

# Impact of educational interventions on utilization patterns of anticancer agents in patients with breast cancer at the specialty oncology care setting in South India

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## Abstract

**Aims/Objectives:** This study was conducted to assess the utilization patterns of anticancer agents in patients with breast cancer and to provide practice recommendations/educational interventions to optimize medication use in patients with breast cancer.

**Materials and Methods:** This was an ambispective study conducted for a period of 3 years at a private, specialty oncology care hospital in South India. In the initial phase, the selection of anticancer agents, dosage of anticancer agents, and management of chemotherapy-induced nausea and vomiting (CINV) were reviewed retrospectively (using paper medical records) with respect to the National Cancer Comprehensive Network guidelines. The administration of anticancer agents and anti-emetics were reviewed with respect to the hospital drug administration policies. The deviations from the standards were reported, and practice recommendations/educational interventions were developed. Treatment patterns were reevaluated prospectively after providing educational interventions. Descriptive statistics were used to report and compare the results from both phases.

**Results:** During retrospective phase, we observed 80% compliance in the selection of anticancer drugs, 74% compliance in drug dosing, and 63.5% compliance in the administration of anti-cancer agents. After the implementation of educational interventions, we observed 85% compliance in the selection of anticancer agents, 82.3% in their dosing, and 86.9% compliance in the administration of anticancer agents. For the management of CINV, we observed 75% compliance in the selection of drugs (vs. 53% during preintervention), 92% compliance in their dosing (vs. 90% during preintervention), 85.1% compliance in the administration of anti-emetics (vs. 50% during preintervention), and 80% compliance in the management of delayed CINV (vs. 60% during preintervention).

**Conclusions:** Treatment patterns of breast cancer were improved with respect to treatment standards after educational interventions to oncology care team.

**Keywords:** Breast cancer, chemotherapy-induced nausea and vomiting, drug utilization evaluation, practice recommendations, quality use of anticancer agents

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## INTRODUCTION

Cancer management has remained a challenge due to the complex nature of disease and high medical expenditure.<sup>[1,2]</sup> Management strategies of cancer may vary based on different health-care settings and resources available for medical care in a respective practice setting (s). It depends on various factors such as availability of medication (s), affordability to patient, physicians' discretion and traditional practices, and most importantly, behavior of local patient population with respect to available treatments.<sup>[1]</sup> Usually, most oncology physicians follow standard practice guidelines and recommendations (like National Comprehensive Cancer Network (NCCN), European Society For Medical Oncology, American Society of Clinical Oncology guidelines) developed based on available clinical evidences and expert opinions.<sup>[3-5]</sup> However, in some settings, the feasibility to strictly adhere to evidence-based guidelines is beyond the control due to the factors such as limited financial resources, limited specificity of local patients to existing evidence (s), and shortage of qualified health-care professionals (HCPs) to deliver optimum cancer care. Despite of diversity in health-care practice and differences in management strategies, it is essential to periodically review the treatment patterns in respective setting (s) to understand the potential areas of improvements in patient care. This further guides a need for education and training of HCPs and to propose administrative changes in the health-care system.<sup>[6,7]</sup>

Breast cancer is the most common cancer reported in women in India and accounts for 14% of the new cancers diagnosed in Indian women.<sup>[8,9]</sup> This study was conducted to understand the utilization patterns of anticancer agents in patients with breast cancer. We also aimed to provide practice recommendations/educational interventions to oncology treatment team to optimize the medication use in patients with breast cancer.

## MATERIALS AND METHODS

### Study design

This was an ambispective study carried out over a period of 3 years.

### Study site/setting

The study site is oncology specialty hospital in South India (Mysore), having 86 beds for inpatients with specialized facilities of medical, radiation, and surgical oncology. It also has an ambulatory chemotherapy unit, with a capacity of 20 chairs/beds.

### Study population

All breast cancer patients aged above 18 years treated in the hospital and prescribed with at least one anticancer agent were included in the study. Terminally ill breast cancer patients were excluded from the study.

### Study phases

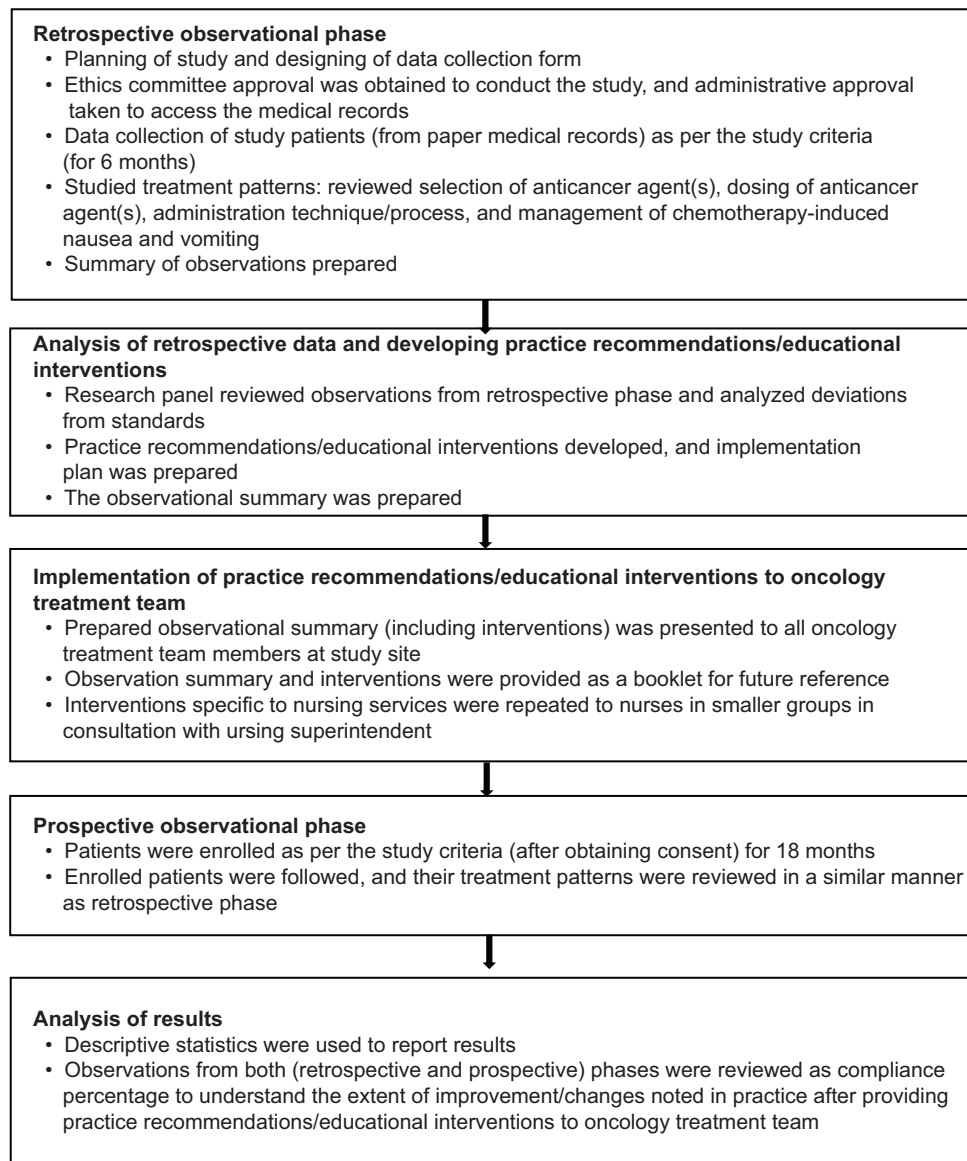
The present study was conducted in four steps: (1) retrospective observational phase, (2) analysis of retrospective data and development of practice recommendations/educational interventions, (3) implementation of treatment recommendations/educational interventions, and (4) prospective observational phase. Ethics committee approval (candidate number-15PPM001, approval date: 29-April 2015) was obtained to conduct the study, and administrative approval was obtained to access the medical records [Figure 1].

#### Phase 1

Retrospective observational phase – relevant data collection form and informed consent form were designed. The aim of the study during this phase was to understand the utilization patterns of the anticancer agents and antiemetics in breast cancer patients with respect to the NCCN guidelines version 2015.<sup>[10]</sup> It was carried out for a period of 6 months (May 2015–October 2015). Paper-based medical records for patients treated for breast cancer in past 1 year at the study site were reviewed.

#### Phase 2

Analysis of retrospective data and development of practice recommendations (November 2015–January 2016) – each patient record was reviewed by the research pharmacist for: (1) selection of anticancer agents (includes cancer chemotherapy, endocrine therapy, and anti-HER2 therapy as applicable), (2) dosing of selected agents, (3) administration technique/process, and (4) antiemetics prescribed specific to given chemotherapy agent (s), and administration of antiemetics. Selection of anticancer agents, dosing of these agents, and prescribed antiemetics was reviewed with respect to the NCCN guidelines version 2015.<sup>[10]</sup> The administration of the anticancer agents and antiemetics was reviewed with respect to the “in house” (hospital) drug administration policies. Standards to review prescribing/utilization patterns were adapted in mutual consultation and agreement among the prescribers and research panel. The observations were compiled and presented to the research panel, including one medical oncologist, one radiation oncologist, two senior clinical pharmacists, nursing superintendent, and one research pharmacist. Based on observations from retrospective data, practice recommendations/educational interventions



**Figure 1:** Process flow of drug utilization evaluation and implementation of practice recommendations/educational interventions

were developed considering local health-care system and hospital policies. Differences in opinion among the panel members were sorted out with discussions and mutual consensus method.

### *Phase 3*

Implementation of treatment recommendations/educational interventions (February 2016–April 2016): the drafted recommendations were presented to the research panel for final review and further implementation at the study site. The draft was then presented to the Medical Superintendent of the hospital (radiation oncologist independent from the research panel) and hospital administration for approval and implementation of these recommendations. All the HCPs of the study hospital (oncology treatment team) involved in patient

care were provided with a copy of the recommendations during the presentation for future ready reference. Recommendations/interventions specific to the nursing staff were presented again to the nurses in smaller groups in consultation with nursing superintendent to ensure that nurses understand the importance and need for the implementation of these recommendations/interventions.

### *Phase 4*

Prospective observational phase: it was conducted for a period of 18 months (May 2016–October 2017). The objective of this phase was to study utilization patterns and to understand the compliance of the treatment patterns to standards after providing practice recommendations/educational interventions by research panel. In this phase, breast cancer patients were enrolled prospectively as per the

study criteria after obtaining informed consent. Enrolled patients were followed, and utilization patterns were reviewed in the similar fashion as in the retrospective phase.

Analysis of results (completed in December 2017) – descriptive statistics was used to report results obtained from both, retrospective and prospective phases. Observations from both phases were reported as the percentage compliance among the total prescriptions reviewed, intended to understand extent of improvement/changes noted in the practice after educational interventions.

## RESULTS

### Retrospective phase

A total of 400 medication orders from 100 different patients were reviewed. Majority of patients had the diagnosis of Stage 3 breast cancer (54%). A total of 34 patients had endocrine responsive tumors (ER positive:  $n = 18$ , PR positive:  $n = 16$ ). A total of 6/100 patients were HER 2 positive. The demographic details of the study population are presented in Table 1.

### Utilization patterns with respect to standards

The most commonly prescribed therapy in the study population was anthracycline-based chemotherapy without radiation therapy ( $n = 53$ , 61%) followed by anthracycline-based chemotherapy with radiation therapy ( $n = 34$ , 39%). Most commonly used endocrine therapy was tamoxifen and anastrozole. The selection of cancer chemotherapy agents was well (80%) in compliance with standards. Selection of endocrine therapy was in compliant in 88.8% cases. Management of HER positive tumors was in compliance in only 16.6% cases. Furthermore, selection of antiemetics was compliant only in 53% cases. The dosing of anticancer agents and antiemetics were in compliance with standards in 74% cases and 90% cases, respectively. The administration of anticancer agents and antiemetics was in compliance (with respect to hospital drug administration policies) in 63.5% and 50% cases, respectively [Table 2]. Table 3 provides the examples of some of the deviations from standards, and recommendations provided by research panel to optimize medication use.

### Prospective phase

A total of 725 medication orders were reviewed which corresponded to 91 patients. Majority of the patients were diagnosed in Stage 2 and 3 breast cancer (around 80%). A total of 36 patients had endocrine-positive tumors (ER positive:  $n = 21$  and PR positive:  $n = 15$ ). A total of 13/91 patients were HER 2 positive. The demographic details of the study population are given in Table 1.

**Table 1: Demographic details of the enrolled study patients**

Demographic details	Retrospective phase, $n$ (%)	Prospective phase, $n$ (%)
Gender		
Male	0	2 (2.2)
Female	100 (100)	89 (97.8)
Age		
20-30	5 (5)	3 (3.3)
31-40	17 (17)	15 (16.5)
41-50	35 (35)	32 (35.2)
51-60	30 (30)	28 (30.8)
61-70	8 (8)	10 (10.9)
71-80	5 (5)	3 (3.3)
Menopausal status		
Premenopausal	49 (49)	31 (34.1)
Perimenopausal	0	6 (6.6)
Postmenopausal	51 (51)	54 (59.3)
Age of attainment of menarche		
<15	100 (100)	64 (70.3)
15 or above	0	27 (29.7)
Comorbid condition(s)		
None	62 (62)	58 (63.7)
Diabetes mellitus	20 (20)	18 (19.8)
Hypertension	32 (32)	25 (27.5)
Hypothyroidism	5 (5)	5 (5.5)
Ischemic heart disease	1 (1)	1 (1.1)
Seizures	0	1 (1.1)
Clinical stage of disease		
Stage I	10 (10)	5 (5.5)
Stage II A	19 (19)	18 (19.8)
Stage II B	7 (7)	16 (17.6)
Stage III A	26 (26)	24 (26.4)
Stage III B	5 (5)	10 (10.9)
Stage III C	23 (23)	5 (5.5)
Stage IV	10 (10)	13 (14.3)
Endocrine status of tumor		
ER positive	18 (18)	21 (23.1)
ER negative	69 (69)	58 (63.7)
PR positive	16 (16)	15 (16.5)
PR negative	71 (71)	64 (70.3)
Unknown	13 (13)	12 (13.2)
HER2 overexpression status		
HER positive	6 (6)	13 (14.3)
HER 2 negative	75 (75)	63 (69.2)
Equivocal but not confirmed with the FISH test	6 (6)	3 (3.3)
Not tested for HER 2 overexpression	13 (13)	12 (13.2)
Treatment approach		
Surgery- CT	10 (10)	5 (5.5)
Surgery - CT - RT	26 (26)	34 (37.4)
CT - Surgery - RT	31 (31)	34 (37.4)
CT - RT - Surgery	23 (23)	5 (5.5)
CT	10 (10)	13 (14.3)

CT=Chemotherapy, RT=Radiation therapy, FISH=Fluorescence in situ hybridization, ER=Estrogen receptor, PR=Progesterone receptor, HER2=Human epidermal growth receptor 2

### Utilization patterns with respect to standards

The most commonly prescribed cancer chemotherapy in the study population was anthracycline-based chemotherapy with radiation therapy ( $n = 53$ ; 71%), followed by anthracycline-based chemotherapy without radiation therapy ( $n = 22$ ; 29%). Most commonly used endocrine therapy was tamoxifen and anastrozole. The selection of cancer chemotherapy agents was well (85.1%) in

**Table 2: Assessment of treatment patterns in study patients during retrospective and prospective phase**

Parameter	Retrospective phase/preintervention		Prospective phase/postintervention	
	Compliance, n (%)	Noncompliance, n (%)	Compliance, n (%)	Noncompliance, n (%)
Selection of cancer chemotherapy agents	320 (80)	80 (20)	617 (85.1)	108 (14.9)
Selection of endocrine therapy for endocrine responsive tumours	16 (88.8)	2 (11.1)	20 (95.2)	1 (4.7)
Selection of treatment for HER2 positive patients	2 (16.6)	10 (83.3)	8 (50)	8 (50)
Dosing of anti-cancer agents(s)	296 (74)	104 (26)	597 (82.3)	128 (17.66)
Administration of anti-cancer agent(s)	254 (63.5)	146 (36.5)	630 (86.9)	95 (13.1)
Selection of anti-emetics	212 (53)	188 (47)	544 (75)	181 (25)
Dosage of given anti-emetics	360 (90)	40 (10)	667 (92)	58 (8)
Administration of anti-emetics	200 (50)	200 (50)	617 (85.1)	108 (14.9)
Prophylaxis for delayed CINV	240 (60)	160 (40)	580 (80)	145 (20)

CINV=Chemotherapy induced nausea and vomiting, HER2=Human epidermal growth receptor 2

compliance with standards. Selection of endocrine therapy was in compliance in 95.2% cases. Management of HER-positive tumors was in compliance in 50% cases. Furthermore, selection of antiemetics was compliant only in 75% cases. The dosing of anti-cancer agents and anti-emetics were in compliance with standards in 82.3% cases and 92% cases, respectively. Administration of anticancer agents and antiemetics was in compliance (with respect to hospital drug administration policies) in 86.9% and 85.1% cases, respectively [Table 2].

## DISCUSSION

Drug utilization studies in oncology practice have been useful to identify the areas of improvement related to use of chemotherapy, biologicals, and supportive care in cancer patients. These studies could be explored at institutional, regional, or at national level based on aims, anticipated benefits, and implications of the study. We aimed to review the usage of anticancer agents at institutional level to understand the usage pattern and to provide need based therapeutic and educational interventions to HCPs to optimize overall medication use in patients with breast cancer. We considered to follow NCCN guidelines as standards to compare our practice because physicians usually consider NCCN guidelines as primary reference for their clinical practice at the study site. However, the administration of drugs was reviewed with respect to hospital-drug administration policies to allow realistic comparison between standards and clinical practice.

During retrospective review, we observed that the selection of anticancer agents (including cancer chemotherapy and endocrine therapy) was fairly in compliance with standards. However, dosing of prescribed drugs and its administration were relatively less compliant with standards. The most common reason for noncompliance in dosing (anti-cancer drugs) was body-surface area of first cycle being used for dose calculations during all subsequent cycles. This was primarily due to physicians facing a high number of

patient load which do not allow them to follow step-by-step approach to write medication orders for each patient. Moreover, paper-based medical records and drug orders in our practice setting further add workload to physicians. Administration of anticancer agents was not in compliant in some patients due to the administration errors such as excess dilution of drugs, faster infusion rates (than recommended in drug orders) due to patient pressure, and to accommodate more patients in a given time.

Usage pattern of antiemetics drew a serious attention during our review. We observed majority patients were prescribed suboptimal antiemetics regimen due to traditional prescribing, limited insurance coverage, and higher out of pocket expenses, mainly noticed in patients treated under the government schemes. In some cases, patient paying their medical expenses themselves had limited affordability and insurance coverage which ultimately did not provide flexibility to physicians for prescribing quality supportive care. Usually, the administration of antiemetics should be done at least 30–60 min before the administration of chemotherapy depending on oral or intravenous formulation used.<sup>[10]</sup> We noticed many patients at study site were administered antiemetics 5–10 min before initiating chemotherapy which caused/increased risk of chemotherapy-induced nausea and vomiting (CINV). A multicentric cross-sectional study was conducted by Zeitoun AA to study an extent of inappropriateness of antiemetics for prophylaxis of CINV in patients receiving cancer chemotherapy in Lebanese hospitals. They reported that around 211 (42.8%) patients received inappropriate antiemetic regimen, and only 17 (6%) patients of those receiving appropriate regimen received the appropriate dose, and just 55 (19.5%) patients were treated for the appropriate duration.<sup>[7]</sup> Thus, similar to our study, this study also showed areas for improvement in antiemetics use and suggested recommendations to minimize patient risk and optimize safe and effective CINV management. However, our study was interventional in nature and also

**Table 3: Examples of deviations from treatment standards and practice recommendations/interventions provided by research panel**

Type of noncompliance	Description of noncompliance	Recommendations/interventions provided
Selection of anti-cancer agents	Patient with stage 3 breast cancer was receiving CMF regimen due to limited insurance coverage/affordability issues. CMF regimen is not preferred currently due to its inferior effectiveness and availability of better alternatives. Many patients with HER 2 positive breast cancer were not receiving targeted therapy (anti-HER2 therapy) due to insurance coverage/affordability issues. Few patients had discontinued endocrine therapy (tamoxifen/anastrazole) by themselves due to chronic use. Patient did not have new prescription due to inconsistent documentation regarding these medication(s)	There were limited opportunities to intervene physicians when therapy was selected against standards due to financial limitations/considerations. It was suggested to advise physicians to ensure prescription of either tamoxifen or anastrozole or any other suitable therapy depending upon menopausal status to all patients with estrogen positive breast cancer. Treatment status should be assessed during each follow up to ensure continuity of care
Dosage of anti-cancer agents	Cyclophosphamide given at a dose of 1000 mg when the required dose was 900mg (as per 600 mg/m <sup>2</sup> , BSA: 1.5 m <sup>2</sup> ). Patient prescribed with paclitaxel 175 mg/m <sup>2</sup> (having BSA of 1.94 m <sup>2</sup> ) was receiving dose of 370 mg (rounded off) instead of 340 mg (rounded off). BSA of first cycle (2.12 m <sup>2</sup> ) was considered for dose calculation instead of latest BSA	BSA of the patient must be calculated for every cycle and the dose of the anti-cancer drugs should be prescribed accordingly. Respecting patient load of physicians, medical residents were also requested to document latest BSA on file to ensure correct dosing. Clinical pharmacists should be allowed to modify doses (without physician's authorization) in such cases prior to its aseptic preparation and administration
Administration of anti-cancer agents	Doxorubicin was prescribed to be given as a short infusion (within an hour), however it was noticed that nurse had administered it at a faster rate (within 35 min) so as to accommodate more number of patients. Patient had developed extravasation following chemotherapy infusion, required an additional medical care. Paclitaxel infusion was recommended over period of 3 h. However, it was observed that infusion was ran faster than recommended flow rate to accommodate subsequent chemotherapy administration for the same patient. Patient was noted to have Grade 3 hypersensitivity reaction within 1 h after starting infusion	Periodic training and continuous education were recommended for nurses to ensure awareness on possible drug toxicities and adverse events as a result of improper administration of anti-cancer agents. It was suggested to provide series of education sessions to nurses in the hospital considering their academic qualifications and limited expertise in oncology practice. Clinical pharmacists were instructed by hospital administration to work with nursing head and provide educational sessions to nurses on safe and effective handling of anti-cancer agents in hospital
Selection of anti-emetics	Patient on highly emetogenic chemotherapy (doxorubicin and cyclophosphamide) regimen was prescribed with single anti-emetic-metoclopramide. Patient with highly emetogenic (5-Fluorouracil + doxorubicin + cyclophosphamide) regimen was prescribed with combination of ondansetron and dexamethasone.  Patient with doxorubicin based chemotherapy regimen was not prescribed with anti-emetics for delayed prophylaxis. On follow up, we noted that patient had vomiting same day evening and next day of chemotherapy. Patient with docetaxel based regimen was not prescribed delayed prophylaxis of CINV. Patient visited hospital next day of chemotherapy due to severe nausea and vomiting	It was suggested to advise physicians to prescribe at least a combination of 5HT3 antagonist, dexamethasone and olanzapine for patients undergoing highly emetogenic chemotherapy regimen. Those patients who can afford/covered by insurance should be given combination of 5HT3 antagonist, dexamethasone and NK-1 receptor antagonist when undergoing highly emetogenic chemotherapy.  It was suggested to advise physicians to ensure prescription to all patients to prevent delayed emesis. It was also recommended to allow pharmacists/nurses to provide prescription of delayed emesis in case if it was missed in physician's orders. Patients were also educated to receive prophylaxis for delayed CINV as part of their standard treatment. If they do not receive prescription, patient were educated to request it from physician/pharmacist/ambulatory nurse
Dosage of anti-emetics	Many patients were given ondansetron at the dose of 32 mg as intravenous bolus. It is known to cause prolongation of QT interval and other abnormal ECG findings. Few patients were given palonosetron (intravenous) for 3 consecutive days. It is known to cause prolongation of QT interval and other abnormal ECG findings	All the physicians were informed/reminded about the risk of QT interval prolongation in the patients who receive an intravenous bolus dose of Ondansetron 32 mg and multiple intravenous palonosetron doses. It was recommended not to use intravenous ondansetron bolus dose of more than 16 mg. If such orders are seen, pharmacists must clarify with physician to ensure that patient receives dose in a safe manner. For patients who is receiving intravenous palonosetron, if additional anti-emetics medications are required, it was recommended to use

Contd...

Table 3: Contd..

Type of noncompliance	Description of noncompliance	Recommendations/interventions provided
Administration of anti-emetics	In many patients, anti-emetics were administered just 5-10 min before the administration of anti-cancer drugs instead of 30 min prior as given in physician orders Improper dilution of palonosetron was observed in few cases. Palonosetron needs to be diluted in maximum of 100 ml of normal saline so as to maintain an effective concentration. We noted few cases where it was diluted in up to 500 ml of normal saline	ondansetron, dexamethasone and olanzapine on following day after using intravenous palonosetron for one dose  The nursing staff needs to be explained about the importance of the time gap between the administration of anti-cancer drug and antiemetic for desired anti-emetic benefits The prescriber(s) were informed about significant changes in effectiveness of palonosetron when diluted higher than 100 ml of normal saline Nurses and pharmacists were instructed to clarify administration orders with concerned physicians in such cases to ensure correct administration of medications

CINV=Chemotherapy-induced nausea and vomiting, ECG=Electrocardiograph, HER2=Human epidermal growth receptor 2, CMF=Cyclophosphamide, methotrexate and 5-fluorouracil, BSA=Body surface area, 5HT3: 5-hydroxytryptamine 3

studied an impact of practice recommendations provided by the study team. Management of HER-2-positive patients was not in compliant in many patients solely due to financial constraints. Many patients in low-to-middle income countries face similar challenges to have access to anti-HER 2 therapy for patients with HER-2-positive breast cancer.<sup>[11,12]</sup>

Observations reported during retrospective review informed the immediate need for educational interventions to HCPs, mainly nurses. Practice recommendations/ educational interventions were proposed by research panel after considering several factors such as local health-care system, qualification and training of nurses, and patient load. Most nurses in our practice setting have not undergone specialized training to provide patient care in oncology setting. Hence, period training and education are highly recommended for nursing staff to ensure continued quality of their services. An interview-based ethnographic study conducted by LeBaron *et al.*<sup>[13]</sup> had aimed to explore challenges encountered by nurses in India and offer recommendations to improve the delivery of oncology and palliative care. Major challenges reported by the study team were safety related to chemotherapy administration, workload and clerical responsibilities, patients who died on the wards, monitoring family attendants, lack of supplies, and lack of formal oncology training. Our study also echoes similar challenges informing a need of quality and structured oncology training of nurses. An interventional study by Patel H conducted at the specialty cancer hospital in South India reported most common medication-related problems in the oncology care setting in India, which noted higher administration errors by nurses due to shortage of skills and had recommended structured educational interventions for nurses.<sup>[14]</sup> There is a great opportunity to work for nurses in coordination with pharmacists to optimize the medication use process.

At the same time, there is a need to review nurse to patient ratio which is high in our practice. Nurses in our oncology setting are expected to deliver many additional patient care services (such as coordinate transition of care, support reimbursement, coordinates internal referral, and complete paper records), leading to high workload. A survey-based multicentric study was conducted by Ulas A to investigate unintentional medication errors and underlying factors during chemotherapy preparation and administration in academic cancer hospitals in Turkey by oncology nurses. They also reported a heavy workload (49.7%) and insufficient number of nursing staff (36.5%) as the most common reasons for higher medication and administration errors (50.5%).<sup>[15]</sup>

The number of medication orders reviewed was relatively higher in prospective phase because it was longer in duration than retrospective phase, and hence, allowed patients' follow-up for more number of treatment cycles. After educational interventions were provided to HCPs, during prospective evaluation, we noticed compliance to dosing of anticancer agents and administration of drugs were relatively improved. With regard to the selection of antiemetics for prophylaxis and delayed prevention was greatly improved (by 32% and 20%, respectively). This improvement indicates that educational interventions provided by research team were well followed and had the impact on improving medication use pattern. We realized that interventions provided to nursing staff regarding safe and effective administration of anticancer agents and antiemetics helped to strengthen their medication handling practice. This study also highlighted need and importance of enhancing team work among physicians, nurses, and pharmacists to ensure the quality medication use process. This was a single-center study. Hence, the results cannot be generalized and may not be representative of all other cancer care settings in the region. As per our knowledge, we

have captured all necessary data during retrospective review. However, if any information which was not documented on patient file will remain beyond the scope of study.

## CONCLUSIONS

This study had emphasized on the great need for improvements in the administration of anticancer agents, and safe and effective use of antiemetics in the study population. Pattern of medication use improved after educational interventions by research team to HCPs involved in cancer care.

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## Conflicts of interest

There are no conflicts of interest.

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