Factors Associated with Nurses' Adherence to the Use of Protective Precautions in Administering Chemotherapy Drugs

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Keywords: Adherence, Chemotherapy Drug, Nurse, Precaution.

Abstract: Chemotherapy drugs could impose hazardous physical effects, especially on nurses administering the drug. However, the precautions may often be of insufficient concern for practitioners. Our study was intended to evaluate the factors associated with nurses' adherence to using protection in administering chemotherapy drugs. We performed a cross-sectional data collection on all nurses working at the in-hospital ward of Dr. Soetomo General Hospital where chemotherapy is given. Results showed that of 133 nurses working in the chemotherapy hosting, 53 participants fulfilled the criteria and completed all the questionnaires. Twenty-nine (54.7%) of the participants were aged between 20-30 years old, 38 (71.7%) had vocational nursing qualifications, and 28 (52.8%) had at least six years of working experience. We found factors significantly associated with nurses' adherence including attitude (Spearman's rho = 0.3; P = 0.03), equipment availability (Spearman's rho = 0.5; P < 0.001) and accessibility (Spearman's rho = 0.4; P = 0.004), and supervision (Spearman's rho = 0.5; P < 0.001). Additionally, the findings indicate that factors associated with nurses' adherence to the use of protective precautions in giving chemotherapy include attitude, equipment availability and accessibility, and supervision.

1 BACKGROUND

Chemotherapy, as one of the cancer treatment modalities, uses a cytostatic agent that belongs to the hazardous and toxic substances. Administration of this agent puts the healthcare provider, especially the nurses, at the risk of exposure (Huda, 2003) with a subsequent possibility of skin rash, infertility, pregnancy abortion, fetal malformation, or cancer (Callahan et al., 2016a). To reduce the risk, it is mandatory to apply protective precautions during the process (Huda, 2003).

It is estimated that around 14 million new cases of cancer are diagnosed each year with 48% of them in developing countries (Callahan et al., 2016b). Data from the Ministry of Health Indonesia in 2013 showed that the prevalence of all-type cancer is around 1.4% of the total population (KEMENKES RI, 2015) with the top four provinces being DI Yogyakarta (4.1%), Central Java (2.1%), Bali (2.0%) and East Java (1.6%).

Dr. Soetomo General Hospital, located in East Java, is one of the top referral and teaching hospitals in Indonesia covering the eastern part of the country. Unpublished medical record data of the hospital showed that in 2015 there had been 12,016 chemotherapy procedures performed on 5,795 patients.

In this study, we aimed to analyze the factors contributing to nurses' adherence to the use of protective precautions while administering the chemotherapy regimen.

2 METHODS

2.1 Study Design, Population, Sample

We performed cross-sectional data collection on all nurses working at the in-patient ward Dr. Soetomo General Hospital that hosts a chemotherapy administration.

Inclusion criteria to enter the study were 1) Nurses responsible for administering chemotherapy drugs directly to the patients in the ward, 2) Nurses who had received special training in chemotherapy drug handling, administration, and management, 3) Nurses who had working experience of more than one year

Pratiwi, I., Hidayati, L. and Nursalim, M.
Factors Associated with Nurses' Adherence to the Use of Protective Precaution in Administering Chemotherapy Drug.
DOI: 10.5220/0008327905210526
In *Proceedings of the 9th International Nursing Conference (INC 2018)*, pages 521-526
ISBN: 978-989-758-336-0

in the institution at the time of study and 4) Nurses who agreed to participate in the study.

As the aim of this study was to portray the entire procedure of chemotherapy administration, we only excluded participants if they did not agree to be included or revoked their consent to the study.

2.2 Study Procedure

Participants were recruited by performing total sample collection on all nurses satisfying the criteria. Prior to the study, each participant was given complete information regarding the study and procedure involved. After the participants agreed and signed the consent form, they were then asked to fill in the questionnaires measuring knowledge, attitude, the availability and accessibility of instruments for administering chemotherapy drugs. Along with those questionnaires, we also collected the basic demographical information of each participant including age, sex, education background and length of working experience. Following the questionnaire step, participants were then observed during their daily activities performing chemotherapy administration.

Since this study involving the everyday tasks of each nurse and may compromise their career, the anonymity and confidentiality of the results are highly appreciated.

Study was conducted at the in-hospital ward of Dr. Soetomo General Hospital Surabaya involving paediatrics, obstetrics and gynaecology, surgery, and medicine ward.

2.3 Questionnaires

To measure the factors that may have an association with the nurses' adherence to protective precautions we used several questionnaires as explained below:

2.3.1 Knowledge Questionnaire

Instrument for measuring knowledge according to Chemotherapy Handling Questionnaire developed by Martha Polovich (Polovich, 2016) adapted to Bahasa Indonesia.

2.3.2 Knowledge Questionnaire

Instrument for measuring attitude adapted from Polovich et al. (Callahan et al., 2016a). The questionnaire is presented in a 5-grade Likert scale.

2.3.3 Availability Questionnaire

Using assessment tools developed by Yuliana (Callahan et al., 2016b) written in Bahasa Indonesia. This questionnaire contains six yes/no questions. The parameters assessed include instrument completeness, condition, and quantity.

2.3.4 Accessibility Questionnaire

We developed a questionnaire with six short yes/no answers. This was measuring instrument location and distance from the chemotherapy administration site.

2.3.5 Supervision Questionnaire

This was assessed with a questionnaire developed by the authors. The parameters measure were policy in using protective precautions, monitoring, and evaluation. There were six questions with yes/no answers.

The forms and questionnaires were standardized and used throughout the study. All questionnaires were tested for validity and reliability before the study on 20 participants (nurses). The results showed that the questionnaires were at least acceptable to use as shown by a Cronbach Alpha score of above 0.700.

2.4 Data Analysis

The data obtained from the study was processed by using Microsoft Excel (Microsoft Inc, California, USA) and analyzed by using SPSS v22 (SPSS Inc., Chicago, Illinois, USA). Participants' baseline demographics were expressed as either categorical data with frequency and percentage or continuous data with mean and one standard deviation.

Correlation analysis results were analyzed using Spearman's correlation test due to the skewed distribution of data.

2.5 Ethical Clearance

The protocol of this study was reviewed and approved by the ethics committee of Dr. Soetomo General Hospital with registration number: 53/Panke.KKE/I/2017. The author asserts that all procedures performed within and related to this study conformed to the basic principles of research involving humans. Participation was voluntary, and all participants were free to withdraw at any stage.

3 RESULTS

Table 1: Participant demographics.

No.	Characteristics	N	%
1.	Age		
	20-30 years	29	54.7
	31-41 years	12	22.6
.	> 41 years	12	22.6
2.	Sex		
	Male	13	24.5
	Female	40	75.5
3.	Education		
	Vocational	38	71.7
	Bachelor	15	28.3
4.	Years experience		
	< 6 years	25	47.2
	6-10 years	15	28.3
	> 10 years	13	24.5
5.	Frequency administering drug		
	1-3/week	12	22.6
	4-6/week	17	32.1
	> 6/week	24	45.3

Table 2: Interview results.

No.	Characteristics	Category	N	%
1.	Knowledge	Good	23	43.4
		Fair	21	39.6
		Poor	9	17.0
2.	Attitude	Positive	48	90.6
		Negative	5	9.4
3.	Instrument Availability	Complete	26	50.9
		Incomplete	27	49.1
4.	Instrument Accessibility	Accessible	24	45.3
		Less accessibel	29	54.7
5.	Supervision	Good	29	54.7
		Poor	24	45.3
6.	Adherence	Adhere	6	11.3
		Non adhere	47	88.7

There were 133 nurses working in the chemotherapy-hosting ward. Of those, 53 participants fulfilled the criteria and completed all the questionnaires, with 13 males and 40 females. Twenty-nine (54.7%) of the participants were aged between 20-30 years old, 38 (71.7%) had vocational nursing qualification, and 28 (52.8%) had at least 6 years of working experience.

Table 3: Spearman correlation test.

No.	Parameter	P value
1.	Knowledge vs. Adherence	0.470
2.	Attitude vs. Adherence	0.030*
3.	Instrument Availability vs. Adherence	< 0.001*
4.	Instrument Accessibility vs. Adherence	0.004
5.	Supervision vs. Adherence	< 0.001*
6.	Age vs. Adherence	0.322
7.	Education vs. Adherence	0.328
8.	Experience vs. Adherence	0.642

*. Significant result

Table 1 shows participants' demographic distribution. More than half of the respondents were female, had a vocational education background, and had less than 10 years of experience. However, 77.4% of them were giving chemotherapy more than four times in a week.

Table 2 explains that most participants have positive attitues toward protective precaution tools and good knowledge. However, more than 88% of them were non-adherent to the use of protective precautions when administering the drugs.

As shown in Table 3, knowledge, age, education, and experience of nurses did not significantly correlate with adherence in using protective precautions. However, we found that attitude, instrument availability and accessibility, and supervision were significantly correlated with nurses' adherence.

Spearman's rho coefficient for attitude, instrument availability and accessibility, and supervision were 0.298, 0.498, 0.386, and 0.511 respectively.

4 DISCUSSION

Most hazardous drugs (HDs) are chemotherapy drugs used in the treatment of cancer, making occupational HD exposure a significant problem for oncology nurses. Nurses may be exposed to HDs during preparation, administration, or handling of patient

excreta following their use (American Society of Health-System Pharmacists, 2006). This study analyzed the factors contributing to nurses' adherence in using protective precautions when administering chemotherapy drugs. Our results indicated that the only predisposing factors significantly correlated with adherence to using protective precautions was attitude, while other factors such as age, education, and working experience did not significantly correlate. Instrument availability and accessibility as the enabling factors on the other hand plays an important role in nurses' adherence showing a moderate yet significant correlation supporting the reinforcing factors, supervision.

4.1 Predisposing Factors and Adherence

Predisposing factors play a role in determining the pre-existing condition of the subject prior to the process. Lawrence Green (Notoatmojo, 2007)) explains that predisposing factors can be shown in knowledge, attitude, beliefs, and values. The factors may also be associated as the factors that could facilitate people in taking particular actions.

Our study indicates that age, as a "solid" predisposing factor, did not correlate with the adherence of performing important procedures such as using protective precautions. Our result was at odds with the theory proposed by Wawan and Dewi (Wawan & Dewi, 2010) that the increase in age may facilitate someone to think constructively, enable them to cope with the problems and thus adhere to rules and regulations. Our in-depth interviews with senior nurses may suggest that they maintain the practice of low adherence due to lack of consistent good practice, and it later becomes a habit. Other study by Nurcahyanti (Nurcahyanti, K.K., Siswanto, Y. & Ariesti, N.D., 2014) confirms our result in an adherence study on midwives.

Our results on education and working experience also did not show a significant correlation to adherence. The results could not confirm Notoatmojo's (Notoatmodjo, S., 2010) and Wawan & Dewi's (Wawan & Dewi, 2010) theories that education and working experience could improve the knowledge insight and the familiarity with the working environment. A significant correlation was also lacking between knowledge and adherence, although most of the nurses exhibit a fair to good level of understanding of the risk of chemotherapy drugs.

On the other hand, one predisposing factor, attitude, was found to have positive weak yet significant correlation to nurses' adherence. Our result was in line with a similar study at RSUD Zainoel Abidin, Banda Aceh by Hasan and colleagues (Hasan, 2016). Other study by Riyanto et al. (Riyanto, 2016) confirms the positive correlation of attitude toward adherence; although the latter study was not specifically conducted in the chemotherapy unit.

4.2 Enabling Factors and Adherence

Two important enabling factors that were evaluated and found to have a positive correlation with adherence were protective instrument availability and accessibility including aprons, head caps, plastic boots, gloves, masks, and protective spectacles within the working area.

The results are in line with Yuliana (Yuliana, 2012) and a study by Nurkhasanah and Sujianto (Nurkhasanan, 2014) which confirm that nurses equipped with sufficient instruments in performing daily tasks support the adherence to standards in using protective precautions. Other studies from Chaerunnisa et al. (Chaerunnisa, 2014) and Erlina and colleagues (Erlina, R., Larasati, T. & Kurniawan, 2013) support the results that instrument accessibility plays an important role in adherence. The latter two studies were performed on pregnant women when accessing antenatal care. Polovich et al. (2011) also confirm that personal protective equipment (PPE) is available in most settings where chemotherapy is handled; however, chemotherapy-designated PPE is not always provided by employers. At least 20% of nurses reported that chemotherapy gowns were not available for their use. Eye protection and respirators were available less often than other PPE (Polovich, M & Marthin, 2011).

In-depth interviews with nurses in the unit suggested that not all units were equipped with complete instruments for performing chemotherapy administration. This may be one reason contributing to nurses' adherence in using protective equipment. Lawrence Green (Notoatmodjo, S., 2010) explained that instrument accessibility influences people in using the facilities and supports their behavior.

4.3 Reinforcing Factors and Adherence

We found that the supervision strategy in the unit performing chemotherapy administration significantly correlated with nurses' observance in using protective equipment. Riyanto's studies evaluating nurses' adherence to protective equipment use in daily practices support our results. They found that head nurse supervision in the ward could improve nurse-in-charge behavior in using protective apparatus (Riyanto, 2016).

Supervision from senior nurses may have a direct impact on the willingness to perform proper procedures. Head nurses have the role of supervising their juniors or nurse-in-charge in performing daily activities (Nursalam, 2013). Lawrence Green (Notoatmodjo, S., 2010) also describes how supervision functions as the strengthening factor in affecting people's behavior.

Follow-up interviews with the head nurses in this study also revealed that the nurse-in-charge performing chemotherapy administration tends to continually perform the procedures while there is a senior or supervisor overseeing their work.

4.4 Study Limitations

The inherent limitation of cross-sectional studies is indivisible in this study. The one-off data collection may limit observation of the whole picture of the daily practice of using protective equipment in a chemotherapy ward. In addition, the observational nature of this study may also exhibit some bias in deducing correlation of factors.

5 CONCLUSIONS

Chemotherapy drugs could pose a serious risk to healthcare providers administering the substances, and this is especially so for the nurse-in-charge of chemotherapy. Therefore, the use of protective precaution equipment is mandatory in every step of the procedure and often involves applying multiple protective apparatus.

Our study indicates that predisposing factors (attitude), enabling factors (instruments availability and accessibility), and reinforcing factors (supervision) correlate significantly with nurses' adherence to using protective precaution equipment while administering chemotherapy drugs.

Further improvements may need to be emphasized by stakeholders, especially involving the factors associated with nurses' adherence. Follow-up studies such as qualitative investigation could be conducted to elaborate the results of this investigation. Alternative methods of disseminating safety recommendations are needed.

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