

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

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Abstract

Background: Medication safety is the third recent global patient safety challenge by WHO. Chemotherapy agents is a high-risk drugs, so safety chemotherapy administration standards are intended to reduce the risk of error when providing patients. **Aim of study:** Evaluate the effect of an educational program regarding double check for safe chemotherapy administration on the oncology nurses' performance, beliefs and attitude. **Study design:** A quasi-experimental design was used to conduct the aim of the study. **Settings:** this study was conducted at outpatient and in-patient of chemotherapy unit at Benha University Hospital, and National Cancer Institute at Cairo University Hospitals. **Subject:** A convenient sample 50 nurses included: 20 from Benha University Hospital, and 30 from National Cancer Institute. **Tools:** Tools were used for data collection; self-administered questionnaire tool for nurses' knowledge, oncology nurse's beliefs and attitude toward double check, and observational checklist of the nurses' practice for double check technique, and patient safety assessment. **Results:** This study showed that most of the studied nurses had unsatisfactory level of knowledge, and incompetent levels of their practices, and patient safety assessment regarding double check technique (100%, 100%, and 98%) respectively preprogram intervention and improved satisfactory level immediately and post 1st and 3rd months of follow up program intervention (100%, 100% and 90%), (96%, 90%, and 84%) and (100%, 100%, and 88%) respectively of the studied nurses. **Conclusion:** This study concluded that there was a high statistically significant difference among oncology nurses' knowledge, practice, beliefs and attitudes pre and post of the educational intervention program, and between nurse 1 and 2 regarding their practices of double check technique and patient safety assessment. **Recommendations:** The study recommended the importance of establishing booklet guidelines for oncology nurses regarding double check technique for safe chemotherapy administration.

keywords: Beliefs and Attitude, Double Check Technique (DCT), Educational Program, Nurses' Performance, Safe Chemotherapy Administration (SCA).

Introduction

Chemotherapy is an important component of treatment for cancer and new anti-cancer drugs represent one of the largest areas of pharmaceutical development. According to the World Health Organization, every year more than eleven million people are diagnosed with cancer and six million die from cancer, ranking cancer as the number one cause of death

worldwide, one of the main forms of their treatment is the administration of chemotherapy (Braun, 2016).

So, prior to chemotherapy administration the nurse should take measures to prevent medication errors: Perform independent double-check of original orders with a second chemotherapy-certified registered nurse (RN). Double check for accuracy of treatment regimen, chemotherapy agent, dose,

calculations flow rate, and route of administration (Braun, 2016).

Nursing is a profession rooted in professional ethics and ethical values, and nursing performance is based on such values. Values are goals and beliefs that establish a behavior and provide a basis for decision making (Poorchangizi, et al., 2019).

By experts and professional groups and establish frameworks for evaluating nursing behavior. Beliefs in safety production' represents mental models of how and why the double-check (DC) generates safety and the contribution of humans to error and error detection (Poorchangizi, et al., 2019).

Oncology Nurses' lack of knowledge and practice (preparation and administration of chemotherapy) regarding double checking is considered to be one of the most significant factors contributing to medication administration errors. Most chemotherapy medication errors cause no harm to patients, but serious injuries (e.g. coma) and deaths are usually due to incorrect administration of high-alert/high risk medications (Graham, Clopp, et al., 2012).

Moreover, the nurses' have critical role of care for patients with cancer on chemotherapy either prevention of medication errors through double checking of chemotherapy medication or promotion of patient safety through educational training program for them. Furthermore, oncology nurse role is to meet patient's safety and need for health instructions about chemotherapy administration knowledge and practice (Joan, & Robinson, 2016).

Significant of the study:

Medication safety may be defined as the freedom from accidental injury due to medical errors or nursing administration mistakes during the medication-use process. Therefore,

the prioritization given the scope of medication use in patient care and the frequency and severity of potential harm. According to the Institute of Medicine statistics report, preventing Medication Errors (MEs) estimated 380,000-450,000 preventable adverse drug events (ADEs) occur in hospitals each year. These errors most frequently occur in the prescribing and administering stages. Medication errors are a significant and often preventable health care problem. (Institute of Safe Medication Administration, 2015).

The researcher observed that most of research focused on the education for patient with cancer who receiving chemotherapy rather than nurses' education which nearly ignored or nurses might not be adequately aware of their role. Thus, should acquire the necessary knowledge and skills to improve their performance and beliefs and attitude through implementing of educational program. Therefore, the aim of the study is to evaluate effect of the educational program regarding DC technique for safe chemotherapy administration on the nurses' performance and beliefs and attitude.

Aim of the study:

Evaluate the effect of educational program oncology nurses' performance, beliefs and attitude towards double-checking for safe chemotherapy administration.

Research Hypotheses:

Hypothesis (1): The oncology nurses' knowledge and practice scores regarding double-check for safe chemotherapy medication administration will be higher post-program than before.

Hypothesis (2) Patient safety assessment in chemotherapy medication administration will be improved performed by the nursing team after attending to an educational program than before.

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

Hypothesis (3) the oncology nurses will have positive beliefs, and attitude towards double checking after attending an educational program than before.

Subjects and methods

Research Design:

Quasi-experimental research design was used in this study.

Setting:

The study was carried out in chemotherapy unit of Benha University Hospital and chemotherapy unit at the National Cancer Institute at Cairo University Hospitals.

Subjects:

A convenient sample of 50 (male and female) nurses. All available nurses are from the following:

-20 nurses from chemotherapy unit at 5th floor at Benha University Hospital in Benha city.

They were divided into 8 nurses for outpatient chemotherapy unit and 12 nurses for inpatient chemotherapy unit.

-30 nurses from chemotherapy unit at National Cancer Institute at Cairo University Hospitals in Cairo city. They were divided into 12 nurses for outpatient chemotherapy unit and 18 nurses for inpatient chemotherapy unit.

Tools for data collection:

To achieve the purpose of the study two tools were used:

Tool (1): Self-Administered Nurses Questionnaire:

It included as follows parts:

Part 1: Demographic Data: It aimed to assess nurses' demographic data: included gender, age, level of education, marital status, years of experience, work place, (either inpatient or outpatient clinic), previous training courses regarding SCMA attended at unit, is there an educational guide on the unit about DC for SCMA?

Part II: Clinical Patterns Background for Safe Medication Administration:

It aimed to assess the clinical work pattern as regard double checking procedures by single nurse or double (two nurses) at unit. It was adapted from (Schwappch, et al., 2016) and developed by the researcher through review of related literature. It included (4) questions.

It involved the following:

- During administration of chemotherapy using DC technique.
- Type of DC was done.
- In case of DC for medication administration, what is the way used.
- Number of frequency of detection of error.

The questions were answered by the oncology nurses related to clinical pattern background in the unit with yes or no and selected one answer accordance to each question.

Part III: Oncology Nurses' Knowledge sheet:

It aimed to assess the oncology nurses' knowledge regarding SCA. It was developed by the researcher and adapted from (Institute of Medicine IOM, 2016, Sharma, et al., 2018). It included (56) questions. It involved (49) MCQ 49 questions (49 scores), and 7 short essay questions (14 scores). It classified into seven sections as the following:

Section 1: It was concerned with the principles that must be followed for SCA. It included 7 questions were MCQ (from 1-7) with 7 scores.

Section 2: It was concerned with items about medications errors. It included 4 questions that were MCQ (from 8-11) with 4 scores.

Section 3: It was concerned with questions about double check. It involved 2 parts questions as following:

A- Multiple Choice Questions: It included 14 questions (from 12- 25) with 14 scores.

B-Short essay questions: It included 4 questions (from 26-29) with 8 scores.

Section4: It concerned with preparing chemotherapy medication in safe way. It included 10 questions that were MCQ (from 30-39) with 10 scores.

section5: It concerned with administration of chemotherapy medication administration in safe way. It included 8 questions of MCQ (from 40-47) with 8 scores.

section6: It concerned with disposing of waste chemotherapy after administration. It included 6 questions that were MCQ (from 48- 53) with 6 scores.

Section7: It concerned documentation of DC for chemotherapy. It included 3 short essay questions (from 54- 56) with 6 scores.

Scoring system:

The total score was 63 scores. The questions scores are distributed for multiple questions (MCQ), (one) score for each correct answer, and (zero) for incorrect or missed. The questions scores for the short essay questions was taken (two) scores for each correct and complete answer, (one) score for correct and incomplete answer, and (zero) score for incorrect or missed.

The result of scoring system was classified as follows:

- **≥80%(50 scores):** It was satisfactory knowledge level .
- < **80%(less than 50 scores) :** It was unsatisfactory knowledge level.

Part IV: Oncology nurses' beliefs and attitude in own DC performance/ self-efficacy:

It aimed to assess oncology nurses' beliefs in benefits and effectiveness of DC represents the perceived value of DC and its role in ensuring medication safety. It was adopted from (Schwapp, et al., 2016). It includes (41) items on (6) domains, as the following:

Domain1: It concerned with beliefs in benefit and effectiveness of the DC. It included 8 questions (8 scores).

Domain2: It concerned with beliefs in double check (DC) performance and self-efficacy. It included 4 questions (4 scores).

Domain3: It is concerned with self-perceived criteria and double check coherence in the unit. It included (9) questions (9 scores).

Domain4: It concerned beliefs and their impact on safety production: It included 8 questions (8 scores).

Domain5: It is concerned with limitations of the DC in clinical routine.

It included 9 questions (9 scores).

Domain6: It concerned with differences in double check related to clinical level. It included 3 questions (3 scores).

Scoring system:

The total score was 41 scores. The scores distributed as values are reverse coded for negatively worded items. (One) score for each agree answer and (zero) for each missed answers.

Tool 2: Nurses' Practice Observational Checklist for Double Checking for SCA:

It included 2 parts as the following:

Part I: Nurses' Practice Observational Checklist Assessment:

It aimed to assess two nurses' performance (nurse one and nurse two) regarding IDC procedure/technique for SCA. It was adopted from **Albert Health Services (AHS) checklist, 2017, &Chua et al., 2019**). It included (78) steps. The total score of practice was (78) scores It consisted of four phases covering the following:

1-General-preparation phase: It included (1-6) steps with 6 scores.

2- Pre-administration preparation phase: It included (19) steps with 19 scores. In addition, it consisted of parts (25) steps with 25 scores, as the following:

1- Preparation of chemotherapy dilution (either vial or ampoule): It included (3) steps with 3 scores.

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

1. a-Preparation of chemotherapy dilution vial: It included (6) steps with 6 scores.

1. b- Preparation of chemotherapy ampoule: it included (6) steps with 6 scores.

1. c-Admixture chemotherapy preparation in IV solutions: It included (10) steps with 10 scores.

3-Administration phase of chemotherapy: It was done at patient's room by both nurses (nurse one and two together). It included (18) steps with 18 scores.

4-Post administration phase: It involved disposing and documenting phases.

A- Disposing phase: It included (5) steps with 5 scores.

B-Documentation phase: It included (5) steps with 5 scores.

Scoring system:

The total score was 78 scores. The scores are distributed as (one) score for each correct step (done) and (zero) for each step (not done or incorrect) or missed. There were some steps not applicable for nurse 1 and nurse 2 according to technique of IDC and vice versa. Nurses' practice was considered as the following:

- **≥ 90%:** Nurses' practice was considered competent if total present scores equal or more than 90% (equal or more than 70 scores).
- **< 90%:** Nurses' practice was considered incompetent if total scores were less than 90% (less than 70 score).

Part II- Patient's safety assessment observational checklist:

It aimed to assess the patient's safety in MA with adequate frequency performed by the nursing team (nurse one and two). It was adopted from (Fortaleza, Brazil, 2016). It included ten domains (28 items/ steps) as the following:

Domain1: Right Patient: it included (1) step which included uses at least two identifiers (full

name, and MRN) to confirm the patient before administering chemotherapy medication.

Domain2: Right Medication: It included (6) steps (from 2 to 7 steps).

Domain3: Right Route: It included (4) steps (from 8 to 11 steps).

Domain4: Right Time: It included (3) steps (from 12 to 14 steps).

Domain4: Right Dose: It included (6) steps (from 15 to 20 steps).

Domain5: Right Record of Administration: It included (4) steps (from 21 to 24 steps).

Domain7: Right Guidance: It included one step (no.25).

Domain8: Right Way: It included one step (no.26).

Domain9: Right patient education: It included one step (no.27).

Domain10: Right answer: It included one step (Q: no. 28).

Scoring system:

It included ten domains (28 items/ steps) with fixed response format, Likert scale (1= never, 2= almost never, 3= sometimes, 4= almost and 5= always) the response was always considered an adequacy frequency for the safe performance that done by both nurses 1 and 2 in their care routine. The total scores were (140) scores for nurse 1. The total scores were (100) scores for nurse 2. There were many steps that were done by nurse 1 and not applicable for nurse 2 according to their technique of DC. Nurses' practice regarding patient's safety assessment observational checklist was categorized as the following:

- **≥ 90%:** It was considered competent level if total present score equal or more than 90% (equal or more than 126 score).
- **< 90%:** It was considered incompetent if less than 90% (less than 126 score).

Educational program booklet:

It was developed and designed by the researcher based on the recent review of relevant literature from (Tehrani, 2015,

Schwappch, et al., 2016, Institute for Safe Medication Practices (ISMP),2017).It aimed to improve the oncology nurses' performance regarding DCT for SCA. It covered two main parts as the following:

I-The theoretical part: Included two parts.

First part: It concerned with information regarding chemotherapy and safe administration (SCA): such as definition of chemotherapy, ethical responsibilities related to the safe chemotherapy administration, routes of chemotherapy administration, etc.. **Second part:** it concerned with information regarding double check (DC) and nursing roles regarding DC for SCA such as definition of DC, goal of DC, types of DC, etc.

II- Practical part: It was concerned with the steps for DC for SCA .It included 4 phases as the following: 1- General Preparation phase of chemotherapy medication: It was done by nurse one only. 2- Pre-administration preparation phase: It was done at medication room equipped with biological safety cabinet (BSC) and done by both nurses nurse 1 and 2. 3- Administration phase of chemotherapy: It was done at patient's room by both nurses 1 and 2. It concerned practices related to administering of chemotherapy by both of them. 4-Post Administration of Chemotherapy: It involved disposing and documenting phases.

Method

I: Administrative design:

- The necessary approval was obtained to carry out the study from both units: chemotherapy unit of Benha University Hospital, and National Cancer Institute at Cairo University Hospitals.
- The directors of chemotherapy unit at Benha University Hospital, and the National Cancer Institute at Cairo University Hospitals.
- Official letter was issued to it from dean the faculty of nursing. Meeting and discussion was held between a researcher and nursing head nurses of both units to make them aware about

aim of the study. As well as, to get better cooperation during the implementation of the study.

- After explaining the aim of the study to obtain permission for the collection of data. The letter included the title, aim of the study, and setting where the study would be conducted. An oral consent (agreement) was taken from nurses for permission to participate in research process.

Ethical Consideration:

The ethical consideration in this study included the following:

- The researcher clarified the objective and aim of the study to the nurses included in the study.
- Participation in the study was voluntary, and that the study subjects had right to withdraw from the study at any time without any rational. Then the informed consent obtained from them.
- The researcher assured maintaining privacy for the oncology nurses' data for the purpose of the research only and would not be used for another purpose.

II- Preparatory phase:

- It included reviewing related literature and theoretical knowledge of various aspect of the study using books, articles, internet, magazines to develop tools for data collection and educational program for nurses.
- It was designed in Arabic language by the researcher based on the results obtained from assessment of the nurses' performance and knowledge regarding DC for SCA before an educational intervention program.

Tool validity and reliability:

Content Validity:

The tools were reviewed for content validity by a jury of 7 experts in Medical Surgical nursing and oncology medicine. 4 from Faculty of Nursing at Benha University and 3 professors in Medical Surgical Nursing, one assistant professor and one professor from

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

Ain Shams University in Medical Surgical Nursing, and two from Cairo University, one professor of Medical Surgical Nursing in faculty of nursing, and one professor of oncology physician of Faculty of Medicine Cairo University. Required modifications were made.

Reliability:

- Internal consistency reliability was assessed in the study and evaluated whether all items on an instrument measure tools variable and internal consistency.
- Testing reliability of the study tools tested via "Cronbach's Alpha" was done statistically for all tools used in the pilot study was larger than (0.7= 70%) which indicating that the reliability of tools considered reliable as following (0.86) for clinical patterns background in medication administration, (0.88) for oncology nurses' knowledge questionnaire, (0.82) for oncology nurses' beliefs and attitude in own DC performance self- efficacy, (0.89) for nurses' practice observational checklist of DC, and (0.91) for patient's safety assessment observational checklist.

Pilot study:

A pilot study was carried out on 5 nurses over a period of 2 weeks (1-15 June 2021) to test feasibility, objectivity, and applicability of the study tools carrying out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools based on the results of the pilot study, needed refinements and modifications were done and pilot study subjects were excluded from the actual study sample.

III-Field work:

The current study was conducted through 4 phases namely assessment, planning, implementation, and evaluation phase.

-The researcher attended to the study setting 4 days per week in the morning and afternoon shifts.

The researcher interviewed each nurse individually and explained the purpose of the study. Data were collected within 8 months and half from the beginning of August 2021 to the half of April 2022.

1- Assessment Phase:

Once the acceptance of nurses was obtained the assessment phase started. And it aimed to assess the oncology nurses' knowledge concerning the nurses' demographic characteristics and clinical patterns background in medication administration nursing using tool 1 (part I, II and III) as well as, the nurses' beliefs and attitude tool1(part IV).it was filled by the studied oncology nurses. Then, the nurses' practice (nurse 1& nurse 2) and patients' safety regarding DCT assessment was observed by the researcher tool 2 (part I, II) as a baseline data assessment pre the educational program intervention.

2- Planning phase:

- Once the initial assessment finished, the proposed educational program was designed based on predetermined subjects' needs, it was revised and modified based on the experts' comments. The program implementation schedule designed by the researcher and planned learning activity and media were prepared by the researcher.

3- Implementation phase:

This phase aimed to implement the educational program session including knowledge and practice. Each nurse was given 5 sessions about knowledge and practice regarding DC technique for SCA to improve nurses' performance regarding DC for SCA. Each nurse in the study was seen continuously by the researcher to be sure that the intervention and steps were followed correctly. Correction,

demonstration and re-demonstration were offered.

4- Evaluation phase:

This phase aimed to evaluate the effect of the educational program regarding safe chemotherapy administration on the oncology nurses' performance, beliefs and attitude.

the evaluation of nurses were done three phases, immediately after the educational program intervention regarding the nurses knowledge and practice and patient safety assessment using the tool 1(part III, IV), and tool 2 (part I, and II),the second evaluation was done after 1stmonth. and third evaluation was done post 3rdmonths of follow up post program intervention regarding the nurses knowledge and practice and patient safety assessment and their beliefs and attitude using tool 1 (part III, IV), and tool 2 (part I, and II),

Statistical Analysis:

On completion of data collection, data were tabulated and analyzed using statistical package for social science (SPSS) program.

SPSS version 20 relevant statistical analysis was done to test the obtained data. Descriptive and inferential statistics were performed such as mean (X) and standard deviation; frequency, percentage (%), and mean percent score. Other statistical test such as ANOVAs test correlation, and use of Z test (chi-square test). Moreover, Cronbach's Alpha test was used to test reliability of the tools.

- Level of significance:

For all statistical tests done, the threshold of significant was fixed at the 5% level (P-value).

- P-value ≥ 0.05 indicates non – significant result.
- P-value ≤ 0.05 indicates a significant result.

- P-value ≤ 0.001 indicates a highly significant result.

Results:

Table (1a): presents that 76% of the oncology nurses' participated in the study was female; their age was ranged from 20-30 years old 66% with a mean age 35.1 ± 8.4 and 62% of them were married. The predominant education qualification was diploma 56%, and only 16% had bachelor's degree in nursing. 52% of the oncology nurses had experience range from 1 to less than 5 years in oncology nursing field.

Table (1b): Shows that 86% of oncology nurses work in the inpatient department. 100% of the studied oncology nurses didn't receive or attended any type of in-service training courses regarding DC for SCA before. Also,100% of them reported that there had not been written guidelines about DC for SCA to them at the department of oncology.

Table (2): Shows that the clinical pattern background of the studied oncology nurses, 8% of them using DC technique during medication administration of chemotherapy and type of DC was done through single nurse by exceptionally method. Furthermore, 100% all the oncology nurses' subjects were detected of errors/inconsistencies during DC several times per week.

Figure (1): This figure shows that 100% all of the studied oncology nurses had incompetent in their practice levels regarding IDC for SCA pre the educational program intervention and 96%, 90%, 84%, respectively had a competent level in their practice post the educational program intervention (immediate post, post 1 and 3months follow up).

Figure (2): This figure shows that 100% of the studied oncology nurses had incompetent in their practice levels regarding IDC for SCA pre the educational program intervention and 96%, 90%, 84%, respectively had a competent level in their practice post the educational program

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

intervention (immediate post, post 1 and 3months follow up).

Figure (3): shows that 78, 78, and 69.4% of nurses 1 achieved high mean percent scores of total scores of practices in the immediate, 1st, and 3rd months post the educational program intervention regarding IDC technique for SCA. While 23, 23, and 20.2 % respectively, the nurses 2 achieved a high rate of scores of total scores of practices in the immediate, post1st, and 3rd months post the educational program intervention, respectively.

Figure (4): represents that 98% of the studied oncology nurses had incompetent level of their practice regarding patient safety assessment of DC for SCA pre the educational intervention program. But it noticed that to become 100%, 100%, and 88%, respectively of them competent level of practice patient safety assessment posts the educational intervention program.

Figure (5): Shows that 121.8, 118.7and 109.7%, respectively of the nurse 1 achieved high-rate scores of total patient safety assessment scores in immediate post-educational program intervention and on the 1st, and 3 rd month of the follow-up concerning the patient's safety assessment compared with before 53.4%. Also, it was noticed that 74.9

,73.9, and 67.6%, respectively, of the nurse 2 achieved high-rate scores of total patients safety assessment scores in immediate post-educational program intervention and on the 1st, and 3rd month of the follow-up compared with before 36.4 %.

Table (3): shows the beliefs and attitude of the studied oncology nurses regarding DCT for SCA, it was noticed that there was a highly statistically significant difference between their beliefs and attitudes pre and post the educational program intervention (post 1st, and 3rd month of the follow-up concerning all items of their belief and attitude ($P \leq 0.001$).

Table (4): Shows that there was a highly statistically significant positive correlation between the nurse's knowledge and beliefs, and attitudes ($p \leq 0.001$). Also, there was a highly statistically significant positive correlation between beliefs and attitudes with their practice and patient safety assessment ($P\text{-value} \leq 0.001$).

Table (5): Shows that there was a highly statistically significant positive correlation between the nurse's knowledge and beliefs, and attitudes ($p \leq 0.001$). Also, there was a highly statistically significant positive correlation between beliefs and attitudes with their practice and patient safety assessment ($P\text{-value} \leq 0.001$).

Table(1a): distribution and percentage of demographic characteristics of the studied oncology nurses (n=50).

| Demographic characteristics : | No. | % |
|---|-------------------|-------------|
| Gender: | | |
| Male | 12 | 24.0 |
| Female | 38 | 76.0 |
| Age: | | |
| 20-30 yrs. | 33 | 66.0 |
| >30-40 yrs. | 11 | 22.0 |
| >40-50 yrs and above | 6 | 12.0 |
| Mean±SD | 35.1 ± 8.4 | |
| Education level: | | |
| -Diploma | 28 | 56.0 |
| -Technical institute of nursing | 14 | 28.0 |
| -Bachelor degree | 8 | 16.0 |
| Social status: | | |
| Married | 31 | 62.0 |
| Single | 12 | 24.0 |
| Divorced | 3 | 6.0 |
| Widow | 4 | 8.0 |
| Nurses' work Experience in oncology field: | | |
| 1-< 5 yrs. | 26 | 52.0 |
| 5-10 yrs. | 13 | 26.0 |
| >10-15 yrs. | 7 | 14.0 |
| >15 yrs. | 4 | 8.0 |
| Mean±SD | 7.8 ± 3.2 | |

Table(1b): Frequency distribution and percentage of socio-demographic characteristics of the studied oncology nurses (n=50).

| Demographic characteristics: | No. | % |
|--|------------|-------------|
| Nurses' Work place: | | |
| In patient | 42 | 84.0 |
| Outpatient (daycare for chemotherapy administration) | 6 | 12.0 |
| Previous in- service training courses regarding DC for SCA at unit: | | |
| No attended | 50 | 100 |
| Yes attended | 0 | 0.0 |
| Presence of DC for SCA guidance at the unit: | | |
| Yes | 0 | 0.0 |
| No | 50 | 100 |

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

Table (2): distribution of the study oncology nurses according to their clinical patterns background in the oncology department concerning DCT (n=50).

| Variables related to Clinical patterns background | Pre program intervention | |
|---|--------------------------|------|
| | No. | % |
| During administration of chemotherapy medication was using DC technique: | | |
| -Yes | 4 | 8.0 |
| -No | 46 | 92.0 |
| Type of DC was done through: | | |
| -Single | 4 | 8.0 |
| -Not performed | 46 | 92.0 |
| The way of DC used: | | |
| -Exceptionally | 4 | 8.0 |
| -Not performed | 46 | 92.0 |
| Frequency of detection for Error | | |
| -Several times per week | 50 | 100 |

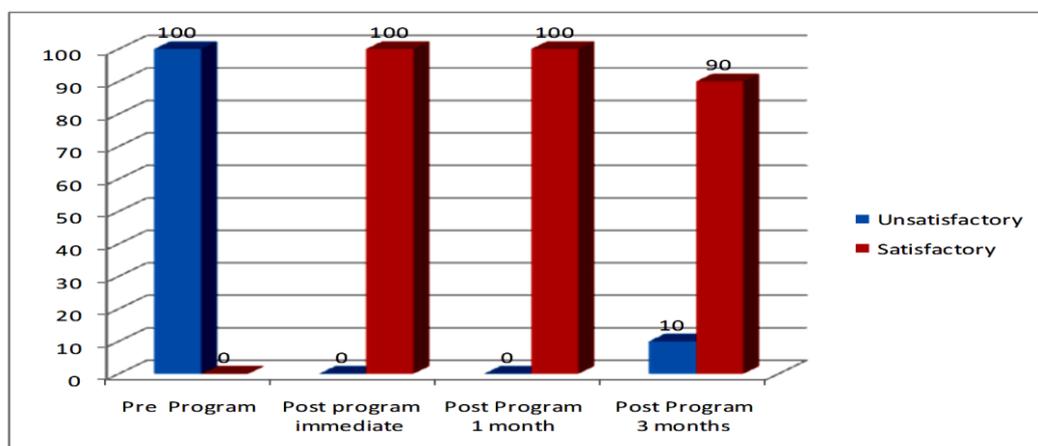


Figure (1): Percentage distribution of the studied oncology nurses' knowledge level pre and post educational program intervention (immediate post ,1st and 3rd months of follow up) concerning DC for SCA (n=50):

(Satisfactory level $\geq 80\%$ and unsatisfactory level $< 80\%$).

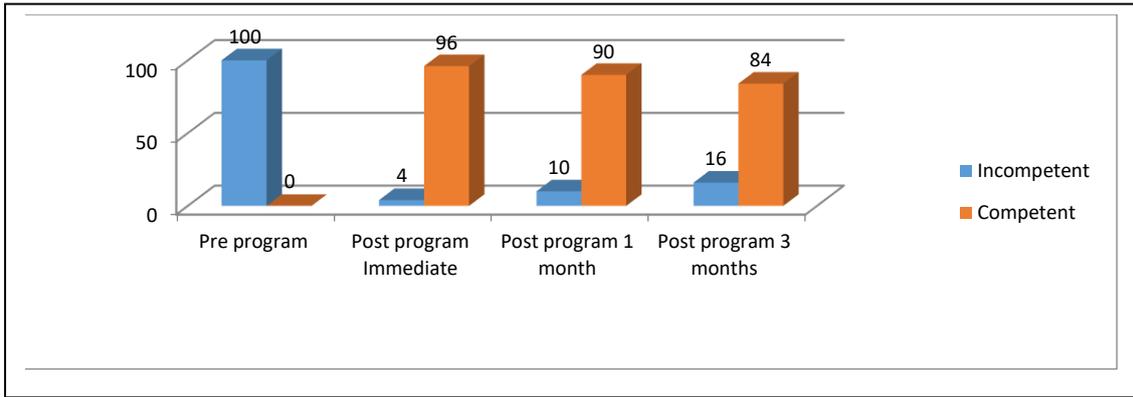
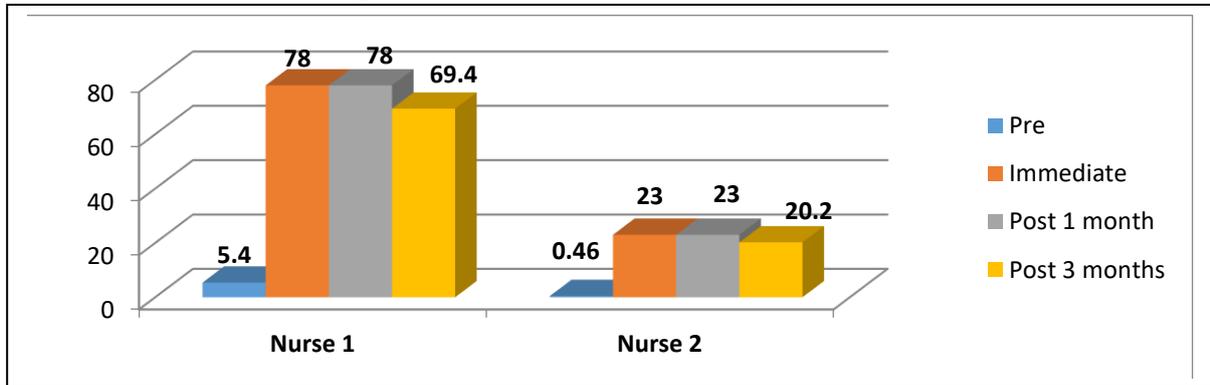


Figure (2): distribution of the studied oncology nurses practice pre and post educational program intervention in immediate post, 1st and 3rd months of follow- up regarding DC technique for SCA (n=50):

Competent level $\geq 90\%$ and incompetent level $< 90\%$.



**Figure (3): Mean percent score of 1st nurse and 2nd nurse regarding their practice of DC technique for SCA pre and post the educational intervention program in immediate post, 1st and 3rd months of follow up (n. Nurse 1=25, Nurse 2=25).
Note: Total scores of practice related to IDC technique nurse one is 78, and nurse two is 23**

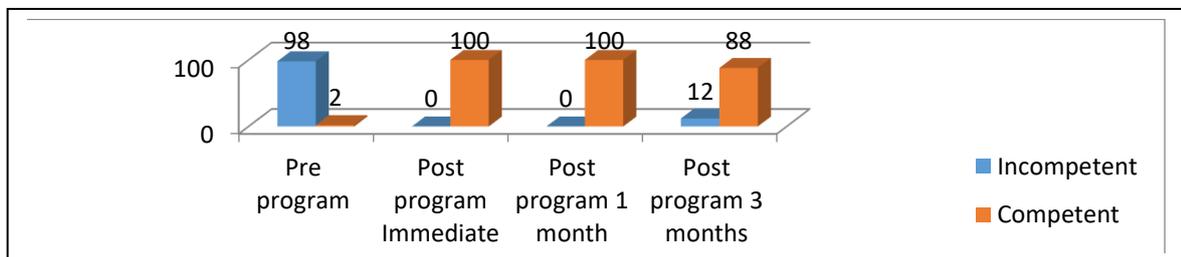


Figure (4): Percentage distribution of practice of patient safety assessment regarding DC for SCA for the studied oncology nurses' (n=50):

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

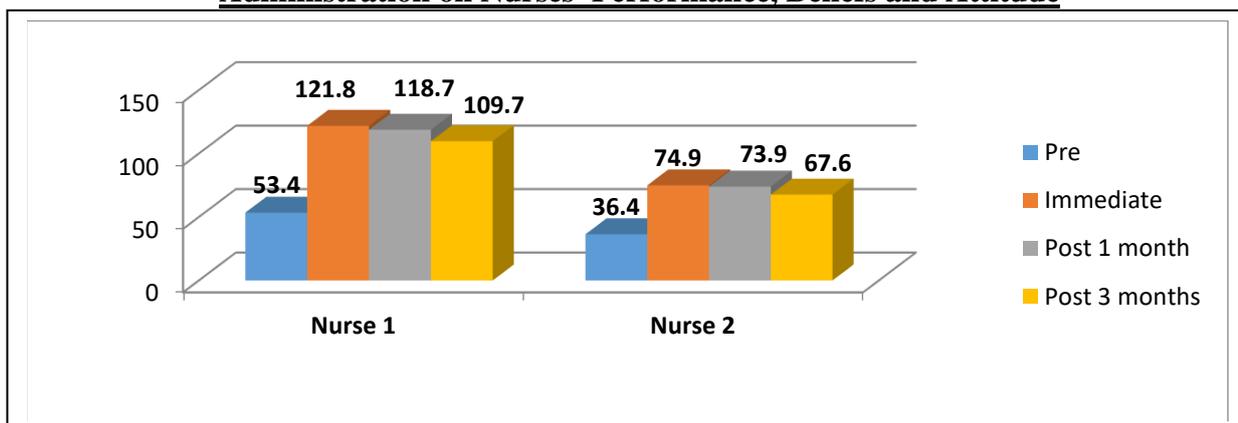


Figure (5): Mean percent score of nurse 1 and nurse 2 regarding patient safety assessment practice of DC technique for SCA pre and post the educational intervention program. (n1=25, n2=25).

Note: Total scores of patient safety practice regarding IDC technique 1stnurse is 140 & 2ndnurse is 100.

Note: Total scores of patient safety practice regarding DC technique 1stnurse is 140 & 2ndnurse is 100.

Table (3): Mean score, standard deviation and significant difference of the studied oncology nurses according to their beliefs and attitude toward DCT for SCA (n=50):

| Variables related to beliefs and attitude | Pre program | Post program intervention | | P1 (P-value) | P2 (P-value) | P3 (P-value) |
|--|------------------|---------------------------|------------------|-----------------|---------------------|-----------------|
| | | 1 month | 3 months | | | |
| | Mean±SD | Mean±SD | Mean±SD | | | |
| - Benefits and effectiveness of the DC. | 0.36±0.36 | 1.00± 0.00 | 0.92± 0.27 | 0.0001** | 0.0001* * | 0.0001** |
| -DC performance and self-efficacy | 0.59±0.34 | 1.00±0.25 | 0.86±0.18 | 0.0001** | 0.0001* * | 0.0001** |
| - Self-perceived criteria and DC coherence in the unit | 0.15±0.21 | 0.99 ± 0.28 | 0.72± 0.18 | 0.0001** | 0.0001* * | 0.0001** |
| -Beliefs impacted safety production. | 0.26± 0.29 | 1.00± 0.00 | 0.93 ± 0.27 | 0.0001** | 0.0001* * | 0.0001** |
| -limitation of the DC in clinical routine. | 0.45 ±0.29 | 0.99± 0.22 | 0.85± 0.13 | 0.0001** | 0.0001* * | 0.0001** |
| -Differences of DC related to the clinical level. | 0.61 ± 0.37 | 0.99± 0.17 | 0.94±0.16 | 0.0001** | 0.0001* * | 0.0001** |
| Total beliefs & attitude mean scores | 0.42±0.17 | 0.80±0.05 | 0.75±0.13 | 0.0001** | 0.0001* * | 0.0001** |

(**) highly statistically significant at the P-value ≤ 0.001 P1: between pre & 1 month post .
 P2: between pre & post 3 month.
 P3: Total pre & total post .

Table (4): Relation between the oncology nurses' knowledge, practice and patient's safety assessment and beliefs & attitudes with their demographic characteristics post the educational program intervention (n.=50).

| Nurses Demographic characteristics | No | Knowledge Mean ±SD | F/ P | Beliefs & Attitude Mean ±SD | F/P | Nurse Practice Mean ±SD | F/ P | Patient safety Mean ±SD | F/ P |
|--|----|--------------------|---------------|-----------------------------|---------------|-------------------------|----------------|-------------------------|----------------|
| Age | | | | | | | | | |
| 20-30 | 33 | 0.8298±0.02 | F=0.06 | 0.8393±0.01 | F=0.01 | 0.8793±0.06 | F=0.95 | 0.91±0.02 | F=4.1 |
| >30-40 | 11 | 0.8298±0.02 | P=0.93 | .8247±0.01 | P=0.99 | 0.9090±0.06 | P=0.39 | 0.88±0.03 | P=0.02* |
| >40-50 | 6 | 0.8270±0.02 | | .8383±0.01 | | 0.8974±0.06 | | 0.91±0.02 | |
| Education level : | | | | | | | | | |
| Diploma | 28 | 0.8298±0.02 | F=0.84 | 0.8049±0.01 | F=0.01 | 0.8793±0.06 | F=4.9 | 0.88±0.02 | F=4.4 |
| Technical | 14 | 0.8298±0.02 | P=0.43 | 0.8049±0.01 | P=0.99 | 0.8974±0.06 | P=0.01* | 0.90±0.03 | P=0.01* |
| Bachelor | 8 | 0.8270±0.02 | | 0.8049±0.01 | | 0.9090±0.06 | | 0.91±0.02 | |
| Nurses' experience in oncology field: | | | | | | | | | |
| < 5 yrs. | 13 | 0.8393±0.02 | F=0.62 | 0.8049±0.01 | F=0.01 | 0.8793±0.06 | F=0.51 | 0.92±0.01 | F=0.68 |
| 5-< 10 yrs. | 26 | 0.8247±0.02 | P=0.6 | 0.8049±0.01 | P=0.99 | 0.9090±0.06 | P=0.67 | 0.90±0.02 | P=0.56 |
| >10-15yrs | 7 | 0.8383±0.02 | | 0.8049±0.01 | | 0.8974±0.06 | | 0.91±0.02 | |
| > 15 yrs. | 4 | 0.8273±0.02 | | 0.8049±0.01 | | 0.8793±0.06 | | 0.89±0.03 | |

Statistically insignificant at the p-value ≥ 0.05. (*) Statistically significant at the p-value

Table (5): Correlation between the studied oncology nurses' knowledge, practices and patient's safety assessment with their beliefs & attitude, regarding DC for SCA post the educational program intervention (n.=50):

| Variables | Knowledge | | Beliefs and attitude | | Practice | |
|---------------------------|-----------|-----------------|----------------------|----------------|----------|----------------|
| | r | P | r | p | r | p |
| Knowledge | 1.0 | - | - | - | - | - |
| Beliefs and attitude | 0.79 | 0.001** | 1.0 | - | - | - |
| Practice of IDC technique | 0.91 | 0.0001** | 0.84 | 0.001** | 1.0 | - |
| Patient safety Assessment | 0.91 | 0.001** | 0.83 | 0.001** | 0.96 | 0.001** |

(**) highly statistical significant at p-value ≤ 0.001 Statistically insignificant at the p-value ≥ 0.05.(--) statistical test isn't valid

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

Discussion:

The vital role and responsibility of the oncology nurses' is ensuring safe chemotherapy administration (SCA) of their patients. Conducting double check (DC) process when administration of chemotherapy agents which is classified as high alert / high risk medications by the Institute for Safe Medication Practices (ISMP, 2015). These medications have narrow therapeutic indices and multiple potential toxicities and often are administered in complex regimens, and protocols. Errors may occur at any point during the medication administration delivery process. Double check procedure is the intervention used to ensure receiving medication in the safe way possible (Harding, et al., 2020). This study was aimed to evaluate the effect of a designed an educational program for safe chemotherapy administration regarding double check on the oncology nurses' performance, beliefs and attitude.

Oncology nurses' demographic characteristics and the clinical patterns background regarding their double check technique.

Concerning gender of the studied nurses, this study showed that the majority of them were females, and more two third of their age ranged from twenty to thirty years old. Nearly two third of the oncology nurses were married. From the researcher point of view, in Egypt, the nursing field is most common a female occupation than male. It might be related to school nurses' graduate large number of females than males and the nursing education for males are started recently.

As regards marital status, this finding shows that nearly two third of the oncology nurses were married. this finding of the current study is at the consistent with study supported by White, et al., (2017), whose entitled "checking it twice: an evaluation of checklists for detecting medication errors at the bedside

using a chemotherapy model", whose stated that the majority of the nurses were married. This result is the same line with study supported by Schwappach, et al., (2016), entitled " oncology nurses' perceptions about involving patients in the prevention of chemotherapy administration errors ", and stated that about two third of them were married and the study nurses' age were within eighteen to thirty years old.

Moreover, regarding age, this finding is congruent with Lester, (2016), a study entitled "Safe handling and administration considerations of chemotherapy anticancer agents in the clinical and home setting" which found that young age of oncology nurses' was provided more appropriate care for patients' with cancer and make sure that adequate psychological support and looking after with them.

Regarding the education qualification of the present study, it indicated that more than half the oncology nurses' had secondary school nursing diploma and little of them had bachelor degree of nursing. This finding is agreement with a study conducted by Padrini, & Bellizzi, (2021), entitled "report of the "satisfaction" survey amongst public health services nurses in Port Said in Egypt study". And this reported that the majority of nurses in Egypt have a certificate diploma of nursing and only from six to eight percent had a certificate of bachelor of nursing. Also, this finding is similar to Egyptian Nursing Syndicate Report, (2017), which reported that in Egypt nurses who have secondary school nursing diploma are 139.249 (86%) nurses of the total nursing manpower from the total number of nurses in Egypt is estimated to be 207.000 nurses.

But, this result of the current study was incongruent with a study by Sharour, (2020), entitled" Oncology nurses' knowledge about exploring chemotherapy-related extravasation

care: A cross-sectional study" who reported that most participants held a bachelor's degree in nursing.

Concerning nurses' work experiences in oncology field, the current study showed that more than half of the oncology nurses' had a work experience that ranged from one to five years in oncology field and administration of chemotherapy. From the researcher point of view, this could be that in light the nature of the chemotherapy unit and oncology department as areas of specialty necessitates a young qualified nurse able to provide for better quality of nursing care offered and ability to tolerate the working load as patients complex assessment and care, high intensity therapies , continuous nursing intervention. But, the less nurses' age was reflected on the less worked experiences in oncology field.

In accordance with the same line that may be a leading factor for oncology nurses' experiences will affected on their knowledge and practice. This finding is correspondent with **Chuk, et al., (2015)**, in the study entitled "Impact of safe administration chemotherapeutic agents in the clinical practice of oncology nurses" who's reported that most of young nurses were newly graduated and had few years of experiences. Also, this finding is supported with **AbdElhamed, et. al, (2017)**, entitled " Nursing personnel perception toward nursing shortages factors and its effect on their work ,experience and its effect on their work at Benha University Hospital, " which stated the majority of the study nurses had work experiences less than five years.

Pertaining to work place, the findings of the present study revealed that the majority of oncology nurses' subjects were worked place at inpatient of chemotherapy department.

It may be attributed that, this could be that in light the nature of the chemotherapy unit and oncology department there are many of patients and high turnover of them at the

chemotherapy unit. So, there is needed for a lot of oncology nurses who would provide best comprehensive care for those patients.

Regarding the oncology knowledge, The present study findings showed that, all of the studied oncology nurses' had unsatisfactory level of knowledge pre educational program intervention regarding DC technique for SCA. And observed that improved of their knowledge post educational program intervention to become satisfactory level of knowledge related to DC for SCA. From the point of my view, pre program intervention this might be due to lack of their nurses' awareness and lack of training courses. While they improved after attending the educational program. This indicates a positive impact of the training the educational program for nurses' knowledge post attending the program regarding DC for SCA which supported the study hypothesis.

This finding is consistent with a study by **Esmail, et al., (2016)** entitled "Safe administration of chemotherapy among oncology nurses' knowledge and practices in Erbil city".

This found that there was more than two third of nurses had no knowledge concerning chemotherapy administration pre the program implementation to become fair knowledge post program intervention. Also, it is supported by **Koyama, et al., (2019)** who's found that the majority of the nurses had unsatisfactory level of knowledge pre program and had satisfactory level post program.

As regard the nurses' practice of DC, The study finding showed that, there was an obvious improvement of the majority of nurses' practices regarding IDC scores were competent level in documented post an educational program (immediate, post 1and 3 months follow up) intervention as compared to their practice pre program. From the point of my view, it may be due to lack of an educational program, training courses ,their nurses'

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

awareness and level of educational qualification of nurses under the study as more than half of them were nursing diploma. While they improved after attending the educational program.

This finding is supported by **Alsulami, Choonara, & Conroy, (2015)**, who conducted the study entitled " Nurses' knowledge about the double-checking process for medicines administration " who's found that the majority of the nurses had competent level of practice post program implementation.

Concerning nurse one and nurse two practices, the current study shows that there was based on the result of the analysis of mean percent score of study nurses' 1 and 2 related practice of DC for SCA, it showed that, the majority of the nurses' 1 and 2 were achieved a high rate scores of total scores of practice post educational (immediate, post1 and 3 months follow up) program an intervention regarding practice of DC technique of SCA. From the point of the researcher view, it was observed that, the obvious improvement for nurses' one and nurses' two practice of DC post program as compared to their pre program.

This reflects a positive effect of the educational training program on the practice of both of nurses' practice (nurse' one and two) regarding IDC technique of SCA post attending the program regarding DC for SCA which supported the study hypothesis.

This finding is agreed with **Kellett, & Gottwald, (2015)** who conducted study entitled " Double checking high risk medications in acute settings: a safer procedure" which stated that two nurses double-checking the entire process enhances and strengthens practice.

Also, stated that there was improvement in nurses one and two practice score after implementation of the program with highly significant statistical difference.

In this respect, the current study shows that the practice of nurses' the study finding shows that ,most of the studied oncology nurses' had incompetent level of practice regarding patient safety assessment of DC for SCA pre the educational intervention program. On the other hand, their practice of nurses' patient safety assessment was improved post attending the educational program intervention to become competent level. It might be related to the nurses under study were being young age, having few years of experience and lack of continuous educational program regarding DC for SCA.

This finding is similar **O'Connell, Crawford, & Gaskin, (2015)** the study entitled " Nurses' attitudes to single checking medications: before and after its use," which conducted two surveys, the first survey was distributed prior to implementation of program of a single checking procedure and second survey was distributed after implementation of the program. Whose stated that all the study nurses weren't being used DC in the first survey had incompetent level of practice at the time of first survey before program implementation of DC.

Concerning mean percent score of 1st nurse and 2nd nurse regarding patient safety assessment practice, the study finding shows that, there was the majority of the nurses' one and two were achieved a high-rate scores of total scores of practices in post an educational (immediate, post1 and 3 months follow up) intervention program regarding IDC technique of SCA than preprogram. This reflects a positive improvement effect of the program on the nurses' practice concerning the patient safety assessment of the (nurse 1 and nurse 2) regarding IDC technique of SCA.

This finding on the same line with **Hewitt, Chreim, & Forster, (2016)** conducted the study entitled "Double checking: a second look" Whose found that the two third of nurses

under the study were having improvement in their practice of patient safety regarding DC post implementation of the program.

Regarding to beliefs and attitude for the studied oncology nurses' the current study showed that there was a highly a statistically significant difference of the oncology nurses between pre and post the educational intervention program concerning their attitude, beliefs toward DCT. This reflects that a positive effect of the educational program on nurses beliefs and attitude regarding DC technique of SCA which supported the study hypothesis.

This finding is agreement with **Schwappch, Taxis, &Pfeiffer, (2016)** conducted the study entitled" oncology nurses' beliefs and attitude toward the double-check of chemotherapy medications: a cross – sectional survey study" which reported that a strong beliefs among healthcare professionals and oncology nurses' that double check has considerable, a positive effects on safety. Such positive attitudes may foster the implementation of the double check irrespective of scientific validation.

In addition, in similar with another study was done by **Griffin, et al., (2016)** entitled "comparison of independent error checks for oral versus intravenous chemotherapy" and found that a highly statistical significant difference between pre and post nurses' beliefs and attitudes of independent double checks toward oral versus IV chemotherapy.

Concerning relation between the oncology nurses' knowledge, practice and patient's safety assessment and beliefs & attitude with their demographic characteristics post the educational program intervention, it shows that there was a statistically significant relation between nurses' practice and patient safety assessment with their education level. From the researcher point view, the degree of

qualification plays an important role in improving the nurses' practice which reflects on their competence of skillful for patient safety assessment.

This result is agreement with **Abdel-Rahman, (2018)**entitled "Effect of a designed teaching program on safe handling of chemotherapy among nurses in a selected oncology setting" who found that there was statistically significant relation between practice , and degree of education.

Also, in the same line with **Abo El-Fadl,(2020)** who conducted the study entitled " Effect of an educational program on nurses' performance regarding prevention and management of intravenous extravasations' chemotherapy" who found that a strong positive statistical a significant relation between nurses performance , and patient safety with their educational level.

Concerning correlation between the studied oncology nurses' knowledge, practices and patient's safety assessment with their beliefs& attitude regarding DC for SCA, the current study clarifies that there was a highly statistically significant positive correlation between the nurse's knowledge with their beliefs, and attitude post the educational program intervention. From the point of the researcher views the improvement of the oncology nurses' knowledge may reflects on their beliefs and attitude toward how they avoid error with chemotherapy administration and ensure safety.

This result is congruent with **Bottcher, et al., (2019)** entitled" attitudes of doctors and nurses to patient safety and errors in medical practice in the Gaza-Strip: a cross- sectional study" whose found that nurses and doctors had a high statistical significant correlation between doctors and nurses' knowledge and attitude at pre and post program implementation.

While, the result of the current study there was statistically no significant relation between

Effect of An Educational Program regarding Double Check for Safe Chemotherapy Administration on Nurses' Performance, Beliefs and Attitude

nurses' knowledge and beliefs and attitude with their age, education, and experiences.

This result is in consistent with **Qalawa, (2017)**: entitled "The relationship between oncology nurses' practice behaviors, knowledge and confidence regarding for chemotherapy induced peripheral neuropathy" who stated that there was no a statistical significant differences were found between nurses' beliefs and attitude mean scores and with their knowledge levels, education level , age and experiences post training program implementation.

Regarding correlation between the studied oncology nurses' knowledge, practices and patient's safety assessment with their beliefs & attitudes, regarding DC for SCA post the educational program intervention. The finding of the current study revealed that there was a highly statistically significant positive correlation between beliefs and attitudes with oncology nurses' practice and patient safety assessment. From the point of my view, this might due to the effect of training program intervention improvement oncology nurses' practice level and patient safety, which impact on their beliefs and attitude of nurses concerning DC for SCMA post program intervention which were supported with the study hypothesis.

In this respect, this finding is in same line with **Ting, et al ., (2020)** entitled " Nurses' preferences of single or double checking of drug administration: a focus group study " which revealed that there were positive improvement of nurses practice , patient safety and their beliefs post implementation of the educational program.

This result is consistent with **Nieva, & Sorra, (2019)** entitled "Safety culture assessment: a tool for improving the patient safety in healthcare organizations " this found that high statistical significant positive correlation between the safety related

perceptions and attitudes of nurses' and their practice pre and post educational intervention.

Besides, this finding is agreement with **Zakaria, Alaa ,&Desoky, (2022)** entitled " Oncology nurses' knowledge and practices regarding safe administration of intravenous chemotherapy" and found that there was positive statistical significant difference between nurses' practice mean scores ,and patient safety with their age, working department and attendance of training workshops.

Conclusion:

All of the studied oncology nurses had unsatisfactory levels of the knowledge and incompetent in their practice level and patient safety assessment practice pre the program intervention regarding DC technique for SCA. It improved to become had satisfactory knowledge and a competent level practices post of the educational program intervention. Also, concerning the practice of DC technique and patient safety, there was a statistical significant difference among nurse 1 and nurse 2 pre and post the educational program intervention. It effected positively on their beliefs and attitude which were a highly statistical significant improvement post the educational program intervention.

Recommendations:

1. Establishing manual booklet guidelines at chemotherapy unit to improve performance regarding DCT for SCA, and must be announced, available, and easily accessible for all nurses.
2. Establishing Continuous and mandatory in-service training for oncology nurses for DCT for SCA (from preparation until administration and documentation) with updating knowledge based on new evidence practices should be provided.
3. Orientation program should be prepared to help the new hiring appointment nurses to

revise, acquire, and develop their knowledge and practice regarding DC for SCA to be competent.

4. Appropriate workplace policies and procedures regarding DCT for SCA should be developed and reviewed based on international patient safety and medication safety standards /guidelines. it must be announced, available and easily accessible to all oncology nurses at the unit of the hospital.

5. Regular performance appraisal and feedback on compliance with application of DCT policies and procedures are of paramount importance.

6. Replication of the current study on a larger sample and on wider geographical areas of Egypt is required to raise the efficiency of nurses' performance regarding DCT.

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تأثير برنامج تعليمي عن الفحص المزدوج للإعطاء الآمن للعلاج الكيميائي علي أداء و معتقدات وسلوك المرضات

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تعتبر سلامة الأدوية هي التحدي الثالث العالمي لسلامة المرضى كما اوضحت منظمة الصحة العالمية. لذا هدفت هذه الدراسة إلي تقييم تأثير برنامج تمريضي تعليمي عن الفحص المزدوج للإعطاء الآمن للعلاج الكيميائي علي أداء و معتقدات وسلوك ممرضين الاورام وقد أجريت هذه الدراسة في القسم الداخلي والعيادة الخارجية بوحدة العلاج الكيميائي بالدور الخامس بمستشفى بنها الجامعي وكذلك القسم الداخلي للمرضى للعلاج الكيميائي بالدور السادس والعيادة الخارجية بالمعهد القومي للأورام بمستشفيات جامعة القاهرة , و قد إشملت العينة علي 50 ممرض وممرضة من جميع الممرضين بوحدة العلاج الكيماوي بالقسم الداخلي والعيادات الخارجية كالأتي: 20 ممرضين من وحدة العلاج الكيميائي بالدور الخامس بمستشفى بنها الجامعي , و 30 ممرضين من وحدة العلاج الكيماوي بالمعهد القومي للأورام بمستشفيات جامعة القاهرة. وقد أوضحت النتائج أن معظم مستوي المعلومات لممرضين الأورام لديهم غير مرضي و أن كذلك مستويات ممارستهم لتطبيق الفحص المزدوج للإعطاء الآمن للعلاج الكيماوي وكذلك ممارسات لسلامة المرضى لديهم غير كفاء قبل تنفيذ البرنامج والذي تحسن الغالبية العظمي منهم ليصبح لديهم معرفة مرضية وممارسات ذات مستوي كفاء بدرجة عالية أدائهم بعد تنفيذ البرنامج التعليمي للفحص المزدوج للإعطاء الآمن للعلاج الكيميائي (مباشرة بعد البرنامج , وبعد شهر , وبعد ثلاثة أشهر متابعة) , علاوة علي ذلك , قد أوضحت النتائج أنه يوجد دلالة إحصائية عالية بين ممرضين الأورام(بين الممرضه الأولي والممرضة الثانية) فيما يتعلق بالمعلومات والممارسات و سلوكهم ومعتقداتهم لتطبيق الفحص المزدوج للإعطاء الآمن للعلاج الكيميائي ما قبل وبعد تنفيذ البرنامج التعليمي للممرضين (مباشرا بعد البرنامج , بعد شهر , بعد ثلاثة أشهر متابعة), و قد أوصت نتائج الدراسة الي أهمية وضع إرشادات كتيب يدوي بوحدة العلاج الكيماوي لتحسين أداء الممرضين للفحص المزدوج آمن إدارة العلاج الكيماوي, ويجب الإعلان عنها وإتاحتها وسهولة الوصول إليها لجميع الممرضين .