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# Clinical audit to assess delays in chemotherapy administration at daycare oncology center at a tertiary care hospital in Karachi, Pakistan

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## Abstract

**AIM:** There were delays reported by patients in chemotherapy administration in daycare oncology. Therefore, we decided to audit all processes which are involved in chemotherapy administration. The objective was to improve our service by decreasing the time between admission and initiation of chemotherapy and identify the reasons for delays. **MATERIALS AND METHODS:** The audit was conducted in three parts. In Review I, audit tool was developed and information documented of 109 patients receiving chemotherapy at daycare center from April 14 to May 13, 2015. Five processes were assessed out of which delay in initial assessment by the nurse was the only factor identified leading to delay in chemotherapy. Review II was done from March 1 to 31, 2016 of 208 patients after increasing the number of nurses and Review III from June 7 to August 25, 2016 of 287 patients by dividing the initial assessment process at two different areas to decrease delay in initial assessment. **RESULTS:** Seventy-two percent of patients had their initial assessment done within 15 min of arrival in daycare in the first audit. In the second part of audit this percentage decreased to 55%, and finally, in the third part of the audit, percentage was improved and increased to 75% after separating initial assessment process into two areas ( $P < 0.001$ , Kruskal–Wallis test). **CONCLUSION:** After separating initial assessment process into two different areas, delays in chemotherapy administration were reduced.

**Key Words:** Administration, audit, chemotherapy, delay

## Introduction

Waiting times for initiation of treatment is a major concern for patients in the general medical as well as oncology patient population.<sup>[1,2]</sup> Extended waiting times affect compliance to clinic appointment and treatment plan.<sup>[3-5]</sup> Along with this, lack of medical personnel and ambulatory care space also leads to increased waiting time.<sup>[6]</sup> Prolonged waiting times also result in financial burdens, an area requiring further exploration.<sup>[7]</sup>

There was a consensus by our daycare team of physicians and nurses that patients were not satisfied with the waiting time for chemotherapy administration. In addition, verbal and documented feedback regarding the concern was raised by patients and their families at different times in 2015. Delayed administration can decrease the advantage of chemotherapy, hence affecting outcomes. This has been proven for various cancers including breast and ovarian cancer.<sup>[8-10]</sup>

There is a great responsibility on the chemotherapy unit to give treatment timely and safely.<sup>[11]</sup> Once patients enter the hospital, they have the right to expect that every effort is made to their care and treatment, which are both safe and effective with no delays.<sup>[11]</sup>

To the best of our knowledge, scientific evidence from our region were lacking regarding factors predisposing to delay in chemotherapy administration. Therefore, we decided to perform internal audit to report and rectify reasons for delays from admission until initiation of chemotherapy. In our study, we aimed to identify factors leading to increase in waiting time for chemotherapy administration.

## Materials and Methods

### Study setting

Aga Khan University Hospital, Karachi, receives cancer patients from all over Pakistan. The daycare center is situated on its main campus. Patients receive intravenous, intrathecal, subcutaneous chemotherapy, hydration, and blood transfusion here. In this 54-bedded daycare unit, patients are adjusted in two shifts and more than 1500 appointments are booked each month. Each day more than eighty adult and pediatric patients are admitted in daycare oncology of Aga Khan University Hospital for chemotherapy and blood transfusions.

### Study overview and participants

To evaluate factors leading to delay in chemotherapy administration, an audit was designed. All patients aged 18 years and above receiving their chemotherapy at Aga Khan University daycare center were enrolled in the study. Chemotherapy included single-day infusion or multiple-day infusions with pumps, both for solid and hematological cancers. Patients were excluded if they were admitted for blood transfusion or intravenous hydration. Nonprobability convenience sampling technique was applied to enroll patients. The study protocol was accepted from the Ethical Review Committee of Aga Khan University Hospital, Karachi, Pakistan, with ERC #4521-Onc-ERC-16.

### Preparation of questionnaire/audit tool sheet

A questionnaire was prepared by a multidisciplinary team of medical oncologist, daycare staff medical officer, pharmacist,

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and daycare head nurse. A consensus was made to identify the following mentioned processes and data was collected: (i) arrival time of patient into daycare, (ii) initial assessment time (which includes documentation of height and weight and vital signs [blood pressure, pulse, respiratory rate, and temperature]), (iii) time of order entry in computer physician order entry (CPOE) system, (iv) chemotherapy receiving time from pharmacy, and (v) time of initiation of administration of chemotherapeutic drugs by the nurse. Data were collected using this questionnaire.

### Review I to measure current practice

There were three timelines of the project. The audit started with collaborating with daycare staff medical officer, pharmacist, nurse manager, and head nurse in April 2015 regarding processes which may lead to delay in chemotherapy administration. Five such processes were identified after an extensive discussion and exclusion of few factors based on experience of all the team members: (i) arrival time of patient into daycare, (ii) initial assessment time (which includes documentation of height and weight and vital signs [blood pressure, pulse, respiratory rate, and temperature]), (iii) time of order entry in CPOE system, (iv) chemotherapy receiving time from pharmacy, and (v) time of initiation of administration of chemotherapeutic drugs by the nurse. The time was recorded from the nursing documentation and electronic computer entry. These processes were assessed against their institutional made benchmarks [Table 1]. Time duration of each process was collected and documented on audit questionnaire which was prepared by multidisciplinary team of physician, in charge nurse of daycare oncology and oncology pharmacist. An E-mail was sent to all the daycare nurses and nursing manager of oncology unit in the 1<sup>st</sup> week of April 2015 regarding the audit. For those without access to E-mail, a copy was displayed in the nursing lounge. Review I was done on 109 patients admitted for chemotherapy at daycare from April 14 to May 13, 2015.

### Feedback of findings and setup of targets

Among the listed five processes, delay in initial assessment by the nurse was the only factor identified leading to delay in chemotherapy administration. Meeting was held with daycare physicians, nurses, and administrative staff and chemotherapy pharmacists regarding delay in initial assessment and how we could motivate the staff involved in this process to reduce it. Key areas for improvement were discussed and decided to improve delay in initial assessment

by increasing the number of nurses assigned from three to six in the morning shift. A 12-month period was agreed to implement and follow the changes.

### Review II to re-evaluate practices

This review was done on 208 patients admitted for chemotherapy at daycare from March 1 to 31, 2016. It was done after doubling of number of nurses, to assess improvement in the initial assessment time. The extent to which the target set was met was fed back to the relevant staff.

### Feedback of findings and setup of targets after Review II

Based on the results, a decision was made to have a final round to close the audit loop.

### Review III to re-evaluate practices

Review III was done on 287 patients admitted for chemotherapy at daycare between June 7 and August 25, 2016. To reduce the initial assessment time, this process was divided into two different areas. In initial assessment room, height and weight was checked and documented in the online computer system and patient sent to the assigned bed. Daycare physicians (medical officer or senior medical officer) assessed patient at the bedside while bedside nurse recorded the vital signs. This led to immediate start of chemotherapy order processing by the daycare physician. Subsequently, Review III of the audit was done to assess for any improvement in this process.

### Statistical analysis

The analyses were performed using the IBM SPSS Statistics for Windows, Version 19.0 (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.).

Comparisons of continuous variables among three audits were made by ANOVA, and *post hoc* test was performed to observe the difference between audits. Comparison of waiting time difference with three audits was plotted by box plot. Data are presented as boxplots; boxes represent the 25<sup>th</sup>, 50<sup>th</sup> (median), and 75<sup>th</sup> centiles. All *P* values were based on two-sided hypothesis testing and significance was set at a *P* < 0.05.

### Results

The initial assessment of practice (Review I) was based on 109 patients admitted for chemotherapy from April 14 to May 13, 2015. All timings of the processes were analyzed and checked against institutional made benchmarks [Table 1].

**Table 1: Assessment of processes for delay in chemotherapy administration**

Process	Institutional benchmark	Average time (HH: MM)	Maximum time (HH:MM)	Minimum time (HH:MM)	Compliance percentage	Noncompliance percentage
Arrival of patient time	15 min	0:04	0:14	0:02	100	0
Initial assessment by nurse	15 min	0:14	1:10	0:01	72.5	27.5
CPOE time	2 h	0:51	3:04	0:02	93.6	6.4
Pharmacy dispatch time of chemotherapy	2 h	1:11	3:45	0:16	92.6	7.4
Administration time of chemotherapy	30 min	0:06	0:22	0:01	100	0

CPOE=Computer physician order entry

**Table 2: Comparative analysis of initial assessment by nurse after intervention**

Audit duration	Average time (HH:MM)	Maximum time (HH:MM)	Minimum time (HH:MM)	Compliance percentage	Noncompliance percentage
April 14 to May 13, 2015	0:14	1:10	0:05	72.5	27.5
March 1-31, 2016	0:17	1:10	0:01	55	45
June 7 to August 25, 2016	0:13	4:08	0:00	75	25

All patients arrived in daycare within 15 min after admission. Thirty (27.5%) patients took more than 15 min to have their initial assessment done. Seven (6.4%) patients required more than 2 h to have their chemotherapy orders entered in CPOE system by the physician.

In 8 (7.4%) patients, pharmacy took more than 2 h to dispatch chemotherapeutic drugs. Chemotherapy was administered in all patients within 30 min. A compliance of more than 90% was seen in four out of five processes; in process of initial assessment of patient, compliance was only 72.5%. These data are shown in Table 1.

Review II is based on 208 patients admitted for chemotherapy from March 1 to 31, 2016, after increasing the number of nurses for initial assessment. The time required for initial assessment was within 15 min for 115 patients among the 208 (55%) as shown in Table 2.

Review III is based on 287 patients admitted for chemotherapy from June 7 to August 25, 2016 after dividing the initial assessment process into two parts. The time required for initial assessment was within 15 min for 212 patients among the 287 (75%) as shown in Table 2.

There was 1.8 min (12.5%) decrease in the waiting time in comparison to Review I, II, and III.

The mean time required for initial assessment was  $14.3 \pm 11.0$  min (median [interquartile range (IQR)] 10 [6–20]) during Review I,  $16.5 \pm 11.4$  min (median [IQR] 14 [8–25]) in Review II, and  $12.5 \pm 11.0$  min (median [IQR] 10 [5–18]) during Review III ( $P < 0.001$ ) [Table 3]. Boxplots of waiting time difference in various audits are provided as Figure 1. The timelines of the audit are given in Table 4.

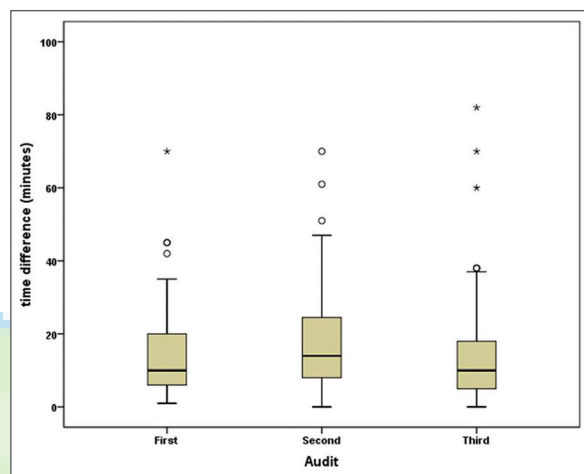
### Discussion

We report a first attempt to measure factors leading to delay in timely administration of chemotherapy from a developing country. The chemotherapy process involves team which include physician, nurses, and pharmacist, and delay can occur in any of these three areas.<sup>[11]</sup> Delay in chemotherapy administration process is the major cause of dissatisfaction in patients and their attendants; we received verbal and written complaints from patients for delays in chemotherapy administration. Our study demonstrated that the initial assessment by the nurse is the leading cause of delay in chemotherapy administration. The institutional benchmark for this process is within 15 min of arrival of patient. We believe that by decreasing the delay in chemotherapy waiting time, we would be able to increase patient satisfaction and adjust more patients in the same time duration. This will also lead to increase in revenue in future as suggested by studies in the past.<sup>[7,12]</sup>

**Table 3: Comparison of audit with different point in time (min)**

	Mean±SD	Median (IQR)	P*	Post hoc	P
Audit 1	14.3±11.0	10 (6-20)	<0.001	Audit 3 versus audit 1	<0.001
Audit 2	16.5±11.4	14 (8-25)			
Audit 3	12.5 ± 11.0	10 (5-18)			

SD=Standard deviation; IQR=Interquartile range



**Figure 1: Waiting time of patients in different audits**

At the second part of the audit after increasing the number of nurses, there was no time reduction in this process. However, after separating initial assessment process into two areas, in the third part of the audit, 75% of the patients completed their initial assessment within 15 min improving from 55%.

The number of certified chemotherapy providers has dropped tremendously since 2014 as reported in a study by Liang.<sup>[13]</sup> This is similar to our study where the number of chemotherapy providers has remained the same over the years despite the constant rise in number of patients. The total number of patients in daycare oncology is increasing each year, with data showing 15,978 patients receiving therapy in 2015 and 17,356 in 2016. In the studies similar to ours, a study which shows that the major cause of delay in chemotherapy is said to be time elapsed in registration, laboratory reports (especially if done on the same day), patient's assessment, and preparation of chemotherapy.<sup>[6,14]</sup> Some of these processes were not assessed in our audit. We in the future propose adding these factors in addition to the five checkpoints performed in our study. In the few studies that have explored the setting of cancer care, long waiting times are frequently linked to dissatisfaction. Many factors such as the registration process, assessment of patients, laboratory results, and preparation of

**Table 4: Timelines of audit**

Date	Person responsible for data collection	Task
April 14 to May 13, 2015	Daycare doctors	Documentation of time of Arrival of patient into daycare Initial assessment Order entry in CPOE Receiving chemotherapy from pharmacy Initiation of administration of chemotherapeutic drugs by the nurse
March 1-31, 2016	Daycare doctors	Initial assessment time after increasing the nurses from 3 to 6
June 7 to August 25, 2016	Daycare doctors	Initial assessment time after dividing the process into two separate areas

CPOE=Computer physician order entry

chemotherapy drugs consume a lot of time. Other factors such as decreased number of oncology trained medical and paramedical staff and availability of patient beds further contribute to the delays. Long waiting time and delays in chemotherapy administration increase patients' frustration and anxiety, hence resulting in patient dissatisfaction.<sup>[14]</sup>

#### Future directions for research

We propose to increase the number of personnel, treatment space, and equipment involved in chemotherapy administration. We also suggest that a day before the scheduled chemotherapy, all requirements such as patients' initial assessment and laboratory investigations are done and chemotherapeutic drug protocol entered in CPOE system. This would bring considerable reduction in waiting time of chemotherapy administration. An audit could then be done to evaluate the decrease in time of the process.

#### Conclusion

Our study demonstrated that by identifying reasons leading to delay in chemotherapy administration and bringing changes to rectify them, it was possible to reduce waiting time which we believe may translate into patient satisfaction.

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#### Conflicts of interest

There are no conflicts of interest.

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