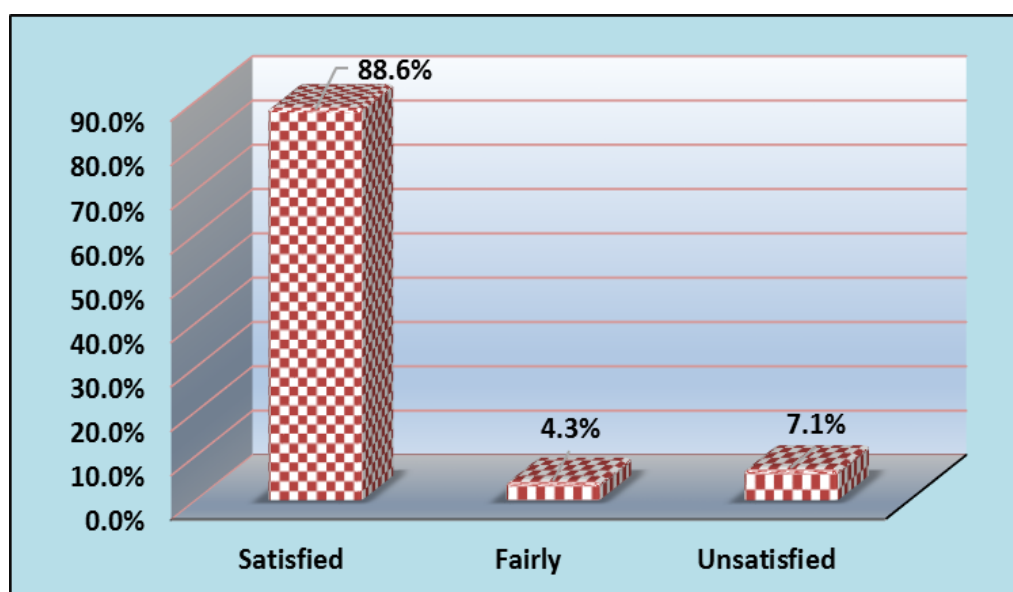
**\*\*A Highly Statistical significant  $p \leq 0.001$**



**Figure (4): Percentage distribution of studied nurses regarding their total competency about infection control measures at delivery room pre and post the COPA model (n=70).**

**Table (5): Distribution of the studied nurses ` satisfaction score after the implementing competency outcomes and performance assessment model (n=70).**

Items	Satisfied		Fairly		Unsatisfied	
	NO.	%	NO.	%	NO.	%
The training content is sufficient.	57	81.5	5	7.1	8	11.4
The objectives of the model are clear.	60	85.7	3	4.3	7	10
All model objectives have been implemented.	67	95.7	0	0.0	3	4.3
The content of the practical training is identical to the objective of the current study.	59	84.3	6	8.6	5	7.1
The methods used in model training are varied and easy.	63	90.0	3	4.3	4	5.7
A suitable environment has been created for the model. Good pressure, well-ventilated space and comfortable seating.	60	85.7	4	5.7	6	8.6
The training schedule is appropriate.	70	100.0	0	0.0	0	0.0
Sufficient time was given to each model session.	70	100.0	0	0.0	0	0.0
Additional time was given to ask questions to the researcher.	70	100.0	0	0.0	0	0.0
The model program helped in good communication between the nurses and the trainer.	63	90.0	2	2.9	5	7.1
The COPA model does not overburden the nursing care assigned to it.	58	82.9	4	5.7	8	11.4
The training contributed positively to nurses' adherence to infection control procedures in the delivery room	61	87.1	3	4.3	6	8.6



**Figure (5): Percentage distribution of studied nurses regarding their satisfaction after the implementing competency outcomes and performance assessment model (n=70).**

**Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

**Table (6): Correlation between total knowledge, total performance and total competency score scores of the studied nurses regarding infection control measures at delivery room pre and post the COPA model (n=70).**

Variables	Total performance score			
	Pre COPA model		Post COPA model	
	r	P-value	r	P-value
Total knowledge	0.432	0.000**	0.511	0.000**
Total competency	0.492	0.000**	0.412	0.000**

**\*\*A Highly Statistical significant  $p \leq 0.001$**

**Discussion**

The delivery room is a complex workshop for keeping cleanliness, maintaining and the safety of facilities, equipment, and devices as one-tenth of all maternal deaths worldwide are caused by infections contracted during childbirth, which is also the primary cause of long-term impairments such persistent pelvic pain, fallopian tube obstruction, and secondary infertility. The policies and practices known as infection control measures are all those that should be implemented in order to restrict and lessen the widespread spread of infections in the delivery care units (**Hassan et al., 2020**). Competent nurses performed proficiently to apply proper infection control measures at delivery room to break the channels of spreading infection (**Chen et al., 2022**).

The current research aimed to evaluate the effect of implementing competency outcomes and performance assessment model on nurses' performance regarding infection control measures at delivery room. The following-mentioned results supported the study hypotheses which were stated previously.

Concerning general characteristics, the results of current study revealed that, more

than half of the studied nurses were in the age group 25 < 30 years with mean age was 30.1 ± 7.27 years, less than two thirds of the studied nurses were studied at the technical institute of nursing and less than half of them had 5<10 years of experience with mean year of experience 8.92 ± 4.66 years. As regards residence, more than half of the studied nurses were lived in rural areas. The findings of **Ghadiry and Shaheen (2020)** were in line with the results, indicating that over 50% of nurses were aged between 25 and less than 35 years, with 5 to less than 10 years of experience. Similarly, **Amasha et al. (2020)** reported that over half of the nurses fell within the age range of 26 to less than 36 years. In terms of educational background, approximately two-thirds of the nurses had attended a nursing technical institute.

The results of the forgoing study displayed that about two fifths of the studied nurses attended training programs related to infection control measures at delivery room. The findings were consistent with **Mahmoud et al., (2023)** indicating that fewer than 50% of the nurses in the study participated in training programs focused on infection prevention and control (IPC). This could reflect the nursing

management commitment to improve their staff knowledge and skills in this area. The World Health Organization's inaugural global report on sepsis highlighted the significance of implementing training programs that encompass the Infection Prevention and Control (IPC) measures at maternity hospitals. This report emphasized that obstetric infections rank as the third leading cause of maternal mortality, underscoring the importance of such training initiatives (**World Health Organization (WHO), 2020**).

Concerning maternity nurses' knowledge regarding infection control measures at delivery room, the current findings revealed that, there was a highly statistically significant difference among total mean scores of all domains of studied nurses' knowledge about infection control measures at delivery room pre and post the COPA model implementation. It was revealed that total mean score of studied nurses' knowledge was higher at post-implementation compared to pre-implementation phase. According to the researchers, these improvements were made possible by competency-based education, which develops nursing staff members' core competencies through customized training programs, active learning, and behavior modification. This enhances overall understanding and clinical nursing proficiency. In addition, the Arabic booklet given to all nurses and a range of instructional methods, including talks and multimedia materials, were used to illustrate these improvements.

These results are consistent with the study by **Hassan et al., (2020)** which found that the primary finding was that, prior to the program's implementation, 50.0% of nurses lacked adequate knowledge about infection control. This percentage improved after the program was implemented, with the percentage of

nurses who had good knowledge rising to 75.0 % immediately after the program and 90.5% two months later. Additionally, **Hoseini et al., (2018)** noted that the three groups shared comparable underlying characteristics before the investigation. There was a discernible difference in the nurses' performance and knowledge before and after training in both intervention groups. In contrast, there was no discernible variation in the control group's knowledge and performance median scores. Notably, the competency-based group displayed superior performance scores compared to the other groups, suggesting that this form of education can yield positive outcomes on nurses' clinical practice and performance.

Concerning maternity nurses' performance regarding infection control measures at delivery room, the current findings revealed that, there was a highly statistically significant difference among total mean scores of the studied nurses' performance regarding infection control measures at delivery room pre and post the COPA model implementation. It was revealed that the total mean score of studied nurses' performance was good at post-intervention in compared to pre-intervention phase. It is clear that education influences performance and enhances practice-based outcomes. As it is known, knowledge is a modifiable variable that has an indirect relationship to practice. Therefore, the design of the educational intervention encourages the integration of the best evidence into practices.

The findings presented earlier align with the research conducted by **Shehab El-Din et al., (2022)** which demonstrated a significant improvement in nurses' practices following the implementation of the program. The difference observed in all infection control subscales was highly statistically significant ( $p < 0.001$ ). The data indicates that the average score for

## **Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

infection control practices in labor and delivery care units was 71.4 before the program was implemented. This score increased to 168.71 immediately after the program was implemented and further increased to 173.64 one month after the program was implemented. The findings were consistent with **Kadam et al., (2018)** who showed that most participants achieved a high level of performance following competency-based education. The performance was significantly higher ( $Z_{19}=3.96$ ,  $p < 0.001$ ). Similarly, the results of this study align with **Rarawagh et al., (2017)** who found that over two-thirds of labor room nurses demonstrated satisfactory practice levels after receiving competency-based education on infection control practices.

Concerning maternity nurses' competency, the current findings revealed that, there was a highly statistically significant difference among mean scores of studied nurses' competency regarding infection control measures at delivery room pre and post the COPA model implementation. It was revealed that total mean score of studied nurses' competency was higher post COPA model implementation compared to pre COPA model implementation. In addition, the results showed that more than four fifths of studied nurses showed competent performance regarding infection control measures at delivery room post COPA model implementation compared to more than two thirds of them pre COPA model implementation. The researchers hypothesized that pre-intervention poor competency may be due to nurses' lack of ongoing training and resources to develop competency in infection control measures. The post-intervention improvement in nurses' competence may be due to competency-based training that

included interactive and stimulating learning materials (simulations, case studies, practical experiments) that captured nurses' interest and motivated them to learn, making the learning process more engaging and more effective, resulting in improved competency.

The results of the present research align with **Mohamed et al., (2022)** indicating a statistically significant difference in nurses' competency scores before and after participating in a competency-based training program, with a p-value of ( $P < 0.000$ ). It was revealed that total competency score raised from  $42.44 \pm 7.50$  pre-competency-based training program to  $90.64 \pm 5.54$  post competency based training program. Also, the results aligned with the conclusions of a meta-analysis carried out by **Chen et al., (2022)** which demonstrated that competency-based training successfully raised new nurses' competency and helped them to be better learners, behave better, and have better abilities. Additionally, the results of this study were consistent with those of **Imanipour et al., (2021)** who came to the conclusion that competency-based education improved the clinical performance of healthcare providers in the intervention group as opposed to the control group. Furthermore, the current study's results were in agreement with those of **Mohammed et al., (2021)**, who reported that nurses' overall competency scores pre-program averaged  $1295 \pm 157$  and significantly improved to  $2850 \pm 174$  post-program. **Ara and colleagues, (2019)** stated that education and training programs can greatly enhance core competencies.

Regarding studied nurse' satisfaction after the implementing competency outcomes and performance assessment model. The results showed that most of studied nurses were satisfied after implementing competency



outcomes and performance assessment model. The outcomes of the present study correlated with those of **Ta'an et al., (2022)** where they found that the average total satisfaction score was 61.18+7.00, indicating high satisfaction among participants in the COPA-based training program. Similarly, **Ibrahim et al., (2021)** also supported these results by stating that both study groups had a low level of CBNE satisfaction prior to the CBNE instructional intervention during the COVID pandemic. Following the intervention, group A showed significant improvement with mean scores exceeding 2.5 for all subscale items, whereas group B did not show any improvement and maintained similar scores.

Concerning correlation between studied variables, the results of the current study clarified that, there was a highly significant statistical positive correlation between total performance score, total knowledge score and total nurses' competency score regarding infection control measures at delivery room pre and post the COPA model. From the perspective of the researchers, these findings highlight the fact that practice levels are affected by knowledge levels and without proper and adequate knowledge, nurses' practices become more ineffective.

The findings of the current study aligned with the conclusions of **Mohamed et al., (2022)** who noted that education was the primary factor improving nurses' performance and that there was a significant positive relationship between nurses' knowledge and practice following the intervention. The results were consistent with those of **Shehab El-Din et al., (2022)** who found a significant but weak to moderate positive relationship between the scores of nurses' infection control practice and their knowledge across the three program phases (pre, immediately post, and one month follow-up). The highest correlation was

observed between total practice and total knowledge immediately after the program ( $r=0.401$ ,  $p<0.001$ ). Conversely, the lowest correlation was noted between total practice and total knowledge one month after the program ( $r=0.278$ ,  $p<0.001$ ).

### **Conclusion:**

Depending on the current study findings, the following can be concluded: there were highly statistical significant improvements in nurses' total knowledge, total mean scores of all practices of studied nurses' performance regarding infection control measures, competence score and satisfaction level post competency outcomes and performance assessment model compared to pre and also, There was significant positive correlation between a highly significant statistical positive correlation between total performance score, total knowledge score and total nurses' competency score regarding infection control measures at delivery room pre and post the COPA model. Which achieved the present study hypotheses.

### **Recommendations:**

- Demonstrate the present study results of competence assessment and performance model as updated data for improving the hospital infection control measures.
- Allocation of suitable resources as educational booklets to help nurses and other health care staff to integrate infection control measures in routine care.
- Provide educational program about competence assessment and performance model for supervisory staff for guiding proper competence in applying infection control measures at delivery room.
- Integrate competence assessment and performance model in the routine processes and policies of the hospital toward proper compliance with infection control measures.

## **Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

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**Implementing Competency Outcomes and Performance Assessment Model on Maternity Nurses' Performance regarding Infection Control Measures at Delivery Room**

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## تنفيذ نتائج الكفاءة ونموذج تقييم الأداء بشأن أداء ممرضات الولادة فيما يتعلق بتدابير مكافحة العدوى في غرفة الولادة

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تعد العدوى الأمومية أثناء الولادة أحد العوامل الرئيسية التي تساهم في وفيات الأمهات في جميع أنحاء العالم، ونتائج الكفاءة ونموذج تقييم الأداء هو نهج قائم على النتائج لتصميم وتنفيذ تدابير مكافحة العدوى في غرفة الولادة. لذا هدفت الدراسة إلى تقييم أثر تطبيق نتائج الكفاءة ونموذج تقييم الأداء على أداء ممرضات الولادة فيما يتعلق بتدابير مكافحة العدوى في غرفة الولادة. و تم استخدام تصميم الدراسة شبه التجريبية. وقد أجريت الدراسة في غرفة الولادة بمستشفى بنها الجامعي على عينة متاحة من 70 ممرضة أمومة في غرفة الولادة. تم استخدام أربع أدوات لجمع البيانات: استبيان المقابلة المنظم، وقائمة مراقبة أداء الممرضات فيما يتعلق بتدابير مكافحة العدوى في غرفة الولادة، ومقياس كفاءة الممرضات واستبيان رضا الممرضات. واطهرت النتائج بأنه كان هناك فرق ذو دلالة إحصائية عالية بين متوسط الدرجات الكلية لجميع مجالات معلومات الممرضات والمجموع المتوسط لجميع ممارسات أداء الممرضات فيما يتعلق بتدابير مكافحة العدوى وكذلك درجات كفاءة الممرضات في تنفيذ تدابير مكافحة العدوى في غرفة الولادة قبل وبعد تنفيذ النموذج. كان معظم الممرضات الذين شملتهم الدراسة راضين بعد تنفيذ نتائج الكفاءة ونموذج تقييم الأداء. كما كان هناك تحسن ذات دلالة إحصائية عالية في معلومات الممرضات، ومتوسط الدرجات لجميع ممارسات أداء الممرضات فيما يتعلق بتدابير مكافحة العدوى، ودرجة الكفاءة ومستوى الرضا عن نتائج الكفاءة ونموذج تقييم الأداء مقارنة بما قبل. وأوصت الدراسة بتوزيع نتائج الدراسة الحالية لتقييم الكفاءة ونموذج الأداء كبيانات محدثة لتحسين تدابير مكافحة العدوى في المستشفيات.