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Original Research Paper

Oncology

"ANALYSIS OF DELAY IN INITIATION OF CHEMOTHERAPY AFTER ADMISSION TO DAY CARE UNIT OF TERTIARY CANCER INSTITUTE".

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ABSTRACT

Patients & Methodology: A survey of those patients admitted for elective chemotherapy was conducted for three months from 01 Jan 2021 to 31 Mar 2021 in day care chemotherapy units in National Cancer Institute, Nagpur. Time taken for various processes from the time of patient's arrival in the ward till the time of initiation of chemotherapy was noted. The difference in time between processes was analyzed.

Findings: 16% of the chemotherapy were started within one hour of admission, 37% within 2 hrs, 25% within 3 hrs., and 22% chemotherapy was initiated after 3 hrs. of admission. 78% of the chemotherapy in the institute was started within the institutional benchmark of 3 hrs.

CONCLUSION: Reducing waiting time between patient admission and initiation of chemotherapy is a big challenge in any cancer institute due to involvement of multiple processes, departments, and people. It directly affects operations, bed occupancy and turnaround time in daycare center, and ultimately patient satisfaction. Identifying the causes for delay and application of lean techniques will optimize the time taken for initiation of chemotherapy and improve patient satisfaction.

KEYWORDS : Chemotherapy, Daycare Unit, Delay in initiation of Chemotherapy

INTRODUCTION

Chemotherapy is an integral part of comprehensive cancer treatment. Cancer patients often experience delays in starting scheduled inpatient chemotherapy after admission in the day care centers . This compromises the quality, patient satisfaction and has a negative impact on reputation of the treating hospital.

The advantages of day care chemotherapy are compelling for the bulk of patients and the advantages of day care chemotherapy far out weighs the disadvantages. Day care chemotherapy centers are designed and equipped for patients who require short therapies or procedures that does not warrant over-night stay in the hospital. The advantages are [2] Drugs can be administered safely and easily Patients wish to avoid admission to hospital is respected. When not admitted overnight the patients feel safe and it strengthens their physical and psychological well-being. The treating Oncologist supervises and controls the administration of chemotherapy. Hospitalization expenses and overnight stay can be avoided. Chemotherapy is administered at patient's convenience.

Other advantages include: -

Routine activities of a patient and their families remain mostly undisrupted.

1. There is easy availability of highly trained oncologists, pain & palliative care specialists, and other oncology trained medical and paramedical staff including onco-nurses, rehabilitation specialists, dieticians, and pharmacist to attend to the patients.
2. There is no need for boarding and lodging for those coming with the patient from faraway places, patients can be sent home on the same day.
3. Day care also minimizes the chance of Hospital Acquired Infections (HAIs) and the patients can remain with their near and dear ones while undergoing chemotherapy.

Disadvantages of day care chemotherapy are mainly related to patient condition.

1. Hospitalized chemotherapy will be ideal in cases of patients requiring very high dose Cisplatin or Methotrexate protocols, specialized procedure chemotherapy, Acute Leukemia Induction Therapy, high-dose chemotherapy with or without stem cell or bone marrow transplantation, chemotherapy with severe emesis, therapy with Ifosfamide, treatment involving combination of radiation and chemotherapy regimens, patients with medical comorbidities, complex chemotherapy regimens, chemotherapy scheduled during hospitalization for an unrelated illness, administration of drugs with complex side effects, intraperitoneal chemotherapy, certain investigational treatment protocols, and when chemotherapy is mandatory with medical conditions that would ordinarily post pone chemotherapy .
2. Cancer patients reporting for chemotherapy regularly experience long waiting in initiation of scheduled inpatient chemotherapy after arrival to the hospital day care unit. These delays have the potential to impair the quality of care, increase the burden of resource utilization on the hospital and ultimately leads to suboptimal patient satisfaction.
3. Chemotherapies are generally protocol based and are repeated in cyclic intervals. Delays in initiation of chemotherapy in day care centre are not liked by the patients and the relatives in general as it goes against their planning for the day. Hence, it is pertinent that, there is a great responsibility on the part of the day care centre to provide safe and timely chemotherapy to the admitted patients .
4. Reducing waiting time between patient admission and initiation of chemotherapy is a big challenge in any cancer institute due to involvement of multiple processes, departments, and people. It directly affects operations, bed occupancy and turn-around in a day care center and eventually patient satisfaction. Prolonged hospital length of stay (LOS) is also associated with increased risk of HAIs
5. Once the treating oncologist takes the decision for chemotherapy, the patient reports to the hospital at a scheduled date and time. The operations often encounter planning problems when there is a steady increase in the

new patients with existing patients for chemotherapy

Every step in this process involves expert and intensive involvement of trained manpower and has the potential for delay due to their involvement in other activities. There are also situations when the condition of the patient does not allow them to undertake the chemotherapy, which is likely to affect the patient's health adversely.

These processes, if not monitored and intervened timely are likely to delay the initiation of chemotherapy post-admission to the day care unit, resulting in prolonged waiting time and also adversely affecting patient satisfaction.

A careful analysis of these processes will ascertain wasteful moves and paves the way for lean thinking. Lean doctrine emphasizes that, regardless of the number of attempts made to improve a process, there will be further scope for improvement. Small changes that occur due to incremental steps taken for improvement of an existing process slowly leads to perfection. The plan-do-study-act cycle when used suitably does help in any effort towards perfection

Our institute is a highly advanced cancer center, which caters for cancer patients of a vast area in Central India. It offers chemotherapy, immunotherapy, hormonal therapy, radiotherapy, and surgery as treatment for cancer patients of all age group. Decreasing the length of stay is of top-priority objective for all health care establishments. Even though there is no benchmark available, literature suggests that a chemotherapy regimen should be initiated within 4 hours of admission

This survey is to audit and identify the causes for delay in initiation of chemotherapy post- admission to a day care unit in a tertiary cancer hospital and determine the avoidable delays in post-admission processes and discuss the application of appropriate lean methods to reduce this delay in initiation of chemotherapy after admission as well as to improve patient satisfaction.

OBJECTIVE.

The objective of the project is to perform a survey to identify the causes for delay in initiation of chemotherapy after admission in a day care unit at National Cancer Institute, Nagpur.

This included:

1. Study of the process of chemotherapy administration
2. Audit of the timeline from admission to administration of chemotherapy and timeline of all the in between processes from ward records.
3. Identification of all possible causes of delays. Determining the possible interventions to avoid / reduce delay in initiation of chemotherapy.
4. Application of lean methods to reduce delay in initiation of chemotherapy after admission to a day care unit to improve patient satisfaction.

MATERIALS & METHODS.

Adult patients admitted for chemotherapy in the hospital day care center and chemotherapy ward were included in the study. Paediatric patients, and those admitted for surgery, long chemotherapy (>12 hrs.), supportive care or ICU were not included in the study.

On admission to the hospital for chemotherapy, the Operations executive of the ward filled in a chemotherapy tracker form designed for this purpose and was loaded on to an MS Excel sheet for data analysis.

Five hundred such records of patients those who had undergone chemotherapy in day care units w.e.f 01 Jan 2021 to 31 Mar 2021 were randomly selected with the help of RAND function in MS Excel and audited.

The data was cleaned and formatted. Name of the patient, date & time of admission, time of patient arrival in the ward, time of initiation of chemotherapy were noted. The differences in time between various processes starting from admission till initiation of chemotherapy were analyzed. We set an institutional standard reference time) for each process, based on evidence from literature and practice and calculated the variation from the set standards. Reasons for delay were divided into various categories

The difference between the time of initiation of chemotherapy and the time of patient arrival in the ward was calculated. 3 hours was taken as the institutional benchmark

Initiation of chemotherapy after 3 hours of patient's arrival in the ward was considered as delay in commencement of chemotherapy.

Common causes for delay in initiation were identified, and lean methods to improve the processes that contribute to the delay are discussed.

Findings.

1. Timing for various processes from admission to initiation of chemotherapy was documented by the nurse / operations executive in the day care wards.
2. The average duration of chemotherapy was 4 hrs. and 19 mins, and the most frequent chemo infusion duration was 2 hrs.

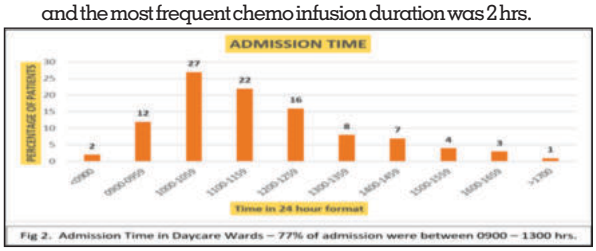

Fig 2. Admission Time in Daycare Wards – 77% of admission were between 0900 – 1300 hrs.

3. The average time for various processes after admission to the day care centre are as Follows

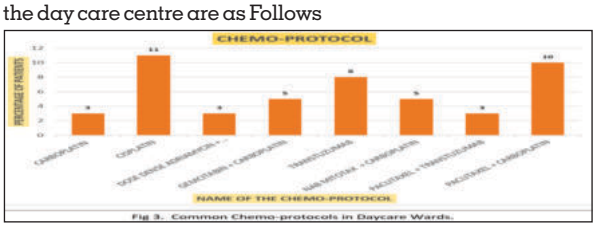

Fig 3. Common Chemo-protocols in Daycare Wards.

4. Average time between admission and finalization of lab reports was 1 hour and 34 minutes.
5. Average time between admission and preparation of chemo protocol was 1 hour and 25 minutes.
6. Average time between protocol preparation and pharmacy indenting was 45 minutes
7. Average time between pharmacy indenting and arrival of drugs 46 minutes.
8. Average time between arrival of drugs and initiation of chemotherapy was 44 minutes.
9. Average time from admission to hospital and initiation of chemotherapy was 2 hrs. and 11 minutes.
10. It was found that 39% percent of the admissions took place between 9 – 11 a.m. and 61% admissions to daycare units occurred by 12 noon
11. It was also found that 48% of the chemotherapy drugs consisted of Cisplatin, Paclitaxel, Carboplatin, Transtuzumab and Gemcitabin, either as a single drug or in combination
12. The relevant lab reports to start the chemotherapy in day care was already available with 78% of the patients. Of the remaining, 20% of them got their blood investigations done on the day of admission on daycare basis. 2% patient's data was not available

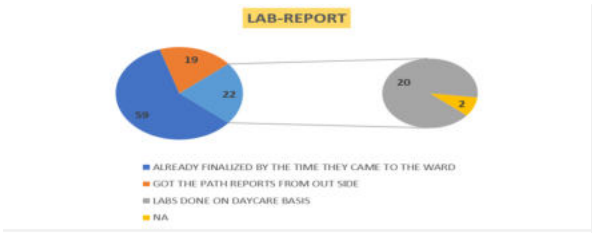

Fig 4. Finalized Lab Reports Before Chemotherapy – Only 22% of patients had to undergo lab investigations on the day of chemotherapy on daycare basis.

13. Of the 20% patients whose investigations were done on daycare basis, 37% reports were made available between 1200 – 1300 hours daily and 90% of the reports were made available before 1400 hours on the day of admission.

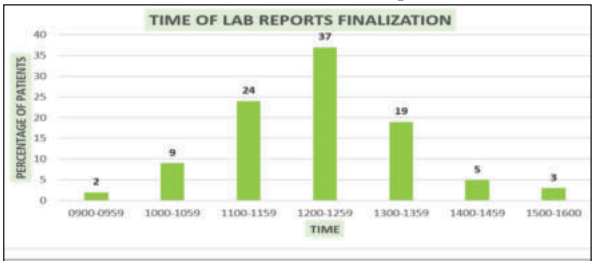

Fig 5. Time of Lab Report Finalization – 80% of the lab reports were finalized between 1100 – 1440 hrs.

14. Almost 66% of the patient's chemotherapy infusion duration was between 2-6 hrs.

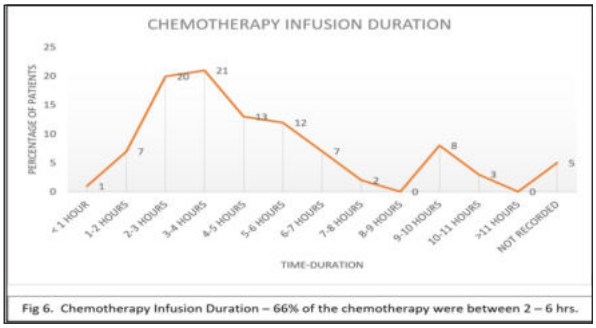

Fig 6. Chemotherapy Infusion Duration – 66% of the chemotherapy were between 2 – 6 hrs.

15. About 55% of the indents were placed between 1000 – 1200 hrs.

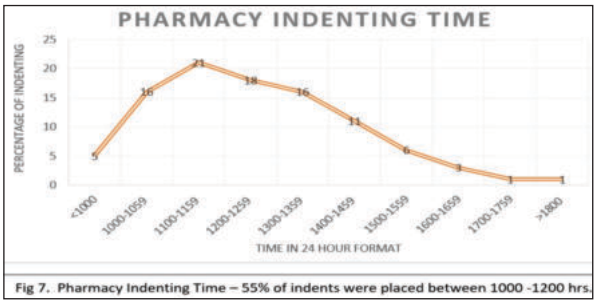

Fig 7. Pharmacy Indenting Time – 55% of indents were placed between 1000 -1200 hrs.

16. Chemo protocol was already available with 51% of the patients and about 37% of the remaining patient's protocol was prepared between 1200 – 1400 hrs.

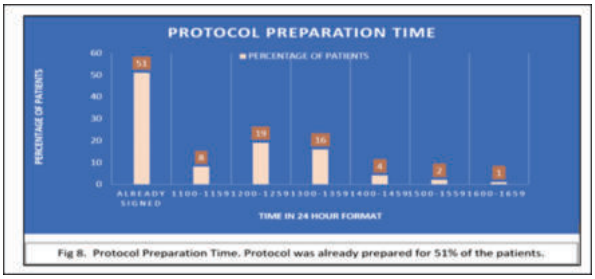

Fig 8. Protocol Preparation Time. Protocol was already prepared for 51% of the patients.

17. 60% of the ward pharmacy indent was received between 1200 – 1500 hr.

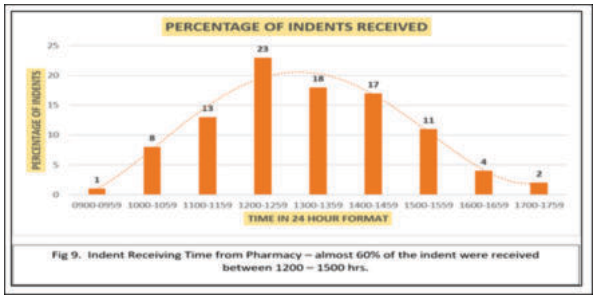

Fig 9. Indent Receiving Time from Pharmacy – almost 60% of the indent were received between 1200 – 1500 hrs.

18. Chemotherapy was initiated in 50% of the patients before 1400 hrs. and the rest of the 50% after 1400 hrs. Less than 5% chemotherapy was stated before 1100 hrs. and after 1700 hrs. 82% of the chemotherapy started between 1200 – 1700 hrs.

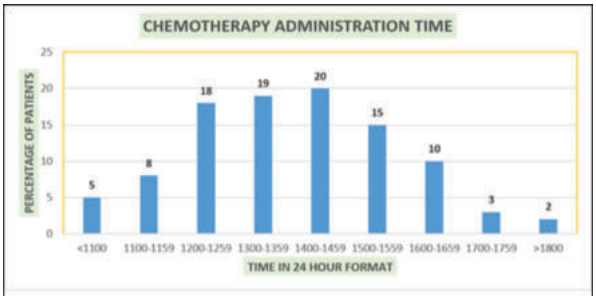

Fig 10. Chemotherapy Administration Time – 82% of the chemotherapy were administrated between 1200 – 1700 hrs.

19. Sixteen percent (16%) of the chemotherapy were started within one hour of admission and about 22% chemotherapy was initiated after 3 hrs. of admission. 37% were administered chemotherapy within 2 hrs. of admission and 25% within 3 hrs.

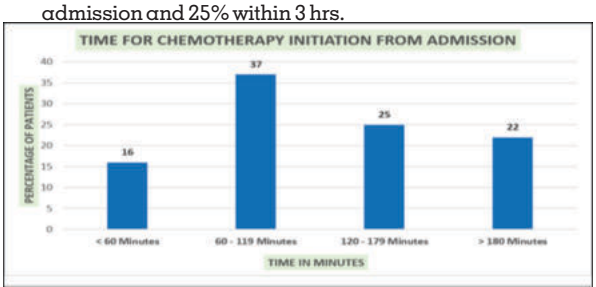

Fig 11. Chemotherapy Initiation time – 78% of the time Chemotherapy was initiated within the institutional benchmark which conforms with available international timings.

20. Out of 110 patients whose chemotherapy was delayed more than 3 hrs., 80 patient's reason for delay was available in the records. Out of them 24% of the time the delay was due to delay in preparation & availability of protocol and 16% of the time the delay was related to establishment of Intravenous access. Out of the 16%, difficulty in accessing a peripheral line was 5% of the time, 5% of the time the delay was due to requirement of central venous access and another 6% of the time the delay was due to want of insertion of chemo port or a Peripherally Inserted Central Line (PICC).

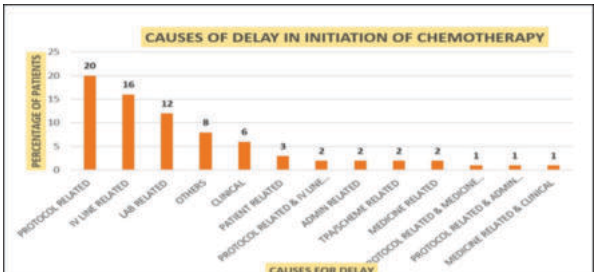

Fig 12. Common Causes for Delay in Initiation of Chemotherapy. Most common cause of delay was related to protocol preparation and signing followed by establishment of intravenous access.

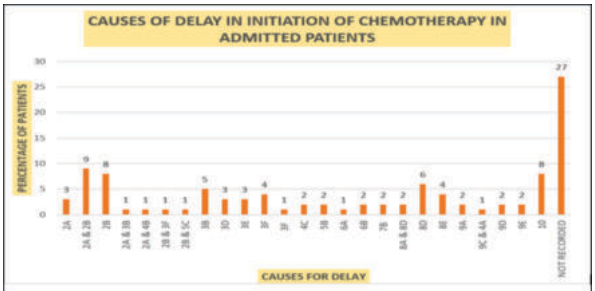

Fig 13. Common Causes for Delay in Initiation of Chemotherapy. Out of 110 recorded delays (more than 3 hrs. of delay), causes were recorded in 80 patients. The numbers assigned are various reasons related to the causes of delay (Table 2)

Table 1: Benchmark - Institutional Standard Reference Time for Various Processes in Chemotherapy administration

Process Time	Benchmark - Institutional Reference Time (in Minutes)
Time between admission and finalization of lab reports.	Within 60 minutes after admission
Time between admission and preparation of chemo protocol	Within 45 minutes after admission
Time between protocol preparation and pharmacy indenting	Within 15 minutes after preparation of protocol
Time between pharmacy indenting and arrival of drugs	Within 45 minutes after indenting
Time between arrival of drugs and initiation of chemotherapy	Within 15 minutes after receiving the drugs from pharmacy
Total time from admission to hospital and initiation of chemotherapy	Within 180 minutes after admission to day care ward

Table 2: Causes for Delay in Initiation of Chemotherapy

Assigned Number	Causes for Delay	Related Reasons
1	Nurse Related	a. Bed not prepared b. Nurse busy with an emergency / another patient
2	Protocol related	a. Not prepared b. Not Signed c. Wrong Protocol
3	IV line related	a. Waiting for anesthetist / surgeon b. Difficult to get IV line c. PICC/Chemo port/Central line dressing d. PICC line insertion e. Chemo port insertion f. Central line insertion
4	Medicine related	a. Delay in indenting b. Delay in supply c. Medicines Not Available
5	Admin related	a. Patient Care Attendant (PCA) Not available b. Waiting for old documents from Medical Records Department (MRD) c. Consent not obtained
6	Patient related	a. Patient not on bed b. Patient having meals
7	TPA/SCHEME related	a. MJPJAY / PMJAY (State / Central Govt Schemes) b. MPKAY (Departmental Scheme) c. CGHS (Central Govt Employees Scheme)
8	Lab related	a. Abnormal CBC b. Abnormal Creatinine c. Abnormal SGOT/SGPT d. Reports not made ready e. Reports Not available
9	Clinical	a. High BP b. Low BP c. Low RBS d. High RBS e. Vitals not stable
10	Others (Specify)	Any other reason not covered in the above list

Table 3: Chemotherapy Infusion Duration

Sample Size (n)	476
Mean	4 hrs, 19 mins
Median	3 hrs, 30 mins
Mode	2 hrs
Standard Deviation	2 hrs, 28 mins
Minimum	20 mins
Maximum	12 hrs, 50 mins
Range	12 hrs, 30 mins

Table 4: Descriptive Statistics of Time Measures of Various Processes in Chemotherapy. This is compared with Institutional Benchmark.

Statistic	Time between admission and finalization of lab reports	Time between admission and preparation of chemo protocol	Time between protocol preparation and pharmacy indenting	Time between pharmacy indenting and arrival of drugs	Time between arrival of drugs and initiation of chemotherapy	Total time from admission to hospital and initiation of chemotherapy
Sample Size (n)	97	244	492	495	488	500
Institutional Benchmark	1 hr	45 mins	15 mins	45 mins	15 mins	3 hrs
Mean	1 hr & 34 mins	1 hr 25 mins	45 mins	46 mins	44 mins	2 hrs & 11 mins
Median	1 hr & 29 mins	1 hr & 17 mins	22 mins	43 mins	20 mins	1 hr & 52 mins
Standard Deviation	50 mins	1 hr & 3 mins	53 mins	25 mins	1 hr & 8 mins	1 hr & 25 mins
Minimum	8 mins	1 min	0 mins	0 mins	2 mins	10 mins
Maximum	5 hrs & 9 mins	5 hrs & 30 mins	6 hrs & 10 mins	3 hrs & 52 mins	13 hrs & 30 mins	14 hrs & 10 mins
Range	5 hrs & 1 min	5 hrs & 29 mins	6 hrs & 10 mins	3 hrs & 52 mins	13 hrs & 28 mins	14 hrs

Table 5: Benchmark - Institutional Standard Reference Time for Various Processes in Chemotherapy administration

Process Time	Benchmark	Average	Min	Max
Time between admission and finalization of lab reports.	1 hr	1 hr, 34 mins	8 mins	5 hrs, 9 mins
Time between admission and preparation of chemo protocol	45 mins	1 hr, 25 mins	1 min	5 hrs, 30 mins
Time between protocol preparation and pharmacy indenting	15 mins	45 mins	0 min	6 hrs, 10 mins
Time between pharmacy indenting and arrival of drugs	45 mins	46 mins	0 min	3 hrs, 52 mins
Time between arrival of drugs and initiation of chemotherapy	15 mins	44 mins	2 mins	13 hrs, 30 mins
Total time from admission to hospital and initiation of chemotherapy	3 hrs	2 hrs, 11 mins	10 mins	14 hr, 10 mins

Table 6: Outliers in the Data Set

Process Time*	Sample Size	Q1	Q3	IQR	Upper Limit	Number of Outliers	Percentage of Outliers
Time between admission and finalization of lab reports	97	1 hr, 6 mins	1 hr, 53 mins	47 mins	3 hrs, 3 mins	5	5%
Time between admission and preparation of chemo protocol	244	32 mins	2 hrs, 4 mins	1 hr,32 mins	4 hrs, 22 mins	4	2%
Time between protocol preparation and pharmacy indenting	492	13 mins	57 mins	44 mins	2 hrs, 3 mins	47	10%
Time between pharmacy indenting and arrival of drugs	495	29 mins	1 hr	31 mins	1 hr, 46 mins	11	2%
Time between arrival of drugs and initiation of chemotherapy	488	13 mins	50 mins	37 mins	1 hr, 45 mins	51	10%
Total time from admission to hospital and initiation of chemotherapy	500	1 hr, 13 mins	2 hrs, 50 mins	1 hr, 37 mins	5 hrs, 15 mins	14	3%

Table 7: Time for Chemotherapy if Outliers (3%) were to be not considered

Statistic	Total time from admission to hospital and initiation of chemotherapy	Total time from admission to hospital and initiation of chemotherapy
Outliers Present	Yes	No
Sample Size (n)	500	486
Institutional Benchmark	3 hrs	3 hrs
Mean	2 hrs & 11 mins	2 hrs & 3 mins
Median	1 hr & 52 mins	1 hr & 50 mins
Standard Deviation	1 hr & 25 mins	1 hr & 5 mins
Minimum	10 mins	10 mins
Maximum	14 hrs & 10 mins	5 hrs & 15 mins
Range	14 hrs	5 hrs & 5 mins

Table 8: Chemotherapy Processes, Stakeholders, Departments, Equipment

Process	People	Department & Equipment
Blood Sample collection	Phlebotomist	Lab
Blood Sample Transportation to Lab	Office Assistant / PCA	IPD
Height, Weight, Vitals Checking	Nurse	IPD – Weighing Machine, BP Apparatus, Stethoscope, Thermometer, Stadiometer, Pulse Oximeter
Consultation & Protocol Preparation	Oncologist	OPD / IPD
Admission / Discharge	Data Entry Operators / Operations Executive	Front Desk, Operations - Computers, HIMS, IT Dept
Allotment of Beds	Ward / Floor Executives	Operations
Patient Examination	RMO / Registrar	IPD – Stethoscope, BP Apparatus, Pulse Oximeter
IV Access	Nurse / Anaesthesiologist / Surgeon	IPD / OT – Chem-port / PICC Line / CVP Line / USG Machine
Placement of Indent	Nurse	Computers (HIMS) / IT Dept
Supply of Medicines	Pharmacist	Central Drug Store, HIMS, IT Dept
Arrival of Medicines	Office Assistant / PCA	Central Drug Store / IPD
Administration of Drugs	Nurse	IPD
Patient Help	PCA / House Keeping	IPD
Fetching Patient's Old File	Office Assistant / PCA	Medical Records Department
Insurance / Govt Schemes	Front Desk & Billing Executives	TPA / Billing Dept
Patient Food & Beverages	F & B Executives	F & B Dept

Summary & Recommendations.

In summary, reducing waiting time between patient admission and initiation of chemotherapy is a big challenge in any cancer institute due to involvement of multiple processes, departments, and people. It directly affects operations, bed occupancy and turnaround time in day care center and ultimately patient satisfaction.

Identifying the causes for delay can be accomplished by dividing the processes involved in chemotherapy administration and by tracking the time taken for each of the processes.

Recommendations:-

The following lean methods will help in reducing the time taken to initiate chemotherapy after admission to day care centre.

- Establishing a satellite lab near the daycare centre to improve TAT.
- Finalization of protocol before scheduling patients, authorizing the Registrars to initiate chemotherapy based on oncologists notes and advice.
- Discouraging unscheduled chemotherapy.
- Dedicated indenting nurse.
- Dedicated chemo drugs dispensing team in central drug

store / pharmacy will ensure fast and safe dispensing of medicines.
- Adequate stocking of relevant chemo and adjuvant drugs, having them as ward stock and replenishing them as and when they get expended.
- Dedicated chemo drug administration nurse or pharmacist.
- Dedicated Chemo-Officer, preferably an oncologist to be in-charge for all the protocolized chemotherapies of the day.

These recommendations can be of immense benefit in an institutional setup and can avoid delays and dissatisfactions.

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