

Suggested guidelines: Assess Patient Caregivers Knowledge and Practice toward Safe Handling Chemotherapy in Assiut University Hospital

Anaam M. Hassan, Mimi M. Mekawy, Madeha A. Mahmoud, & Hanan G. A. Mostafa.

Head nurse oncology unit, Assiut University Hospital.

Assistant Professor of Medical Surgical Nursing, Adult Nursing Department, Faculty of Nursing, Assiut University.

Lecturer Adult Nursing Department, Faculty of Nursing Assiut University, Egypt.

Assistant Professor of Clinical Oncology, Faculty of Medicine, Assiut University, Egypt.

Abstract

Aim: to assess patient caregiver's knowledge and practice toward safe handling chemotherapy, development of suggesting guidelines for patient caregivers toward safe handling chemotherapy. **Methods:** the study was conducted in oncology unit at Assiut University hospitals. Data were collected from all patient caregiver, convenience sample of patient caregivers (60) male and female working in oncology department, in period from preparation until 72 hour post administration, it consist of (20) nurses, (20) worker and (20) patient family member. Tool utilize for data collection were an Arabic structured interview questionnaire sheet and observation checklist for patient caregivers. **Results:** there was lack of nurse's knowledge about chemotherapy with percentage (95%). In addition workers had low knowledge about chemotherapy with percentage (50%, 85%, 65% and 45% respectively). Family member had low knowledge regarding knowledge about cancer and chemotherapy at high percentage with (85%, 100% and 80 respectively) and there is lack of practice related to some of equipment is not applicable. **Conclusions:** majority of patient caregivers had deficient in knowledge and practice towered safe handling chemotherapy. **Recommendation:** focusing on more training and education for patient caregivers and health monitoring to prevent or reduce risk of exposure.

Key words: *Guidelines, Patient Caregivers & Safe Handling Chemotherapy.*

Introduction

Cancer chemotherapy can be divided into four main groups: steroids, immunosuppressant, and monoclonal antibodies and cytotoxic. These guidelines are concerned with the cytotoxic drugs and it is this group which has caused concern with regard to possible adverse effects through handling. (Chen et al., 2013)

Chemotherapy refers to treatment with drugs, while cytotoxic is defined as toxic to cells. Cytotoxic chemotherapy is therefore used largely to treat disease by killing cells. (Mellinger et al., 2012)

Cytotoxic drugs may also be known as anti-neoplastic drugs or cancer chemotherapy drugs. The name refers to a category of drugs which have the ability to kill or arrest the growth of living cells. They play an important part in the treatment of cancer but are also finding a wider role as immunosuppressive agents in transplantation and various diseases with an immunological basis. (Sharon, 2009)

Cytotoxic drugs are commonly administered by injection of single doses or by continuous infusion. Some are given orally in tablet, capsule or liquid form. The potential for exposure exists during various tasks e.g. drug reconstitution and mixing,

connecting and disconnecting intravenous tubing, and disposing of waste equipment or patient waste. (Askins and Moore, 2010)

The main routes of exposure to cytotoxic drugs are through the inhalation of the drug dusts or aerosols, skin absorption, inadvertent ingestion through contact with contaminated food or cigarettes, and needle stick injuries. (Power and Jorgenson, 2010)

Patients who have received chemotherapy in the past 48 hours should have a "chemotherapy precautions" Personnel dealing with blood, vomitus, or excreta from patients who have received chemotherapy should wear chemotherapy approved gloves (double gloves are recommended for all handling activities), disposable chemotherapy gown, and eye and face protection if splashing is expected. (Harmer, 2011)

Clearly marked storage areas must be available for all cytotoxic agents. Safe storage areas must be designed to minimize the risk of breakage and to contain spills. Cytotoxic agents must not be stored in food storage and preparation areas. (Jacobson, 2012)

Cytotoxic drug dilution is an important part of cancer chemotherapy. It should be carried out separately in a cytotoxic admixture unit and not in the wards because of the danger from spillage and contamination. (Goodin et al., 2011)

The practice of preparing cytotoxic drug in the wards or outpatients should be discouraged because of the

danger of spillage and higher chances of exposure of the personnel involved in preparing. If a drug is needed immediately and no pharmacist is available to make the admixture, then a duty doctor / nurse of oncology department may use the pharmacy hood to prepare the admixture. If however a cytotoxic admixture unit is not established in a hospital then in the wards or outpatients a proper place should be fixed and all the precautionary measures to avoid exposure like wearing latex powder free long cuff gloves, a gown that is low or non-permeable, long sleeve, cuffed and solid fronted, aerosols free mask. A spillage kit should be kept nearby to tackle the cytotoxic drug spillage. (Joanne, 2012)

The spillage of cytotoxic drugs should be handled with most care. A proper procedure must be implemented for spillage and it should be treated appropriately. The admixture room should have a spill kit with the waste material generated after cytotoxic drug admixing like syringe, needle, mask and gloves should be disposed carefully in cytotoxic disposal bags. A standard procedure is to be made and followed for disposals of waste materials. The disposal bags should print with cytotoxic drug. (Gulten, 2011)

The hospital should maintain the records of patients receiving cytotoxic drugs. Every detail regarding the cytotoxic drug used and how it was prepared ... etc. Incident form should be filled in case of any error in the process. Any spillage of the cytotoxic drugs is notified. (Favier, 2011)

The responsibilities of caring for a person with cancer may seem complex and overwhelming at first. Depending on the person's needs, you may provide emotional support; practical assistance, such as help with medical cares, financial issues, or insurance issues; or serve as the communicator between the patient and the health care team. The following tips are designed to help you become a successful caregiver:

A caregiver is a member of an important team that includes family members, friends, other volunteers, and the health care team. Each member of the team brings different skills and strengths to the group and is working towards a common goal-providing effective care. If you are the primary or lead caregiver, help each team member express concerns, opinions, and emotions, and make sure that the person with cancer has a central role in all discussions and decisions; if possible it is very important for the person with cancer to have a sense of control and a way to be as proactive as possible (American Society of Health-System Pharmacists, 2006)

The role of the nurse in the administration of chemotherapy is continuously developing. The

importance of education and training for staff administering these treatments is widely recognized as safety for both patient and staff is essential. The risks associated with handling chemotherapy are associated with the time dose and routes of exposure. (Kirby and Millerm, 2010)

Significance of study

In the internal oncology departments about 70-80% of all cancer patients receiving chemotherapy. The more common routes of exposure are contact with skin or mucous membranes through (spillage, splashing), inhalation via (e.g. over pressurizing vials and ingestion through eating, drinking or smoking in contaminated areas or from poor hygiene) in period of 48 from administration until 72 hours after each time of dosage.

From The researcher's clinical experience it has been observed that most of patient caregivers suffer from deficit knowledge and practice in safe handling chemotherapy. This study assesses of patient caregivers knowledge and practice toward safe handling chemotherapy.

Aim of the study

The aims of this study were

- 1- Assess patient caregiver's knowledge and practice toward safe handling chemotherapy.
- 2- Development of suggested guidelines for patient caregivers toward safe handling chemotherapy.

Research questions:

This study is directed to answer the following question

What is the patient caregivers' knowledge and practice toward safe handling chemotherapy?

Operational definitions:

Chemotherapy:

It is a drug treatment that uses powerful chemicals to kill fast-growing cells in patient body. Chemotherapy is most often used to treat cancer, since cancer cells grow and multiply much more quickly than most cells in the body. (Halsen and Kramer, 2011)

Patient caregivers

An individual such as a physician, nurse, family member or social worker whose assists in the identification, prevention or treatment of an illness or disability. (Jacobson, 2012)

Safe handling for chemotherapy

It is a top priority develops procedure for all health care professionals for every stage of handling: receiving, storage, preparation, administration and disposal. (Tomioka and Kumagai, 2009)

Subjects and Methods

Research design

Descriptive exploratory design was utilized to achieve the aim of this study.

Technical design

It includes study setting, subjects, and tools of data collection.

Study setting

The study was conducted in oncology department at Assiut University Hospital.

Study subjects

A convenience sample of all available patient caregivers about (60) male and female working in oncology department who are willing to participate in the study, who are currently assigned and provide care for adult patient with chemotherapy, in period from preparation of medication until 72 hour post administration, it consist of (20) nurses, (20) worker and (20) patient family member.

Tools of the study

Two tools were developed by researcher conducted for data collection includes the following:

Tool [I]: An Arabic structured interview questionnaire sheet for patient caregivers:

It was developed by researcher based on the review literature to assess patient caregiver's knowledge toward safe handling chemotherapy. It included three sheets:

Sheet (1) : An Arabic structured interview questionnaire sheet for nurses:

It included two parts:

Part (I) : Socio demographic data about the nurses such as: age, gender, qualification, years of experience, training course and number of abortion and

Part II : Nurses' knowledge about cancer, chemotherapy and dealing with cytotoxic spillage.

Sheet (2) : An Arabic structured interview questionnaire sheet for worker:

It included two parts:

Part I: Socio demographic data about the worker such as: age, gender, level of education, years of experience and training course and

Part II: Worker's knowledge about chemotherapy and dealing with cytotoxic spillage.

Sheet (3) : An Arabic structured interview questionnaire sheet For patient family member:

It included two parts

Part I: Socio demographic data about the patient family members such as: age, gender, level of education, material status, address, the degree of relationship to the patient and

Part II: patient family member's knowledge about cancer, chemotherapy and dealing with cytotoxic spillage.

Scoring system

Each complete answer was get score of (2) and incomplete answer was get score of (1) but unknown answer was get score of (0). Patient caregivers who scored (70%) or more were considered as having "very good" knowledge. Those who scored (60-70%) were considered having "good" knowledge while those scored (50-60%) were considered as having "pass" knowledge. Less than (50%) were considered poor.

Tool [II]

Observation checklist for patient caregivers

Observation checklist was developed by the researcher based on extensive review of literature to assess patient caregivers' performance toward safe handling chemotherapy. **It included three sheets:**

Sheet 1: Observation checklist Sheet for nurses: It included three parts:

Part I: Pre procedure: - It included: Environmental condition, storage in clinical areas, personal protective equipment, preparing equipment, chemotherapy order sheet, assesses the patient/family knowledge and documentation,

Part II: During procedure:- It included: Oral medication administration, subcutaneous (SC) / intramuscular (IM), precautions during dilution of cytotoxic drugs, peripheral cannula, intravenous cytotoxic agent administration, management of extravasation and Documentation of extravasations and

Part III: Post procedure: - It included: How work be finished, dealing with a cytotoxic spillage onto the nurses skin, dealing with a cytotoxic spillage in the nurses eyes, dealing with a cytotoxic spillage onto clothing/bed linen and dealing with needle-stick injury etc.

Sheet (2) : Observation checklist Sheet for worker: It included: Immediate action, before dealing with the spillage, dealing with cytotoxic spillage on work surfaces, furniture or floors, onto the skin, onto the eye, clothing/bed linen, with needle-stick injury, powder drugs, minor spills (cytotoxic spills less than 50 mls, cytotoxic spills greater than 50 mls), body fluids during 48 hours of receiving chemotherapy and Waste management guidelines.

Sheet (3) : Observation checklist Sheet for patient family members: It included:

Safety precautions, dealing with a cytotoxic spillage onto the skin, dealing with a cytotoxic splash on the eyes, dealing with a cytotoxic spillage onto clothing/bed linen.

Scoring system

was rated for four levels: not done gets a score of (0), not applicable gets score of (1), incorrect gets score of (2) and correct answer gets score of (3). Those who obtained less than (50%) were considered having unsatisfactory level of practice. More than (50%) were considered having satisfactory level of practice.

Tool [III]: Suggested guidelines of patient caregivers

Guidelines were developed by the researcher based on the review of relevant literature according to the needed of patient caregivers and family member knowledge and practice that can help to be safe handling chemotherapy.

It included

Definition of chemotherapy, risk of exposure from chemotherapy, procedures for safe handling chemotherapy, spill and waste management ... etc.

Operational design

The operational design includes preparatory phase, face & content validity, pilot study and ethical consideration.

Preparatory phase

It was included reviewing of literature and different studies related to assess patient caregivers knowledge and practice toward safe handling chemotherapy and to Development of suggesting guidelines for patient caregivers toward safe handling chemotherapy.

Tool testing and pilot study

The content and validity was done by (5) experts in medical surgical nursing field and medical staff. A pilot study was applied on 10% of the studied patient caregivers before starting data collection on 60 Patient caregivers, the aim of pilot study was to assess tools clarity and applicability, time needed for filling in the sheet, moreover, to identify problems that may be encountered during the actual data collection. Necessary modifications were done and patient caregivers included in the pilot study were excluded from the study group.

IV- Statistical design

The data obtained were reviewed, prepared for computer entry, coded, analyzed and tabulated. Descriptive statistics (i.e., frequencies and percentages, mean and standard deviation) were done using computer program (SPSS) version (16). One Way Anova test used in relationship between knowledge and practice. It's considered significant when P. value less than (0.05).

Limitations of study

1. The facilities (personal protective equipment and spill kit) in the oncology unit are limited.
2. Number of participant not covered the work.
3. There is no centrally located area for preparing chemotherapy.

Results

Table (1): Distribution of study sample related to socio-demographic data of patient caregivers:

Items	Caregivers					
	Nurses		Family member		Worker	
	(N=20)	%	(N=20)	%	(N=20)	%
Age in years:						
18<30.	13	65.0	14	70.0	6	30.0
30<45.	5	25.0	4	20.0	11	55.0
≥45.	2	10.0	2	10.0	3	15.0
Mean±SD	32.40±11.91		29.40±9.26		36.40±9.77	
Gender:						
Male.	3	15.0	8	40.0	15	75.0
Female.	17	85.0	12	60.0	5	25.0
Marital status:						
Single	6	30.0	-	-	-	-
Married	14	70.0	-	-	-	-
Nursing Qualification:						
Diplom nursing.	15	75.0	-	-	-	-
Technical institute.	4	20.0	-	-	-	-
Bachelor of nursing.	1	5.0	-	-	-	-
Years of experience:						
≤5.	10	50.0	-	-	12	60.0
5-10.	4	20.0	-	-	5	25.0
>10.	6	30.0	-	-	3	15.0
Mean±SD	2.10±4.7		-		5.40±4.36	
Previous training:						
Yes.	0	0.0	-	-	0	0.0
No.	20	100.0	-	-	20	100.0
Level of education:						
Illiterate.	-	-	6	30.0	-	-
Reads and writes.	-	-	1	5.0	12	60.0
Basic education.	-	-	12	60.0	8	40.0
A university education.	-	-	1	5.0	-	-
Address:						
City.	-	-	3	15.0	-	-
Village.	-	-	17	85.0	-	-

Table (2): Assessment of patient caregiver knowledge towards safe handling chemotherapy.

Patient caregiver	Knowledge (n=20)						Mean±SD
	Unknown		Incomplete		Complete		
	N	%	N	%	N	%	
For nurses :							
1. Knowledge about cancer.	0	0.0	11	55.0	9	45.0	2.3±0.8
2. Knowledge about chemotherapy.	7	35.0	8	40.0	5	25.0	3.1±0.9
3. Knowledge about Dealing with a cytotoxic spillage.	9	45.0	4	20.0	7	35.0	2.5±0.5
For workers:							
1. Knowledge about chemotherapy:	12	60.0	5	25.0	3	15.0	3.7±0.8
2. Knowledge about dealing with spillage.	1	5.0	16	80.0	3	15.0	1.8±0.7
For family members:							
1. Knowledge about cancer and chemotherapy.	12	60.0	7	35.0	1	5.0	3.5±0.4
2. Knowledge about dealing with spillage.	1	5.0	16	80.0	3	15.0	2.1±0.5

Table (3): Assessment of patient caregiver practice towards safe handling chemotherapy.

Patient caregiver	Nurses' practice (pre procedure) (n=20)								Mean± SD
	Done				Not Done		Not Applicable		
	Correctly		Incorrectly		N	%	N	%	
	N	%	N	%	N	%	N	%	
For nurses:									
1. Environmental condition.	2	10.0	8	40.0	5.0	25.0	5	25.0	2.6±0.1
2. Storage in clinical areas.	2	10.0	18	90.0	0.0	0.0	0	0.0	1.8±0.2
3. Personal protective equipment.	0	0.0	5	25.0	5.0	25.0	10	50.0	3.2±0.1
4. Preparing equipment.	0	0.0	3	15.0	17.0	85.0	0	0.0	2.8±0.1
5. Chemotherapy order sheet.	2	10.0	18	90.0	0.0	0.0	0	0.0	1.8±0.1
6. Assesses patient/family knowledge.	0	20.0	0	0.0	0.0	0.0	0	0.0	2.0±0.0
7. Documentation.	0	20.0	0	0.0	0.0	0.0	0	0.0	2.0±0.0
For worker:									
1. Immediate action.	1	5.0	5	25.0	6	30.0	8	40.0	3.1±0.08
2. Before dealing with the spillage ensure you have put on.	0	0.0	5	25.0	1	5.0	14	70.0	3.4±0.06
3. Dealing with cytotoxic spillage on work surfaces, furniture or floors.	0	0.0	8	40.0	7	35.0	5	25.0	2.8±0.05
4. Dealing with a cytotoxic spillage onto the skin.	4	20.0	4	20.0	12	60.0	0	0.0	2.4±0.3
5. Dealing with a cytotoxic spillage in the eyes.	3	15.0	8	40.0	9	45.0	0	0.0	2.3±0.1
6. Dealing with a cytotoxic spillage onto clothing/bed linen etc.	0	0.0	3	15.0	17	85.0	0	0.0	2.8±0.8
7. Dealing with needle-stick injury.	5	25.0	5	25.0	10	50.0	0	0.0	2.2±0.2
8. Dealing with powder Drugs.	0	0.0	0	0.0	20	100.0	0	0.0	3.0±0.0
9. Minor spills (cytotoxic spills less than 50 mls or spills of body fluids containing cytotoxic agents).	0	0.0	9	45.0	7	35.0	4	20.0	3.1±0.05
10. Major spills (cytotoxic spills greater than 50 mls).	0	0.0	7	35.0	10	50.0	3	15.0	2.7±0.1
11. Body fluids and excreta during 48 hours of receiving chemotherapy.	0	0.0	4	20.0	9	45.0	7	35.0	3.1±0.5
12. Waste management guidelines.	0	0.0	8	40.0	6	30.0	6	30.0	2.8±0.8
For family member:									
1. Safety precautions.	0	0.0	0	0.0	20	100.0	0	0.0	2.0±0.0
2. Dealing with a cytotoxic spillage onto the skin.	1	5.0	13	65.0	2	10.0	3	15.0	2.7±0.3
3. Dealing with a cytotoxic splash on the eyes.	2	10.0	6	30.0	5	25.0	7	35.0	2.5±0.2
4. Dealing with a cytotoxic spillage onto clothing/bed linen etc.	1	5.0	9	45.0	11	55.0	0	0.0	2.7±0.1

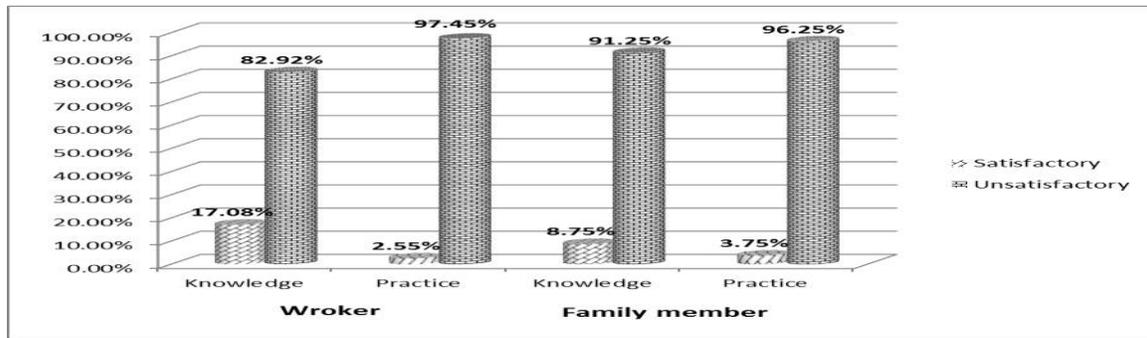
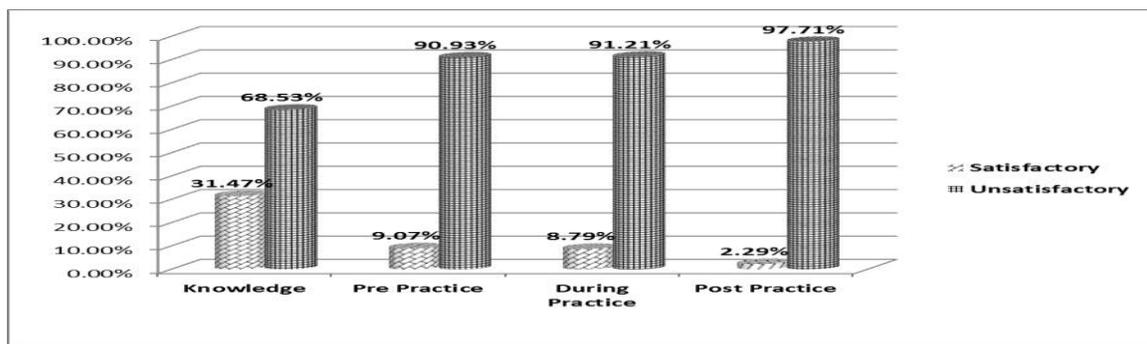
Fig (1): Assessment of workers and family members' knowledge and practice (n=20):**Fig (2): Assessment of nurses' knowledge and practice (n=20):**

Table (1) : shows that, highest percentage of nurses and family member (65%, 70%) had age 18-30, but about (55%) of workers had age 30-45. Concerning gender, majority of nurses were females (85%). But three fourths of workers were male (75%). About (70%) of nurses are married, and three quarters of them (75%) are diploma nursing. Concerning years of experience half of nurses (50%) have ≤ 5 years of experience and more than half of worker (60%) has ≤ 5 years of experience. Nurses and worker hadn't received previous training about safe handling chemotherapy. According to family member's education, the table cleared that (60%) had basic education and (30%) illiterate. On other hand about (60%, 40%) of workers reads and writes and basic education respectively.

Table(2) : illustrated that, nearly half of nurses had incomplete knowledge about cancer with percentage (55%), more than three quarters of workers had unknown knowledge about dealing with spillage with percentage (80%), as well as more than three quarters of family member had unknown knowledge about dealing with spillage with percentage (80%),

Table (3) : this table reflected that, nurses had high percentage scores in done incorrectly practice in storage in clinical areas and chemotherapy order sheet with percentage (90%) and, (100%) of workers had not done practice in dealing with powder drugs,

as well as (100%) of family member had not done practice in safety precautions.

Fig. (1, 2): illustrated that, the vast majority of the studied patient caregiver had unsatisfactory knowledge about safe handling chemotherapy with (68.53%, 82.92% and 91.25% respectively). On other hand the vast majority of nurse's practice is unsatisfactory in pre, during and post procedure with (90.93%, 91.21% and 97.71% respectively). Also there is high percentage of unsatisfactory practice in worker and family member with (97.45% and 96.25% respectively).

Discussion

The aims of this study are assess patient caregiver's knowledge and practice toward safe handling chemotherapy and development of suggesting guidelines for patient caregivers toward safe handling chemotherapy. Chemotherapy is a major treatment modality for cancer and can have a substantial impact on patient's physical function and quality of life. Many common cancer patients treated with chemotherapy in an inpatient or in outpatient. Therefore, nurses have a pivotal role in care of patient undergoing chemotherapy **Ekman et al, (2004).**

The Discussion was cover the main result findings as the following:

I- Socio demographic characteristics of patient caregiver:

Based on the results of the present study, the majority of nurses their ages ranged from 18-30 years, female, married, and has diploma nursing. Their years of experience less than 5 years **Abd Al-Magid, (2012)** in the same line with the current study finding conducting in oncology unit at Assuit university hospital, entitled nursing care standers for cancer patients undergoing chemotherapy who revealed that the majority of nurses their ages ranged from 20-40 years, married, female and have diploma of nursing. As regards socio-demographic data of workers, this result is in line with the study of **Sugira et al., (2010)** which revealed that the majority of health care workers had not attended any training related program. This is in line with **Clark and Patricia, (2012)** conducted the study in Geneva, the report stressed on important of training course that should make staff more aware of potentially serious implication of mismanagement of waste, this consistent with my current study.

II- Patient caregiver' knowledge towards safe handling chemotherapy:

The present study revealed that majority of the nurse has poor knowledge on dealing with chemotherapy spillage onto skin, where are chemotherapy waste put and personal protective equipment. In the same line with the current study **Chen et al, (2013)** reported that evidence-based results suggested that nurses have insufficient knowledge about safe handling chemotherapy. More fundamentally, however nurses need more education about chemotherapy in nursing school and through in-hospital continuing education.

Kyprianou et al., (2010) reported that level of knowledge about antineoplastic agents is high among nurses; along with the level of personal protective equipment use, medical surveillance and employee training seems to be lagging behind. And this disagrees with the present study.

The present study show that the majority of nurses have poor knowledge in three items of chemotherapy (advantage of storage of chemotherapy, management of extravasation and potential duration of exposure effect of chemotherapy) this may be attributed to insufficient course related to cancer and chemotherapy included their undergraduate curriculum of nursing education. And this disagree with **Polovich, (2012)** who stated that chemotherapy medications should be packaged in a labeled, sealed, leak-proof container with outer bag heat sealed where possible. Cytotoxic medications should be stored in a hard-walled and robust container, securely closed and

labeled with cytotoxic warnings. Refrigerate as necessary.

As regards workers knowledge towards safe handling chemotherapy the study revealed that the workers has poor knowledge in the majority of items (knowledge about chemotherapy and knowledge about dealing with spillage) this may due to all workers not attended any previous training program or workers shop towered safe handling chemotherapy.

In this aspect **Venitt et al., (2013)** mentioned that the health effects of occupational exposure to hazardous drugs are provided information about specific steps that can be taken to reduce accidental exposure, such as reducing surface contamination, use of personal protective equipment and proper disposal guidelines, among other safe practices.

As current study revealed that family members has poor and moderate knowledge toward safe handling chemotherapy this may due to that family member not received sufficient information or knowledge about chemotherapy and how to deal with chemotherapy spillage, so booklets and pamphlet must be present at oncology unit to help the family members to acquire information toward safe handling chemotherapy and how to deal with chemotherapy spillage.

Patient caregiver' practice towards safe handling chemotherapy

As regard nurse's practice (pre procedure) towards safe handling chemotherapy the study revealed that are some equipment are not applicable (use ducted biosafety cabinet, a long sleeved gown, safety spectacles or goggles) and procedure for handling spills not done in using preparing equipment (Portable trolleys, Disposable injection trays, disposable gauze squares, disposable gauze squares around syringe, plastic-backed absorbent. This finding may be related to the facts that facilities in the oncology unit are limited and this disagree with **Viele, (2005)** who stated that before chemotherapy drug administration necessary equipment must be present.

Anton and Kathryn, (2013) reported that most of participant's usually wearing gloves and using laboratory coats as protective equipment during chemotherapy handling. Usual use of face and respiratory protection was few. Chemotherapy was reported to be prepared in laminar air flow hoods of work settings. This disagrees with the current study which revealed there are some equipment are not applicable (ducted biosafety cabinet, a long sleeved gown, safety spectacles or goggles).

Also the result revealed that all nurse not done these items incorrectly (access to hazardous drug storage areas, assess patient /family knowledge and

documentation). This means that nurses need training program and work shop to improve their clinical skills. **Macqueen et al., (2012)** who mentioned that documentation regarding the process of chemotherapy administration is critical and documentation should occur on approved institutional forms and according to policies and procedures that govern practice within the specific agency. Disagree with the present study which revealed that high percentage of not done on documentation of chemotherapy extravasations.

Conclusions

Based on the results of the present study can be concluded that:

The majority of nurse, workers, family member had deficient in both knowledge and practice towered safe handling chemotherapy. In addition there are deficient in environmental condition, storage of drugs and some equipment are not applicable (ducted biosafety cabinet, a long sleeved gown, safety spectacles or gogglesetc.)

Recommendation

Based on the result of the present study, the researcher come up with the following recommendations:

For nurses:

- Nurses should be encouraged to attend specific meeting as workshop and seminars held for safe handling chemotherapy to be acquainted with most recent advances and skills in the field
- Clinical meeting should be planned periodically in order to present to all nurses new advances in this field.
- Periodic monitoring of nurse's knowledge and practice to evaluate the level of nurses who administered chemotherapy.

For workers

Workers should be encouraged to attend specific meeting as workshop and seminars to cover these items:

- Hazards of chemotherapy.
- Infection control measures.
- How to deal with patient body fluids, excreta, vomitus of patient undergoing chemotherapy.
- How to deal with spillage onto clothing/bed linen and floor.

For family members

- All personnel involved in the care should receive an orientation to chemotherapy drugs including their known risk, how to deal with patient body fluids... etc.
- The nurse should give patients and their family member's adequate verbal and written

information about their chemotherapy regimen, how to take their medication and how to deal with exposure.

References

1. **Abd Al-Magid S., (2012):** Nursing care standers for cancer patient undergoing chemotherapy research at Assiut university hospital, result, PP: 95-104.
2. **American Society of Health-System Pharmacists., (2006):** Basics of Aseptic Compounding Technique Video Training Program, U., Chapter (2) Hand washing Proper procedure, P.,: 6-9.
3. **Anton K., and Kathryn R., (2013):** The Safe Handling and Administration of Cytotoxic Products for the Treatment of Cancer, PP: 3-6.
4. **Askins M., And Moore B., (2010):** Psychosocial support of the pediatric cancer patient: lessons learned over the past 50 years, Cure Oncology Rep, Vol. (10), PP: 469-476.
5. **Chen I., Wang K., and Tang F., (2013):** Evaluating nurses' knowledge of chemotherapy, Vol. (44), Issue (12), December 2013, PP: 553-563.
6. **Clark P., and Patricia C., (2012):** Factors Influencing Oncology Nurses' Use of Hazardous Drug Safe-Handling Precautions, Oncology Nursing Forum Vol. (39), Issue (3), PP: 99-111.
7. **Ekman I., Bergbom I., Ekman T., Berhold H., and Mahasneh S., (2004):** Maintaining normality and support are central issues when receiving chemotherapy for ovarian cancer, Cancer nurses, 27(3), PP: 177-182.
8. **Favier B., Labrosse H., Gilles-Afchain L., Cropet C., Perol D., Chaumard N., Latour J., and Hild P., (2011):** Impact of its use on workplace contamination and duration of chemotherapy preparation, Journal Oncology Pharm Practice, Vol. (18), Issue (1), PP: 37-45.
9. **Goodin S., Griffith N., Chen B., Chuk K., Daouphars M., Doreau C., Rinku A., and Schwartz R., (2011):** Safe Handling of Oral Chemotherapeutic Agents in Clinical Practice: Recommendations From an International Pharmacy Panel, Journal Oncol Pract, 2011 January, Vol. (7), PP: 7-12.
10. **Gulten T., Evke E., Ercan I., Evrensel T., Kurt E., and Manavoglu., (2011):** Lack of genotoxicity in medical oncology nurses handling antineoplastic drugs: effect of work environment and protective equipment, Chapter (39), PP: 485-489.
11. **Halsen G., and Kramer S., (2011):** Assessing the risk to health care staff from long-term

- exposure to anticancer drugs - the case of monoclonal antibodies. *Journal Oncol Pharm Practice*, Vol. (17), PP: 68-80.
12. **Harmer V., (2011):** Breast Cancer Nursing Care and Management, Chapter (9) Chemotherapy as Breast Cancer treatment, Second edition, John Wiley & Sons, PP: 151-155.
 13. <http://www.springerlink.com/content/>
 14. **Jacobson F., (2012):** Guidelines for Safe Handling and Administration of Anticancer, British Oncology Pharmacy Association, *Cancer Journal for Clinicians*, Vol. (119), Issue (26), P: 125.
 15. **Joanne L., (2012):** Safe Handling and Administration Considerations of Oral Anticancer Agents, *Clin Journal Oncol Nurs.*, PP: 192-197.
 16. **Kirby J., and Miller C., (2010):** Intraregional chemotherapy for no melanoma skin cancer: A., practical review, *Journal Am Acad Dermal*, P.,124.
 17. **Kyprianou M., Kapsou M., Raftopoulos V., and Elpidoforos S., (2010):** Knowledge, attitudes and beliefs of Cypriot nurses on the handling of antineoplastic agents, Vol. (E7), Issue (1), *Online Journal of Knowledge Synthesis for Nursing*, PP: 51-60.
 18. **Macqueen S., Bruce E., and Gibson F., (2012):** The Great Ormond Street Hospital Manual of Children's Nursing Practices, USA, Chapter (8), PP: 136-137.
 19. **Mellinger E., Skinker L., Sears D., Gardner D., and Shult P., (2012):** Safe handling of chemotherapy in the perioperative setting, *Oncol Nurs Forum*, May, Vol. (1), Issue (39), PP: 299-309.
 20. **Polovich M., (2012):** Nurses' Use of Hazardous Drug-Handling Precautions and Awareness of National Safety Guidelines, *Oncology Nursing Forum*, Vol. (38), Issue (6), PP: 85-91.
 21. **Power L., and Jorgenson J., (2010):** Safe handling of hazardous drugs Video training, USA, Chapter (3) Receipt, Storage, Transport, Labeling. PP: 24-26.
 22. **Sharon L., (2009):** Chemotherapy and biotherapy guidelines and recommendations for practice, 3rd ed., Pittsburgh, Chapter (8) Guidelines for Personnel Dealing with Chemotherapy, PP: 2-5.
 23. **Sugaira S., Nakanishi H., Asano M., Hashida T., Tanimura M., Hama T., and Nabeshima T., (2010):** Study for environmental and biological monitoring of occupational exposure to cyclophosphamide in Japan, *Journal Oncol Pharm Practice*, Vol. (17), PP: 20-28.
 24. **Tomioka K., and Kumagai S., (2009):** Health risks of occupational exposure to anticancer (antineoplastic) drugs in health care workers, *Clinical Journal Oncology Nursing*, Aug, Vol. (13), Issue (4), PP: 433-439.
 25. **Venitt S., Crofton C., Hunt J., Speechley V., and Brigg K., (2013):** The lancet Originally published as Vol. (1), Issue (8), P: 168.
 26. **Viele C., (2005):** Keys to unlock cancer: targeted therapy, *oncology nursing forum*, 32-(5).