

Patients Flow Analysis

A Study with Reference to Emergency Department of a Hospital

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ABSTRACT: Patient Flow Management is one of the most important aspects to enhance patient experience. It is managing the journey of a patient through the healthcare facility. This term is applicable to all kinds of healthcare facilities including Out Patient Clinics, Day Care Surgery units, Inpatient Centres, Emergency Departments etc. Patient flow in an Emergency Department involves Triage, Initial Assessment, shifting out to Intensive Care Unit(ICU) or Operation Theatre(OT), Observation Beds Management, etc. The Emergency Department is an extremely challenging area for doctors, other medical personnel and of course to the patients and their families too. The present study aims to analyze the patient flow process in an Emergency Department of a hospital to help design strategies that improve the process. The prime data source is the nominal register of the ED which records the in time and out time along with the medical problems with which the patient comes. This helps in calculating the Turnaround time. An analysis of the Triage system being followed will help in identifying any loopholes with respect to the hospital under study and suggest replacement with a more useful system. In addition, the process and procedures were observed by the researcher during the research period to record any inefficiency. Short discussions and interviews with medical personnel in the ED were held to collect further required data. The major findings related to efficiency of patient flow in the emergency department are recorded and suggestions to make the process more efficient were given with respect to operating procedures and the Triage system.

Keywords: Emergency Department, Patient Flow, Triage, Turnaround Time.

PATIENTS FLOW ANALYSIS

A Study with reference to Emergency department of a Hospital

Patient Flow Management is one of the most important aspects to enhance patient experience. It is managing the journey of a patient through the healthcare facility. This term is applicable to all kinds of healthcare facilities including Out Patient Clinics, Day Care Surgery units, Inpatient Centers, Emergency Departments etc. Patient Flow in different departments varies. For instance, in Inpatient departments it includes how the patient gets admitted, allotment of bed, final discharge whereas in Operation Theatres it involves scheduling of patients, making space for emergencies, planning elective surgeries, pre surgical protocols and scheduling of infected surgeries.

Patient flow in an Emergency involves triage, initial assessment, shifting out to ICU or OT, Observation beds management etc. The Emergency department is an extremely challenging area for doctors, other medical personnel and of course to the patients and their families too.

Most people that visit an Emergency department are seriously anxious about their health and feel a need for prompt evaluation and help. From the hospital's perspective, it is essential for the Emergency department to be perfectly organized. Owing to its crucial position in a hospital's organizational structure, a poorly functioning Emergency department impacts the entire hospital. If Patients have to wait long periods in the ED, they may lose trust in the health services which would jeopardize the public trust in the hospital. The operational role of the emergency department can be understood as a place to receive patients with a medical emergency and start treatment right away. Assessment and stabilization of the patient is the main concern. To have a process flow that reduces the waiting time of patients helps in early diagnosis and stabilisation which is important in saving lives. The first step in an ED would be a Triage which is the preliminary assessment of patients in order to determine the urgency of their need for treatment and the nature of treatment required. The objective of triage encounter is to aid both clinical management of the patient and departmental management. Its length is such that initial assessment is able to diagnose and stabilize the patient. Emergency wait times can lead to delays immediate medical care. Hence, hospitals must focus on reducing these waiting times by managing the patient flow safely and effectively while making use of the resource capacities. The turnaround time of patients based on the triage division gives an idea of the average time taken to assess and stabilize patients requiring different levels of medical care and attention.

Significance and Objectives of the Study

The study aims to provide an understanding and analyze the patient flow process in an emergency department of a hospital. The study should help in the design of strategies that improve the patient flow in an ED to maximize the effectiveness of resources and capacity of the hospital.

The study was undertaken the following objectives

1. To study the process of patient flow in the emergency departments of a Hospital.
2. To understand the method used in categorisation of patients based on Triage.
3. To analyze the turnaround time of patients in the emergency department.
3. To recommend on measures to improve patient flow in the Emergency department.

Methodology

The research design is observatory in nature. The data collection is done using the nominal register of the emergency department recording various parameters including triage division, in-time, out-time, diagnosis and shifting. Based on the instructions of the hospital authorities, the name of the hospital is kept confidential in publication.

Though the patient flow was more than 150 during the 2 weeks time taken for the study, data related to 83 patients only was available to the researcher. Hence the sample size of 83 Patients who visited the emergency department for treatment during the study period were considered for the study

The prime source is the nominal register of the emergency department. The hospital had both digital and handwritten registers. Only data recorded in both has been considered for authenticity reasons. Other sources include websites, journals, and books of related to the topic under study. The primary source includes recording of observations by the researcher and discussion with the hospital staff of the emergency department.

Data analysis tools used were measures of central tendency (mean and mode).

Data Analysis

The process flow of the emergency department commences when the patient walks in, after which the Emergency physician performs an initial assessment of the patient based on his level of consciousness, vital signs and pain assessment. This procedure helps in assigning different triage levels to the patient namely P1, P2, or P3. The department follows the Canadian 3 tier system of triage division. Priority 1 patients require immediate care and should be treated right away, priority 2 patients can have a waiting time of 15 minutes depending on their condition and priority 3 patients can be made to wait for about 20-25 minutes. The triage division will decide the waiting period for the necessary treatment to be given. The Emergency department can have an immense inflow of patients all at once or none. Hence, the triage will simplify the classification of patients and the level of urgency. Once the attending physician is done with that, the initial assessment form is filled. This form will include all the details of the patient, the chief complaint, history of previous illness and treatments and allergies if any. Once the form is filled and documented the necessary tests and treatments are advised by the physician and are then administered by the nurse. The medications stabilize or reduce the pain of the patient after which the patient is monitored and discharged or shifted to the concerned department where the treatment continues. If the patient is brought dead or succumbs after being brought to the hospital different certificates are assigned. Similarly, if a patient leaves against medical advice a certificate is issued and it is documented in the Leave against Medical Advice (LAMA) Register. The Emergency department maintains an array of registers to make note of even minute procedures like sample collection or biomedical movement.

TRIAGE ASSESSMENT

Emergency patients are unique with regard to the injuries with which they present. Not all patients are as well as they appear, and not all patients are sick as they think. This is where triage division comes into action and prioritizes in determining acuity with assessment of the patients. There are various system used for Triage assessment. The current hospital was using the Canadian 3 Tier System. The others are:

The Canadian 5 tier system (CTAS) has 5 levels. The details of the levels of priority and the time allowed for attending to the patient is as follows-

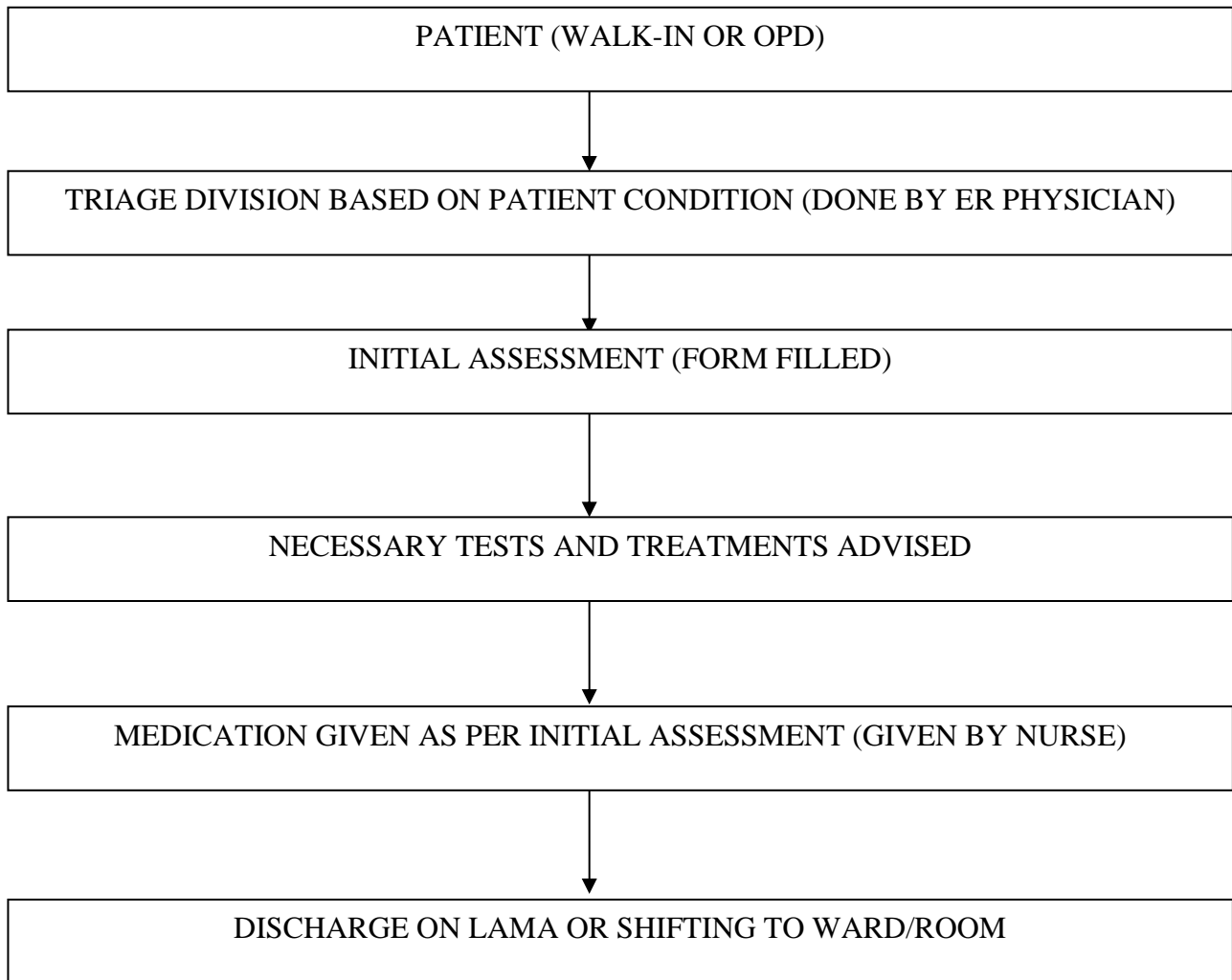
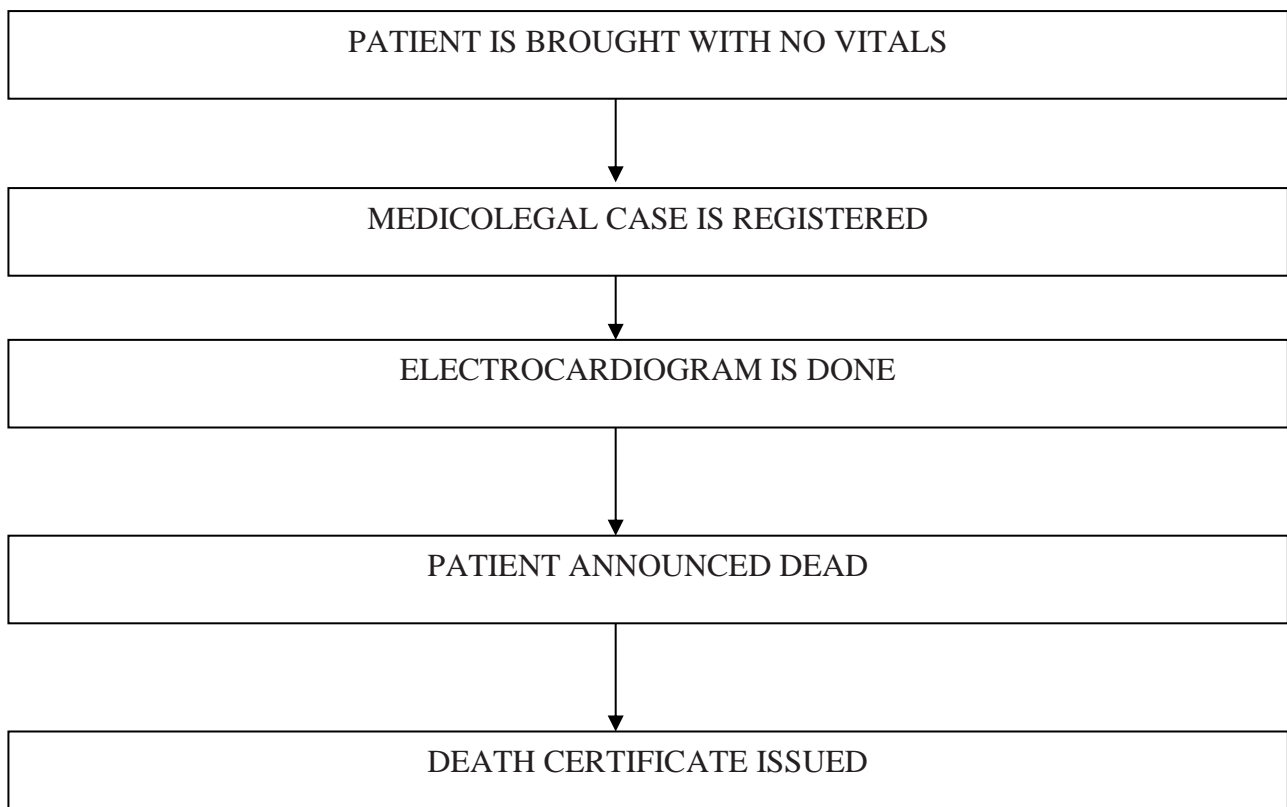
- 1 – Resuscitation Level 1 - 0 minutes
- 2 – Emergent Level 2 - 15 minutes
- 3 – Urgent Level 3 - 30 minutes
- 4 - Less Urgent Level 4 - 60 minutes
- 5 – Non Urgent Level 5 - 120 minutes

Australasian Triage Scale (ATS) is used in countries such as Australia & New Zealand. The details of the levels of priority and the time allowed for attending to the patient is as follows-

- 1 – Resuscitation Level- 1- 0 mins
- 2 – Emergency Level 2 - 10 minutes
- 3 – Urgent Level 3 - 60 minutes
- 4 - Semi-Urgent Level 4 - 120 minutes
- 5- Non-Urgent Level 5 - 240 minutes

Manchester Triage System is used in countries like England & Scotland. The details of the levels of priority and the time allowed for attending to the patient is as follows-

- 1- Immediate (Red) Level 1 - 0 minutes
- 2 - Very Urgent (Orange) Level 2 - 10 minutes
- 3 - Urgent (Yellow) Level 3 - 60 minutes
- 4- Standard (Green) Level 4 - 120 minutes
- 5 – Non-Urgent (Blue) Level 5 - 240 minutes

PROCESS OF PATIENT FLOW**PROCESS OF PATIENT FLOW**

TURNAROUND TIME OF PATIENTS IN THE EMERGENCY DEPARTMENT

There were about 11 Priority 1 patients who came to the emergency department during the period of research. The details of their in time and out time along with the health problem and Turnaround time are recorded in the table below.

FOR PRIORITY 1 PATIENTS

PATIENT	IN TIME	OUT TIME	HEALTH COMPLAINT	ACTION	TURAROUND TIME
P1	15:45:00	22:34:20	BROUGHT DEAD	NIL	6:49:20
P1	11:40:00	14:03:00	SOB CHEST PAIN	SHIFTED TO MICU	2:23:00
P1	16:00:00	22:00:00	BROUGHT DEAD	NIL	6:00:00
P1	5:30:00	5:45:00	LABOR PAIN	SHIFTED TO LDR	0:15:00
P1	1:20:00	1:30:00	LABOR PAIN	SHIFTED TO LDR	0:10:00
P1	20:00:00	1:30:00	CVA	SHIFTED TO HDU	5:30:00
P1	20:00:00	2:30:00	INFLAMMATORY PNEUMOTHORAX	SHIFTED TO HDU	6:30:00
P1	1:30:00	4:00:00	SEIZURE	SHIFTED TO MICU	2:30:00
P1	0:05:00	2:00:00	SOB CHEST PAIN	SHIFTED TO PICU	1:55:00
P1	6:15:00	6:20:00	LABOR PAIN	SHIFTED TO LDR	0:05:00
P1	19:30:00	21:00:00	NIL	SHIFTED TO MAIN BLOCK	1:30:00
					4:09:40

The Turnaround time for P1 patients was found to be 4 hours and 09 minutes and 40 seconds.

FOR PRIORITY 2 PATIENTS

There were about 29 Priority 2 patients who came to the emergency department during the period of research. The details of their in time and out time along with the health problem and Turnaround time are recorded in the table below.

PATIENT	IN TIME	OUT TIME	HEALTH COMPLAINT	ACTION	TURAROUND TIME
P2	20:25:00	2:35:00	ABDOMINAL PAIN	SHIFTED TO SICU	6:10:00
P2	21:30:00	0:30:00	CRUSH INJURY (LEFT LEG)	LAMA	4:00:00
P2	22:05:00	0:45:00	VOMITING	SHIFTED TO FEMALE MEDICAL WARD	3:40:00
P2	4:00:00	5:10:00	FEVER AND COLD	PATIENT LEFT	1:10:00
P2	8:45:00	11:30:00	CHEST PAIN	SHIFTED TO CATH LAB	2:45:00
P2	20:45:00	21:40:00	CHEST PAIN	PATIENT LEFT	0:55:00
P2	5:00:00	8:00:00	BACK PAIN	LAMA	3:00:00
P2	10:50:00	13:30:00	FEVER	SHIFTED TO FEMALE MEDICAL WARD	2:40:00
P2	11:40:00	13:00:00	GIDDINESS	PATIENT LEFT	1:20:00
P2	1:00:00	3:00:00	VIRAL PYREXIA	SHIFTED TO 5TH FLOOR	2:00:00
P2	8:30:00	12:30:00	CHEST PAIN	PATIENT LEFT	4:00:00
P2	10:00:00	17:30:00	DYSPHAGIA	PATIENT LEFT	7:30:00
P2	0:00:00	0:45:00	EAR PAIN	PATIENT LEFT	0:45:00
P2	12:00:00	17:00:00	PAIN (RIGHT LEG)	PATIENT LEFT	5:00:00
P2	13:10:00	17:00:00	ABDOMINAL PAIN	PATIENT LEFT	3:50:00
P2	10:20:00	16:00:00	HIP FRACTURE	SHIFTED TO SICU	5:40:00
P2	11:00:00	18:40:00	HIP FRACTURE	SHIFTED TO WARD 12	7:40:00
P2	13:40:00	17:00:00	ANEMIA	SHIFTED TO HDU	3:20:00
P2	13:50:00	15:50:00	ABDOMINAL PAIN	PATIENT LEFT	2:00:00
P2	23:30:00	3:00:00	LACERATION (RIGHT KNEE)	SHIFTED TO WARD 12	3:00:00
P2	0:50:00	11:30:00	SEIZURE	LAMA	10:40:00

P2	16:30:00	20:00:00	CHEST PAIN	PATIENT LEFT	3:30:00
P2	9:00:00	12:00:00	ABDOMINAL PAIN	PATIENT LEFT	3:00:00
P2	9:00:00	9:10:00	LABOR PAIN	SHIFTED TO LDR	0:10:00
P2	14:50:00	NIL	SEVERE ANEMIA		
P2	7:40:00	16:30:00	CHEST PAIN	SHIFTED TO HDU	8:50:00
P2	9:00:00	19:00:00	ABDOMINAL PAIN	PATIENT LEFT	10:00:00
P2	14:18:00	14:21:00	LDR (TEST)	SHIFTED TO LDR	0:03:00
P2	13:20:00	16:30:00	RENAL CALCULI	SHIFTED TO WARD 11	3:10:00
					2:45:00

The Turnaround time for P2 patients was found to be 2 hours and 45 minutes.

FOR PRIORITY 3 PATIENTS

There were about 43 Priority 3 patients who visited the emergency department during the period of research. The details of their in time and out time along with the health problem and Turnaround time are recorded in the table below.

PATIENT	IN TIME	OUT TIME	HEALTH COMPLAINT	ACTION	TURAROUND TIME
P3	20:30:00	22:30:00	CHEST PAIN	PATIENT LEFT	2:00:00
P3	21:15:00	0:30:00	CHEST PAIN	PATIENT LEFT	3:15:00
P3	20:10:00	1:30:00	HEADACHE	PATIENT LEFT	5:20:00
P3	23:30:00	2:30:00	DENGUE	LAMA	3:00:00
P3	21:40:00	3:30:00	DOG BITE (ONLY INJECTION)	PATIENT LEFT	5:50:00
P3	15:20:00	19:00:00	LACERATION (RIGHT KNEE)	PATIENT LEFT	3:40:00
P3	16:20:00	16:40:00	ONLY INJECTION	PATIENT LEFT	0:20:00
P3	18:00:00	18:15:00	ONLY INJECTION	PATIENT LEFT	0:15:00
P3	21:50:00	22:00:00	SAMPLE COLLECTION	PATIENT LEFT	0:10:00
P3	23:40:00	1:30:00	ABDOMINAL PAIN	PATIENT LEFT	1:50:00
P3	23:50:00	0:30:00	DOGBITE	PATIENT LEFT	0:40:00
P3	8:20:00	9:30:00	ABDOMINAL PAIN	PATIENT LEFT	1:10:00
P3	18:10:00	22:30:00	FEVER	SHIFTED TO 8TH FLOOR	4:20:00
P3	9:10:00	11:00:00	SEIZURE	SHIFTED TO PICU	1:50:00
P3	10:00:00	10:40:00	FEVER	PATIENT LEFT	0:40:00
P3	11:50:00	13:50:00	COVID POSITIVE	LAMA	2:00:00
P3	19:35:00	19:50:00	ONLY INJECTION	PATIENT LEFT	0:15:00
P3	3:00:00	4:30:00	FEVER	PATIENT LEFT	1:30:00
P3	10:15:00	18:55:00	ABDOMINAL PAIN	LAMA	8:40:00
P3	11:15:00	15:30:00	ANEMIA	SHIFTED TO MICU	4:15:00
P3	12:00:00	14:10:00	ONLY INJECTION	PATIENT LEFT	2:10:00
P3	0:15:00	2:45:00	FEVER	LAMA	2:30:00
P3	1:40:00	3:45:00	SPINAL CORD INJURY	SHIFTED TO WARD 1	2:05:00
P3	12:00:00	12:10:00	CONSTIPATION	PATIENT LEFT	0:10:00
P3	15:00:00	16:00:00	DYSMENORRHEA	PATIENT LEFT	1:00:00
P3	13:45:00	2:10:00	GIDDINESS	PATIENT LEFT	12:25:00
P3	18:45:00	20:20:00	VOMITING	PATIENT LEFT	1:35:00
P3	10:30:00	10:40:00	CANNULIZATION	PATIENT LEFT	0:10:00
P3	15:00:00	17:14:00	RAT POISONING	NIL	2:14:00

P3	4:15:00	10:45:00	ABDOMINAL PAIN	SHIFTED TO GYNAC WARD	6:30:00
P3	10:00:00	10:30:00	SAMPLE COLLECTION	PATIENT LEFT	0:30:00
P3	16:00:00	17:00:00	DIFFIVULTY IN SWALLOWING	PATIENT LEFT	1:00:00
P3	22:55:00	22:00:00	SOB CHEST PAIN	PATIENT LEFT	23:05:00
P3	17:10:00	14:00:00	ABDOMINAL PAIN	SHIFTED TO SICU	20:50:00
P3	10:20:00	10:40:00	ONLY ECG	PATIENT LEFT	0:20:00
P3	1:00:00	2:00:00	ABDOMINAL PAIN	PATIENT LEFT	1:00:00
P3	9:40:00	15:00:00	ACUTE APPENDICITIS	SHIFTED TO RECOVERY WARD	5:20:00
P3	11:30:00	11:40:00	ONLY CANNULA	PATIENT LEFT	0:10:00
P3	13:00:00	13:10:00	CANNULIZATION	PATIENT LEFT	0:10:00
P3	16:00:00	16:30:00	ONLY ECG	PATIENT LEFT	0:30:00
P3	2:00:00	2:45:00	EXCESSIVE CRYING	PATIENT LEFT	0:45:00
P3	13:50:00	14:00:00	FEVER	PATIENT LEFT	0:10:00
P3	12:10:00	14:30:00	FEVER	PATIENT LEFT	2:20:00
					2:10:00

The Turnaround time for P3 patients was found to be 2 hours and 10 minutes.

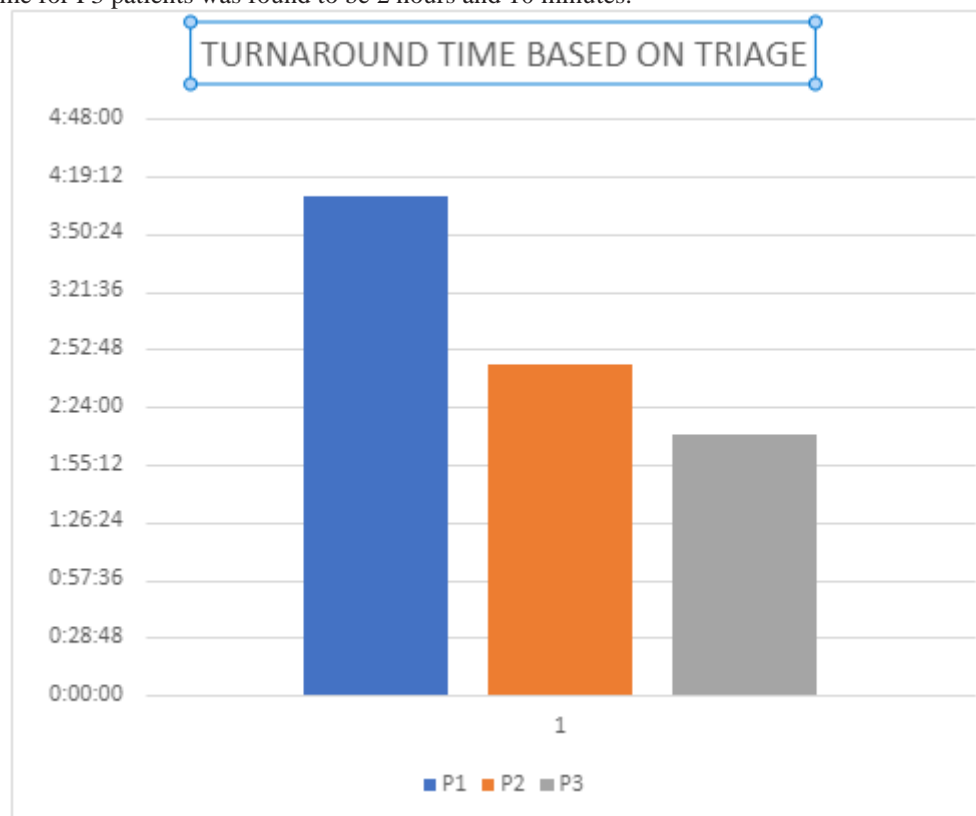


Fig 4.7

FINDINGS AND CONCLUSIONS

The shift timings and work schedule of the nursing staff is appropriately timed and conveniently planned for the staff to work without feeling exhausted.

The turnaround time for priority 1 patients was 4 hours and 9 minutes, for priority 2 patients it was 2 hours and 45 minutes and for priority 3 patients it was 2 hours and 10 minutes. For Priority 1 patients the TAT seems to be high.

The department has an emergency physician and 4 nurses present at all given times and the initial assessment and triage division are accurately done. Symptomatic relief is immediately provided to the patients.

X-rays and scans for P1 patients or bedridden patients are provided on the bedside. The medications advised by the physician are administered by the nurses.

The initial assessment form is recorded both manually and digitally to maintain records and a Covid test was taken for each patient on admission as a safety measure.

More than one attendant were seen to accompany the patient inside the emergency room. Though there is a rule that only one attendant per patient is allowed, it was not being enforced properly.

All the registers pertaining to and patients were not being maintained and checked at regular intervals. They was delay in entering the in time and subsequent schedules of patients in the nominal register. In addition, time lapse existed between digital and manual entry of patient details which has to be focused upon to make the system perfect.

Death certificates are issued at the emergency department desk within an hour of the victim's death.

WAYS TO IMPROVE HOSPITAL WORKFLOWS

BE COLLABORATIVE

Creating a successful healthcare workflow demands buy-in from all participants in the workflow. If just a single clinician believes a clinical workflow is faulty and decides to perform a task outside the normal procedure, this can make the whole team less productive. In a worst-case scenario, one individual's actions could negatively affect all workflow procedure processes that follow. This may motivate other individuals, and not in a good way, to attempt their own fixes. Then, before long, part if not all of the clinic workflow is significantly different than intended.

Defining workflow procedure is one of the main reasons why it's essential to include all stakeholders involved in process, implementation and management. Stakeholders will likely include department leadership, clinicians, IT managers, staff, and vendors whose products or services support the hospital workflow diagram.

AIM FOR THE DIFFICULT TACTICS

If the hospital or clinical workflow is going to continually deliver positive patient outcomes, processes will need to go smoothly and effortlessly. Some hospital workflows are naturally more complex to complete than others. Some of these, when performed below par, are more likely to impact patient outcomes and safety in a negative way.

While the administrators should have the resources to monitor and measure the effectiveness of all processes within a healthcare workflow, defining workflow challenge areas may be worth a closer look and require more frequent attention. Keep an eye out for disruptions in policy and workflow procedure. When problems are identified, carry out an analysis of the hospital workflow diagram to determine the cause and use the experience as an opportunity to avoid repeating it again.

Turnaround Time (TAT) is the period of time between when a process is submitted and when it is finished. It is the overall amount of time that a process in the system spends, and this process may either involve waiting or task execution. For instance, if a patient is waiting while their data is entered into the system for registration, the TAT would be the amount of time from when the registration number is generated until the patient consults a doctor. The process has finished its full period. TAT is a highly important factor in determining how effectively a hospital's operation system works. The management can concentrate more on the patient satisfaction rate. Along with evaluating each person's role play; it has significant positive effects on departmental production and efficiency.

SUGGESTIONS

After summarizing the study on the patient process flow of the emergency department, interaction with the medical staff and direct observation based on mapping the process flow, evaluating the turnaround time and analyzing the triage division, the following suggestions are made to the department to further improve the process.

Immediate documentation of the patient admission as it can easily be missed out later on. It is very important to maintain the Emergency Room Nominal register up to date by mentioning the correct diagnosis and surnames. The registers containing in and out time of patients to be revised regularly to avoid having any data unaccounted for. The Handwritten registers should be composed neatly in order to be able to decipher it for future use

The nurses should have a system in which one nurse in each shift solely takes the responsibility for entering patient details and information both digitally and manually to avoid any omissions and inaccuracies..

Not more than one guardian should be allowed with each patient to avoid any crowding in the department. The "one guardian per patient" rule needs to be reinforced by the security guard to prevent crowding in the ER. The said rule needs to be printed in local languages and be displayed in front of the emergency department and at the entrance for better understanding.

A separate area near the entrance needs to be assigned for "triage assessment" as the previously allotted area is being used for Covid tests

Allocation of more interns and attending physicians in the department in a given shift to manage multiple emergency cases if they occur and save time of the already admitted patients should be planned for.

Application of Canadian 5 tier System:

The Canadian 5 tier system can be beneficial to the Emergency Department as most of the patients coming into the ER are Priority 3 patients, further triaging them into P4 and P5 can help in better assessment and provision of quicker treatment to those in need of it thereby reducing the turnaround time of P3 patients and reducing the crowding in the department and easing patient process flow. This system will also help in prioritizing patients and the consults they require from doctors of various other departments as they can be summoned speedily, which will again help in reducing the patient turnaround time.

Another point that might be beneficial after the application of the 5-tier system could be if the P4 and P5 patients are placed on beds away from the entrance as they mostly come for injections, cannulas, IV Drips, the beds by the entrance can be kept for P1, P2 and P3 patients who are rushed in due to injuries. This will reduce crowding in the department and help in giving utmost consideration to the patients who require it immediately.

The major limitation of applying this approach would be requirement of more medical staff in the department. They would have to be trained regarding the 5-tier system and it may lead to inaccuracies at least during the initial stages which have to be taken care of. Miss assessment of triage could be fatal to the life of the patient and it may also lead to an increase in the turnaround time of patients

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