

## ผลของการให้คำปรึกษาด้านเคมีบำบัดในผู้ป่วยมะเร็งโดยเภสัชกร

### Outcome of Chemotherapy Counseling in Oncology Patients by Pharmacist

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#### Abstract

Cancer is a disease that requires long term treatment and intensive monitoring. There are several methods to manage cancer but most cases are treated with chemotherapy. Patients who receive chemotherapy should receive advice on side effect management and proper self-care to properly cope with drug related problems and ultimately obtain the maximum benefits from the treatment. The prospective descriptive study was designed to evaluate the outcome of chemotherapy counseling utilizing standard questionnaires by a pharmacist who participated in an oncology care team during December 2004 to March 2005. The study setting was a medical oncology patient care unit (5E ward), Srinagarind Hospital, Khon Kaen University, Thailand. Ninety-one cancer patients were assessed for eligibility and 82 (90.1%) were recruited in this study. The counseling by pharmacist took place three times before and after patient received chemotherapy at each visit. The patients were evaluated in terms of knowledge, satisfaction and frequency of side effects. The results demonstrated that patients had an improved knowledge score based on disease and chemotherapy, possible side effect of chemotherapy and self care behavior after receiving chemotherapy counseling by a pharmacist following three evaluation periods ( $p < 0.01$ ). Satisfaction score also significant improved (4.8 of 5) after receiving intervention by a pharmacist ( $p < 0.01$ ). As for the adverse event evaluation, gastrointestinal (GI) side effects such as anorexia were the most common adverse event (91.5%) found in the first evaluation period however GI side effects were reported to be less in degree and frequency at the second and third follow up period post counseling. In conclusion, the pharmacist intervention based on chemotherapy counseling improved knowledge and satisfaction in oncology inpatients and reduced adverse events following chemotherapy treatment. The results of the present study should be used to encourage the establishment of oncology

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pharmacy practice model. By utilizing this pharmaceutical care activity, pharmacists will be able to serve as valuable health care staffs who can ultimately improve the quality of oncology care in the future.

**Keywords:** Adverse event, Chemotherapy, Counseling, Pharmaceutical care

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## บทคัดย่อ

มะเร็งเป็นโรคร้ายแรงที่ผู้ป่วยต้องได้รับการดูแลอย่างต่อเนื่อง การรักษามะเร็งมีหลายวิธี อย่างไรก็ตามการรักษาด้วยยาเคมีบำบัดถือว่าการรักษาหลักสำหรับผู้ป่วยมะเร็งส่วนใหญ่ ผู้ป่วยที่ได้รับการรักษาด้วยเคมีบำบัดควรได้รับคำแนะนำด้านยาและการปฏิบัติตัวเพื่อให้อาการไม่พึงประสงค์และการไม่พึงประสงค์และเพื่อให้ได้รับผลสัมฤทธิ์สูงสุดจากการรักษา การศึกษาเชิงพรรณนาแบบไปข้างหน้านี้มีวัตถุประสงค์เพื่อศึกษาผลของการให้คำแนะนำความรู้เกี่ยวกับยาเคมีบำบัด ในผู้ป่วยมะเร็งโดยมีเภสัชกรเป็นส่วนหนึ่งของทีมรักษา การวิจัยนี้เป็นการประเมินองค์ความรู้ด้าน อาการอันไม่พึงประสงค์จากการรักษาพยาบาล และประเมินความพึงพอใจของผู้ป่วยหลังจากได้รับคำแนะนำความรู้เกี่ยวกับยาเคมีบำบัดโดยเภสัชกร ในช่วงระหว่างเดือนธันวาคม 2548 และเดือนมีนาคม 2549 ที่หอผู้ป่วยเคมีบำบัด 5 จ โรงพยาบาลศรีนครินทร์ มหาวิทยาลัยขอนแก่น จังหวัดขอนแก่น ผู้ป่วยจะถูกประเมินโดยอาศัยชุดคำถามมาตรฐาน และประเมินออกมาเป็นคะแนน หลังจากนั้นจะมีการเปรียบเทียบคะแนนความรู้เกี่ยวกับการรักษาด้วยยาเคมีบำบัด อาการอันไม่พึงประสงค์จากการรักษาด้วยยาเคมีบำบัด ปัญหาที่เกิดจากการใช้ยาเคมีบำบัด ก่อนและหลังการได้รับคำแนะนำจากเภสัชกร นอกจากนี้ยังมีการประเมินความพึงพอใจของผู้ป่วยหลังได้รับคำแนะนำด้วยผลการศึกษา พบว่ามีผู้ป่วยจำนวน 91 รายที่เข้ารับการคัดกรอง แต่มีเพียง 82 ราย (90.1%) ที่เข้าร่วมการศึกษา และได้รับการติดตามประเมินผลของการให้คำแนะนำปรึกษาเป็นจำนวน 3 ครั้ง ในช่วง 3 รอบการรักษา ผลการศึกษาพบว่า หลังจากผู้ป่วยได้รับคำแนะนำเกี่ยวกับยาเคมีบำบัด ระดับคะแนนความรู้ของผู้ป่วยเกี่ยวกับยาเคมีบำบัดเพิ่มขึ้นจากระดับคะแนนพื้นฐานทั้ง 3 ครั้งของการประเมิน โดยมีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ( $p < 0.01$ ) ทั้งในด้านองค์ความรู้เรื่องโรคมะเร็ง ยาเคมีบำบัด อาการข้างเคียงจากยาเคมีบำบัด และการดูแลตนเองเมื่อเกิดอาการข้างเคียงจากยาเคมีบำบัด ในด้านความพึงพอใจพบว่า ผู้ป่วยมีความพึงพอใจต่อการได้รับคำแนะนำ โดยมีคะแนนเฉลี่ย 4.8 จาก 5 คะแนน ซึ่งหมายถึงมีความพึงพอใจมากที่สุด และเห็นว่าการให้คำแนะนำนี้มีประโยชน์ต่อการดูแลและป้องกันตนเองจากอาการอันไม่พึงประสงค์ต่างๆ สำหรับอาการอันไม่พึงประสงค์ที่พบหลังได้รับการรักษาด้วยยาเคมีบำบัด การศึกษานี้พบว่า อาการข้างเคียงต่อระบบทางเดินอาหาร ได้แก่ เบื่ออาหาร คลื่นไส้ เป็นอาการที่พบมากที่สุด อย่างไรก็ตามอาการเหล่านี้ลดลงภายหลังจากที่ได้รับคำแนะนำปรึกษาโดยเภสัชกรในการประเมินครั้งต่อมา โดยระดับความรุนแรงของอาการคลื่นไส้ลดลงอย่างมีนัยสำคัญทางสถิติในการประเมินครั้งที่ 2 และครั้งที่ 3 ( $p < 0.01$ ) ตามลำดับ โดยสรุป การให้บริการคำแนะนำปรึกษาแก่ผู้ป่วยมะเร็งในด้านยาเคมีบำบัดสามารถช่วยเพิ่มความรู้ ป้องกันอาการอันไม่พึงประสงค์ และอาจมีผลในการช่วยให้ผู้ป่วยพึงพอใจ ผลการศึกษานี้สามารถนำมาช่วยสนับสนุนบทบาทของเภสัชกรในการจัดตั้งงานบริบาลทางเภสัชกรรมในผู้ป่วยมะเร็งอันจะก่อให้เกิดการพัฒนาคุณภาพการบริบาลผู้ป่วยมะเร็งอย่างต่อเนื่องในอนาคต

**คำสำคัญ:** อาการไม่พึงประสงค์ เคมีบำบัด การให้คำปรึกษา การบริบาลทางเภสัชกรรม

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## Introduction

Cancer is a public health concern among nations around the world as the incidence of disease

and mortality rate continue to increase. World Health Organization (WHO) has predicted that in 2020, the number of deaths related to cancer will be more than

11 million people globally, of which 4.7 million newly diagnosed patients will be in the developed countries and nearly 5.5 million newly diagnosed patients will be in developing countries (Deerasamee, 2003).

In Thailand, cancer is the first cause of disease related death following accidents and heart disease. The incident rate of cancer in Thailand in 2006 was 152.8 males per 100,000 population and 128.5 females per 100,000 population (Attasara, 2006).

Cancer is a disease that requires continuity of treatment and long term monitoring. Several types of cancer could be completely controlled. Unfortunately, the majority of patients could not be cured due to tumor spreading and relapse. As novel treatments are developing, the coordination of health care providers such as physician, pharmacist, nurse and other clinical staff could help to improve treatment outcome and patient's quality of life (Balmer and Valley, 2002; Pineo and Giaccone, 1997). In general, the most common treatment for cancer is the use of chemotherapy to reduce tumor relapse as well as to provide symptoms control. However, the incidence of adverse drug reactions as a result of cancer treatment are reportedly high. The report of adverse drug reaction following chemotherapy from 1983–1999 by Food and Drug Administration of Thailand found the incremental of 17.4 % to 28.8 %.

Patients who received chemotherapy should receive a close monitoring from caregiver before they return home. They should also be given advice and knowledge of proper self-care in order to prevent drug related problems as well as obtain the maximum benefits from the treatment (Perkins and McCormack, 1981). There were at least 3 reports of patients experiencing adverse drug reactions after receiving chlorambucil, lomustine and procarbazine because of a lack of the understanding of treatment instruction and confusion due to complexity of the treatment (Cohen et al., 1996; Hadjiyannt et al.,

1883; Hornten et al., 1983).

These studies demonstrated the effect of providing knowledge and advice to patients who received chemotherapy and appeared to reduce the severity and frequency of adverse events (Graham et al., 1993; Liebman, 1992). Patients could potentially be able to take care of themselves and to manage the undesired effects of chemotherapy appropriately (Ream and Richardson, 1996).

At Srinagarind Hospital, there were no studies to evaluate the effect of oncology pharmacy service in provision of knowledge and understanding to patients receiving chemotherapy. Such activities were pending at the time this study was conducted due to limited availability of clinical staff and specialized pharmacists to provide such knowledge to patients with cancer. Therefore, this study aimed to investigate a potential role for pharmacists in providing pharmaceutical care with health care team via pharmacy.

## Methods

This study is a prospectively descriptive study to evaluate a role of pharmacist in Medical Oncology Patient Care Unit (5E ward), Srinagarind Hospital, a 500-bed teaching hospital affiliated with Khon Kaen University, Thailand during December 2004 – March 2005. The Medical Oncology Patient Care Unit consisted of 30-bed facilities serving cancer patients requiring treatment with chemotherapy. A clinical pharmacist has been experimentally introduced as a part of medical oncology team since 2003 based on daily routine service. This pharmacist was responsible for providing pharmaceutical care services to cancer patients prior to receiving chemotherapy and following through all treatment processes to warrant an optimal patient care until patients were discharged. This pilot research was subsequently conducted to support the establishment of oncology pharmacist service in this model setting.

Patients diagnosed with cancer who received chemotherapy were recruited if they were hospitalized in medical oncology patient care unit at Srinagarind Hospital and had a confirmed diagnosis with breast cancer, cholangiocarcinoma, lung cancer, osteosarcoma and cervical cancer (the most common types of cancers admitted in Srinagarind Hospital since October 2003 – March 2004); aged over 12 years; and agreed to sign inform consent. Patients were excluded if they had visual or hearing difficulty. Those patients who had severe complications and some physical disabilities prohibiting them from responding to the research materials and questionnaires were also excluded.

Subsequently patients were classified into two groups, group 1 (cancer patients to treat by chemotherapy for the first time); and group 2 (cancer patients being treated with chemotherapy for at least one cycle). Data were collected at baseline and three follow up periods in terms of history of illness, medication history, problems related to chemotherapy and treatment plan, and knowledge score utilizing questionnaires upon pharmacist's counseling. Adverse events diary was provided to all patients prior to discharge to record all adverse effects experiencing at home. Naranjo algorithm was used to assess the likelihood of whether an ADR (adverse drug reaction) is actually due to the drug rather than the result of other factors. The grading of adverse

event occurred was adapted from National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE) version 2 which was a preferred toxicity scale. Satisfaction had also been evaluated before patients being discharged as shown in Table 1.

SPSS version 11.0 (Chicago, USA) statistical software package for windows was used to record and analyze the data. Parametric statistical analysis was used for normally distributed data, and non-parametric statistical analysis was used for non-normally distributed data. P-values of less than 0.05 were considered statistically significant. The continuous data variables such as age were reported in forms of mean, standard deviation, median and percentages. The categorical data variables were presented by percentage. The knowledge scores (adapted from Dodd 1984) data were presented by using scale ranking of 1–20 points which consisted of 4 points from disease and treatment aspects, 6 points from chemotherapy toxicities, and 10 points from self care aspects. The satisfaction scores (adapted from Eide 2003) data was given as scale ranging from 1–5 point according to Likert scale model. The difference in knowledge and satisfaction scores before and after receiving counseling were evaluated by analysis of covariance. The Adverse events were reported as percentages. An  $\alpha$ -value below 0.05 (95% CI) was considered to indicate statistical significance.

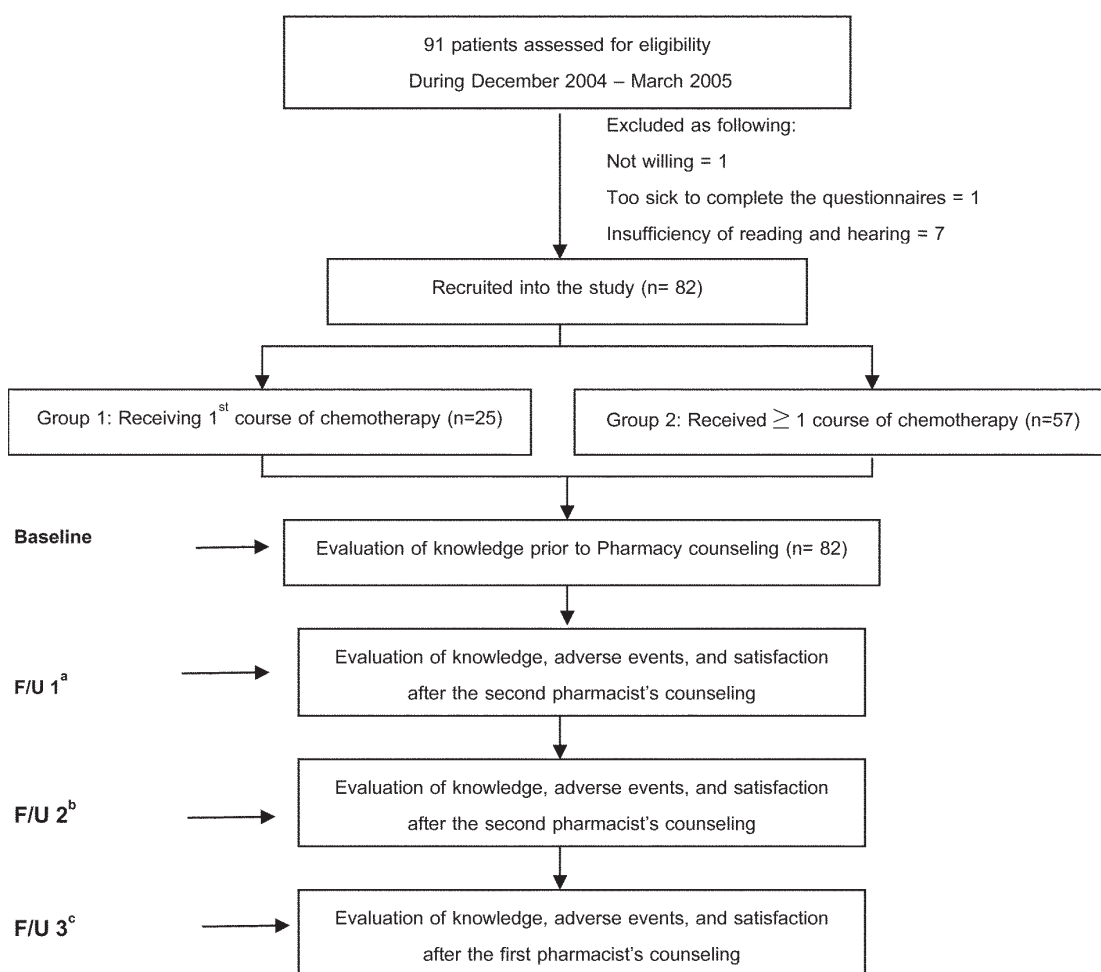
**Table 1** Data collection time frame

Period of data collection	Activities		
	Knowledge evaluation	Adverse events documentation	Satisfaction evaluation
Before receiving pharmacy counseling	✓	–	–
After receiving pharmacy counseling, before being discharged (1 <sup>st</sup> visit)	✓	✓	✓
After receiving pharmacy counseling at 1 month (2 <sup>nd</sup> visit)	✓	✓	✓
After receiving pharmacy counseling at 2 months (3 <sup>rd</sup> visit)	✓	✓	✓

## Results

From December 2004 to March 2005, 91 patients were assessed for eligibility and 82 patients (90.1%) were recruited into this study. There were 25 patients (30.5%) receiving chemotherapy treatment for the first time and 57 patients (69.5%) receiving at least 1 cycle of chemotherapy treatment prior to the study as depicted in Figure 1.

Most patients were female (54.9%), aged between 41–50 years old, involved in agricultural occupation, maintained low monthly income (1,000–5,000 bahts) and majority obtained at least a level of high school education (54.9%). Breast cancer (46.3%) was the most common cancer found in our study patients and cyclophosphamide/methotrexate/5-fluorouracil (CMF) protocol (30.5%) was the most common chemotherapy treatment being prescribed as illustrated in Table 2.



**Figure 1** Study Procedures

<sup>a</sup> F/U 1 = data collection after the studied patients received chemotherapy at the first month prior to discharge

<sup>b</sup> F/U 2 = data collection before the study patients received chemotherapy at the second follow up visits

<sup>c</sup> F/U 3 = data collection before the study patients received chemotherapy at the third follow up visits

**Table 2** Demographic characteristic of the study patients (n=82)

Characteristics	Frequency (%)	Characteristics	Frequency (%)
Gender		Income (Baht/month)	
Female	45 (54.9)	None	15 (18.3)
Male	37 (45.1)	<1,000	1 (1.2)
Age		1,000-5,000	53 (64.6)
Mean ±SD	43.5±11.6	5,001-10,000	9 (11.0)
12-20	3 (3.7)	10,001-15,000	4 (4.9)
21-30	9 (11.0)	Education	
31-40	13 (15.9)	Elementary	24 (29.3)
41-50	35 (42.7)	High school	45 (54.9)
51-60	20 (24.4)	Diploma degree	9 (11.0)
>60	2 (2.4)	Bachelor degree	4 (4.9)
Occupation		Reimbursement method	
Government employee	6 (7.3)	Self payment	1 (1.2)
Private own business	5 (6.1)	Civil servant medical benefit scheme	21 (25.6)
Business firm	11 (13.4)	Social security scheme	10 (12.2)
Agricultural	34 (41.5)	30 Baht- scheme	50 (61.0)
Unskilled laborer	11 (13.4)	Diagnosed with	
Student	3 (3.7)	Breast cancer	38 (46.3)
None	12 (14.6)	Cholangiocarcinoma	12 (14.6)
		Lung cancer	24 (29.3)
		Osteosarcoma	8 (9.8)
Characteristics		Frequency (%)	
Chemotherapy protocol (Cancer types)			
Cisplatin/Doxorubicin (Osteosarcoma)		4 (4.9)	
Cisplatin/Etoposide (Lung cancer)		21 (13.4)	
Cisplatin/5-Fluorouracil (Cholangiocarcinoma)		1 (1.2)	
Cyclophosphamide/Doxorubicin/5-Fluorouracil (Breast cancer)		5 (6.1)	
Cyclophosphamide/Methotrexate/5-Fluorouracil (Breast cancer)		25 (30.5)	
Docetaxel/Cisplatin (Lung cancer)		2 (2.4)	
Doxorubicin/Cyclophosphamide (Breast cancer)		1 (1.2)	
Doxorubicin/Ifosfamide (Osteosarcoma)		4 (4.9)	
5-Fluorouracil/Doxorubicin/Carboplatin (Cholangiocarcinoma)		6 (7.3)	
Mitomycin/5-Fluorouracil (Cholangiocarcinoma)		12 (14.6)	
Paclitaxel/Carboplatin (Lung cancer)		1 (1.2)	
Cycle of chemotherapy treatment			
Mean±SD		2.2±1.2	
1		25 (30.5)	
>1		57 (69.5)	

## Evaluation of Knowledge

In this present study, cancer patients had improved knowledge score based on disease and treatment aspect, chemotherapy toxicities and self care behavior after receiving counseling from pharmacist following three evaluations as shown in Table 3. The total (all aspects) knowledge score increased significantly following the first, second and third follow up counseling evaluation when compared to the score at baseline ( $2.4 \pm 3.1$ ,  $2.8 \pm 2.8$  and  $2.9 \pm 2.8$ , respectively,  $p < 0.01$ ).

## Evaluation of Satisfaction

The results of satisfactory outcome assessed by 10–short questionnaires confirmed considerable satisfaction from cancer patients after receiving counseling from pharmacist working in medical oncology team. This satisfaction was evaluated by using 5–point Likert Scale format (1= Very dissatisfied, 2= Dissatisfied, 3= Neither satisfied nor dissatisfied, 4= Satisfied, and 5= Very satisfied) each time after a pharmacist provided counseling about disease and treatment, chemotherapy toxicities and self care aspects of knowledge. Satisfaction scores were 3.8, 4.8 and 4.8; consecutively at the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> follow up evaluation, as shown in Table 4. Comparing to the score of the 1<sup>st</sup> evaluation, satisfaction score improved significantly on the 2<sup>nd</sup> and 3<sup>rd</sup> follow up evaluation respectively ( $1.0 \pm 0.5$  and  $1.1 \pm 0.5$ ,  $p < 0.01$ ).

## Evaluation of adverse events

### Frequency of adverse events

The adverse reactions of chemotherapy commonly depend on the type of therapy being used. At the first follow up evaluation, anorexia was the most commonly reported GI adverse events (91.5%) following by nausea (75.6%) and vomiting (29.3%). These GI adverse events are normally preventable.

At the second follow up evaluation, the incidence of anorexia was declined dramatically from 91.5 to 28% and further declined to 19.5% at the third follow up evaluation. This phenomenon is also seen with other GI side effects such as nausea and vomiting. The lower incidence of preventable side effects could be attributed to pharmacist intervention emphasizing on chemotherapy toxicity management and self care. Moreover, the incidence associated with febrile neutropenia also declined from 6.1% at the first follow up evaluation to 2.4% at the second follow up (2.4%) and there was no incidence of neutropenic fever reported on the third follow up evaluation. In addition, there were no reports of diarrhea, extravasations, other infections, bleeding and peripheral neuropathy after receiving chemotherapy treatment at the end of the third follow up evaluation.

### Severity of adverse events

Following the pharmacy counseling, a higher proportion of studied patients had transitioned to less severity grade of adverse event at the subsequent follow up as shown in Table 5.

## Discussion

The current study describes the potential roles of oncology pharmacist in medical oncology patient care unit by utilizing patient counseling and education processes which emphasized knowledge of disease, treatment, chemotherapy and self care.

At the time this study was conducted, there was very limited information describing the roles of oncology pharmacy in Thailand. As we performed literature evaluation to review the effect of chemotherapy counseling, we found that our patient population was quite different from those of previous reports performed by Dodd (1984) and Richardson et al. (1988) in term of cancer types and age of patients. These factors related to the individual might have affected his or her perception and interpretation

Table 3 Evaluation of patients' knowledge according to knowledge category (n=82)

Knowledge Category	Mean±SD				
	Baseline	F/U 1	F/U 2	F/U 3	
Disease and treatment	3.4±0.7	3.9±0.4	4.0±0.2	4.0±0.1	F/U 1-Baseline 0.5±0.9 <sup>a</sup> F/U 2-Baseline 0.6±0.8 <sup>a</sup> F/U 3-Baseline 0.6±0.8 <sup>a</sup>
Chemotherapy toxicities	5.1±1.1	5.9±0.3	6.0±0.2	6.0±0.2	0.8±1.2 <sup>a</sup> 0.8±1.1 <sup>a</sup> 0.8±1.1 <sup>a</sup>
Self-care	8.6±1.8	9.7±0.7	10.0±0.3	10.0±0.1	1.2±1.9 <sup>a</sup> 1.4±1.8 <sup>a</sup> 1.4±1.8 <sup>a</sup>
Total scores for all aspects	17.1±2.8	19.5±0.9	19.9±0.4	19.9±0.3	2.4±3.1 <sup>a</sup> 2.8±2.8 <sup>a</sup> 2.9±2.8 <sup>a</sup>

<sup>a</sup> p<0.01

Table 4 Satisfaction outcome from counseling (n=82)

Evaluation of Satisfaction	Satisfaction Scores	
	(5 points scales) (Mean±SD)	
F/U 1	3.8±0.3	
F/U 2	4.8±0.4	
F/U 3	4.8±0.4	
2 <sup>nd</sup> - 1 <sup>st</sup> Follow up	1.0±0.5 <sup>a</sup>	
3 <sup>rd</sup> - 1 <sup>st</sup> Follow up	1.1±0.5 <sup>a</sup>	

<sup>a</sup> p<0.05

**Table 5** Proportion of patients in each severity level following adverse events (n=82)

Adverse event categories	F/U 1 <sup>a</sup>				F/U 2 <sup>b</sup>				F/U 3 <sup>c</sup>			
	Proportion of patients (%)				Proportion of patients (%)				Proportion of patients (%)			
	Grade 0	Grade 1-2	Grade 3-4	Grade 0	Grade 1-2	Grade 3-4	Grade 0	Grade 1-2	Grade 3-4	Grade 0	Grade 1-2	Grade 3-4
<b>Gastrointestinal system</b>												
Nausea	20 (24.4)	46 (56.1)	16 (19.5)	63 (76.8)	19 (23.2)	0 (0.0)	66 (80.5)	16 (19.5)	0 (0.0)	66 (80.5)	16 (19.5)	0 (0.0)
Vomiting	58 (70.7)	19 (23.2)	5 (6.1)	58 (70.7)	24 (29.3)	0 (0.0)	60 (73.2)	22 (26.8)	0 (0.0)	60 (73.2)	22 (26.8)	0 (0.0)
Anorexia	7 (8.5)	60 (73.2)	15 (18.3)	59 (72.0)	23 (28.0)	0 (0.0)	59 (72.0)	23 (28.0)	0 (0.0)	59 (72.0)	23 (28.0)	0 (0.0)
Mucositis	73 (89.0)	8 (9.8)	1 (1.2)	58 (70.7)	24 (29.3)	0 (0.0)	68 (82.9)	14 (17.1)	0 (0.0)	68 (82.9)	14 (17.1)	0 (0.0)
Diarrhea	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)
Constipation	69 (84.1)	13 (15.9)	0 (0.0)	66 (80.5)	16 (19.5)	0 (0.0)	70 (85.4)	12 (14.6)	0 (0.0)	70 (85.4)	12 (14.6)	0 (0.0)
<b>Others</b>												
Insomnia	60 (73.2)	22 (26.8)	0 (0.0)	65 (79.3)	17 (20.7)	0 (0.0)	65 (79.3)	17 (20.7)	0 (0.0)	65 (79.3)	17 (20.7)	0 (0.0)
Fever	77 (93.9)	5 (6.1)	0 (0.0)	80 (97.6)	2 (2.4)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)
Fatigue	68 (82.9)	14 (17.1)	0 (0.0)	66 (80.5)	16 (19.5)	0 (0.0)	68 (82.9)	14 (17.1)	0 (0.0)	68 (82.9)	14 (17.1)	0 (0.0)
Infection	74 (90.2)	8 (9.8)	0 (0.0)	78 (95.1)	4 (4.9)	0 (0.0)	81 (98.8)	1 (1.2)	0 (0.0)	81 (98.8)	1 (1.2)	0 (0.0)
Bleeding	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)	82 (100.0)	0 (0.0)	0 (0.0)

<sup>a</sup> F/U 1 = the data collection after patients received chemotherapy at the first month prior to discharge<sup>b</sup> F/U 2 = the data collection before patients received chemotherapy at the second follow up visits<sup>c</sup> F/U 3 = the data collection before patients received chemotherapy at the third follow up visit

of knowledge causing the discrepancies among our results and those reported in literature.

In this study, we only included patients based on the most common solid tumors and enrolled as young as 12 years old into our study as it truly reflects the real practice. Despite the demographic differences, the patients had improved knowledge score based on disease and treatment, chemotherapy toxicities and self care aspects after receiving counseling by a pharmacist in the oncology team following three evaluations. The results appeared to be in the same direction of a nursing study performed by Dodd (1982) where there was an increase in pre-intervention and post-intervention composite chemotherapy knowledge scores (0.03 and 0.65,  $p < 0.01$ ) and the difference between the average self care behavior performance score ( $p < 0.01$ ). As for the satisfaction evaluation, the study results illustrated high satisfaction score results after receiving counseling by a pharmacist ( $p < 0.01$ ) and the results were supported by a study conducted by Eide et al. (2003). Nonetheless, our study did not randomize the studied patients to control group or experimental group; therefore, it could not be used to compare the effect of intervention. For this reason, it is essential for researchers to consider race and ethnicity, religion, literacy level and education when providing pharmacy intervention. In addition, future investigators should also separate the patients' previous experience with cancer therapy from the naïve patients so that the analysis results will be more practical to adopt.

The side effects of cancer treatment generally depend on the type of therapy being selected for particular malignancies. Most chemotherapy side effects come to an end after treatment. Although uncommon, some treatments may produce long-term effects. In the present study, the most common adverse events reported were GI toxicities including anorexia (49.2%) which were similar to those of studies conducted by Foltz et al. (1996) and

Dikken and Sitzia (1998) whereby anorexia was reported to be 53–60%. The variability of baseline characteristics such as chemotherapy regimens and pre-medication regimens in our studies could have accounted for some difference in outcome reported such as incidence of adverse events. As for the incidence of nausea this was relatively low (39.4%) in our study compared to the results of studies conducted by Foltz et al. (1996) Dikken and Sitzia (1998) where nausea was reported to be 71–72%. The lower rate of nausea might have been a consequence of the pharmacist's intervention as nausea is a preventable side effect of chemotherapy. In addition, all our studied patients received medications to prevent nausea and vomiting before and after chemotherapy treatment, but no report of prevention in previous studies (Dikken and Sitzia, 1998; Foltz et al., 1996). This might have also led to lower rate of these adverse events in this study.

It should be noted that adverse events recorded at home by using adverse events diary was not quite completed. Some patients did not properly record the adverse events as they were not able to correctly correlate severity in the questionnaires. Indeed, only 6.1% of patients did document the adverse events in their diaries. Therefore, the volunteers were re-assessed by the pharmacist about side effects once again as they returned for the subsequent course. Nevertheless, this re-assessment could have led to an underestimation of some incidence such as neutropenic fever as patient might have already recovered from the fever when they returned to the hospital for their future treatment. We also found that some studied patients could not recognize onset and severity of adverse events which happened at home. This could also lead to a recall bias. As a result, adverse events reported in this study might have underestimated the true incidence.

This study had several limitations. Firstly, it was not a randomized control trial. Without a control group;

we could not conclude that the improvement of outcome results was solely attributed to pharmacist intervention. Secondly, it was difficult to differentiate whether complications arose from cancer or chemotherapy as we recruited patients with a variety of cancers and treatments. In term of application of the present model, this study was conducted in a clinical setting where one pharmacist can only serve approximately 30–40 patients in a medical oncology patient care units, therefore, prioritization should focus on new patient cases with the most common tumors with commonly preventable adverse reactions from chemotherapy such as GI toxicities.

## Conclusion

The pharmacist intervention based on chemotherapy counseling during participation with a health care team have improved knowledge and satisfaction in oncology patients and reduced adverse events based on chemotherapy treatment.

From this study's results, patients who received chemotherapy counseling had continuous improvement of knowledge and satisfaction that could lead patient cooperation in self care behavior for reducing of adverse events. Therefore, the pharmacist's intervention with a health care team should be implemented in the workflow of inpatient service. Due to the variety of chemotherapy treatment and adverse events, the providers should assess adverse events and knowledge of patients every time before and after chemotherapy treatment both during admission and at home. In addition, a booklet containing self care information for patients receiving chemotherapy can be used as a tool for counseling patients, although it needs further improvement in specific content and interesting design.

In future, health care team should adopt this pharmacy practice model to improve the quality of pharmaceutical care in other patient care settings.

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