ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE SCHOOL OF PUBLIC HEALTH

Assessment of patient flow, areas of inefficiency for improvement in Tikur Anbessa Specialized Hospital: A mixed explanatory study

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Acronyms

DEA…… Data Envelopment Analysis

DMU……. Decision Making Units

EMR……. Electronic Medical Records

GDP……. Gross Domestic Product

MRN……. Medical Record Number

OPD……Out Patient Department

RTS……Return to Scale

TASH……. Tikur Anbessa Specialized Hospitals

VRS……. Variable Return Scale

ABSTRACT

Introduction: In Ethiopia, hospitals face many challenges like high waiting times, inefficiency, and negative patient experiences. Tikur Anbessa Specialized Hospital (TASH) is a tertiary level hospital located in Addis Ababa. There is little study done on patient flow, areas of inefficiency, and patient experiences. Understanding these areas will help in making improvement in the health service provision that are given in Tikur Anbessa Specialized Hospital in an efficient manner.

Objective: This study aims to assess the patient flow and identify bottleneck areas of inefficiency for improvement in Tikur Anbessa Specialized Hospital.

Methods: A facility based cross sectional design, employing time motion survey and Data Envelopment Analysis (DEA) to assess the patient flow and measure technical efficiency respectively. And a qualitative phenomenological design is used to explore the patient experience identify the bottleneck area at TASH. For the time motion study, descriptive analysis is performed using mean and standard deviation to characterize health worker contacts time at services areas at the hospital by using STATA version 12. For the patient experience interview, the transcript is read repeatedly to have an overview and coded. The codes with similar meaning were categorized which were then further classified into themes that reflects the central idea. The data are analyzed using Atlas.ti version 9 software. A DEA was used to calculate the efficiency of each department taking them as decision making units (DMUs). As an input, the number of health workers are taken; and as an output the number patients treated/visited at that department were included. The data were analyzed using MaxDEA software.

Result: The identified bottlenecks in operating the routine activities include communication barrier between the health care providers themselves, and between the health care providers and patients and caretakers. In addition to these issues, lack of fulltime doctors at outpatient departments (OPDs) and poor appointment system were found to be challenges resulting in long patient queues at different services areas. In addition, issues of inconsistent availability of drugs and supplies, services like MRI and CT scan have resulted in the clogging the patient flow in the routine operations of the Hospital**.** Out of the ten OPDs with the highest patient visits, only two were technically efficient.

Conclusion: Therefore, these bottlenecks contributed for the OPDs not functioning efficiently. Furthermore, the results from the DEA indicated that the technical efficiency of OPDs needs better operational improvement.

1. Introduction

1.1. Background

Ethiopia is one of the countries with the estimated population is of over 120 million [1], and its health care expenditure is 4.9% of its Gross Domestic Product (GDP) [2]. The country's health care systems make up: The primary level health care (health posts and health centers) designed to serve 40,000 population. This is the initial point of contact for patient seeking medical attention. Secondary level Health care includes General hospital, specialty centers and specialty clinics. It is the first referral level where complex problems are managed. The tertiary level health system has specialized hospital that provides specialty care with senior specialists; serves up to 3.5-5 million peoples [3].

Facilitating patient flow in the health service system of all levels ensures that patients receive timely care, reduces waiting times, increases patient satisfaction; and boosts overall hospital efficiency; and all of which recognize the hard work of committed healthcare staff. Patient flow is the movement of clients through a health facility, from the moment they arrive to the time they leave. When the patient flow system becomes inefficient, it causes disruption of the patient flow system and congestion in emergency and other health departments leading to patient and provider dissatisfaction, increased medical errors, and higher mortality rates [4].

Poor patient flow also increases operational costs as more money is spent on getting additional staff and expanding the facility to deal with overcrowding [5]. In TASH, there are many problems in achieving the service quality at different departments. Research conducted on the OPD pharmacy services has shown insufficient staff, poor medication information, and uncomfortable waiting areas were determinants factors on patient satisfaction [6]. Another study done on the laboratory services of TASH, overcrowding at the sample collection areas, unavailability of requested investigation, and lack of adequate latrine accessibility were found to be among the some of the challenges [7]. Additionally, there are communication barriers between patients and health care providers, particularly in specialty OPDs. One contributing factor was identified as the absence of guidelines for this type of communication between health care providers and patients, language barriers, and cultural differences [8].

The purpose of this study is to assess the patient flow of the hospital to identify the major bottlenecks and areas of inefficiency for further improvements which will help the hospital to

improve efficiency, managing the resources effectively, increase patient satisfaction and ultimately improve health service quality.

1.2. Statement of the problem

Health system inefficiency is becoming an alarming issue since health expenditure is rapidly growing due to different factors from place to place and from time to time [9]. The declaration of Astana on Primary Health Care in 2018 states that the global community cannot afford waste in health care spending due to inefficiency if universal health coverage and other health and health-related targets of the Sustainable Development Goals are to be achieved [10]. Worldwide around $ 300 billion is lost annually to hospital-related inefficiency [11]. Therefore, assessing the causes of hospital inefficiency is crucial in order to enhance patient outcomes and implement the standard of health service.

Since TASH is Ethiopia's largest and most specialized hospital in Ethiopia, research conducted at TASH demonstrated inefficiencies in the procedure that prevents patients from being processed promptly and effectively, making it impossible for the services to effectively satisfy the demand for the health care services [12].

The problems with the health care system include long wait times, disorganized facility structure, uncomfortable waiting rooms, and poorly designed medical units. Concerning the healthcare providers, there are insufficient time management, communication barriers, and deficiencies in clinical expertise in managing both standard and complex care and treatments. From the perspective of the patients, miscommunication brought on by language obstacles, a lack of comprehension of the information provided to them during interactions regarding their medical treatment, and a lack of familiarity with the facility due to confusing medical facility designs. All the mentioned problems in the healthcare system hinders optimal patient flow in the hospital leading to poor patient flow contributing to inefficiency. Even though smooth patient flow is noted to be necessary for the hospitals to function efficiently. The patient flow process linked to efficiency is poorly noted in TASH. And also identified bottlenecks that hinders optimal patient flow are poorly recognized.

This study comprehensively evaluates the patient flow processes within TASH, focusing on identifying areas of inefficiency and bottlenecks that hinder optimal flow. While the hospital

strives to provide quality care, a mixed explanatory study is warranted to uncover the root causes behind bottlenecks, delays, or inadequacies within the patient flow dynamics.

Addressing these issues is fundamental to optimizing patient care delivery, reducing waiting time, enhancing resource utilization, and ultimately improving the overall quality of health services provided by TASH.

1.3. Significance of the study

TASH is one of the largest hospitals that serve a significant number of populations with diverse medical needs. Undertaking a comprehensive assessment of these inefficiencies through a mixed explanatory approach holds significant rationale for several key reasons.

Efficient patient flow directly impacts the overall patient experience. Understanding and fixing inefficiencies can reduce waiting times, streamline processes, and contribute to a more positive patient journey within the hospital. Identifying inefficiencies allows for the optimization of resources, including proper allocation of staffs, facility infrastructure usage, and maximization of equipment utilization. Streamlining these resources improves operational efficiency and cost-effectiveness. By addressing bottlenecks and shortcomings in patient flow, the hospital can enhance the health service delivery, ensuring timely access to care, reducing the risk of errors, increasing patient satisfaction; and improving overall health outcomes for patients.

The findings from this research can serve as a basis for evidence-driven interventions that are provided targeted gap filling interventions that can facilitate strategic decision-making to drive sustainable change within the TASH. A mixed explanatory study allows for a multifaceted exploration of patient flow inefficiencies. Combining quantitative data on patient flow metrics with qualitative insights from patient experiences and staff perspectives enables a comprehensive understanding of the root causes behind these inefficiencies and provides the remedial evidence-based interventions that can improve the overall patient flow in the health care system.

In general, to improve TASH's inefficiencies even further, an assessment of patient flow and the identification of areas with bottlenecks in the health services was conducted. This study

identified the bottle necks and generated evidence to improve operational effectiveness, optimizing patient care delivery, and supporting the hospital's mission to offer the better medical care and treatment to its varied patient population.

2. Literature review

2.1 Patient flow

Patient flow refers to the process of moving patients through each part of the clinical environment [4]. Patient flow represents the health system's ability to serve patient quickly and effectively throughout their treatment period. When the system process operates normally, patient process becomes smoother, and all related processes can be resolved with minimal delay [13].

In different areas, there are different sequences in the patient flow. For instance, in a study conducted in Thailand, most of the medical department's services were provided within the department's area. General procedures begin with measuring blood pressure in the service area. After that the patient will wait to see the doctor and submit medical records. If no further diagnosis is needed, the patient can wait for a prescription or invoice. About 95% of patients are prescribed some type of medication. After paying and receiving the medicine, the patient will return to the pharmacy department to schedule the next examination. About 99% of patients receive an appointment card. Once the appointment is completed, patients can leave the hospital and experience long waits for some procedures, especially during diagnosis and receiving medications [14]. The difference is not only in patient flow sequence but also their arrival time. In a case study done in a Nigerian tertiary hospital radiology department, the patient arrival rate differs throughout the day. In this study over half of the patients (63.5%) arrive early in the day [15].

When patient flow is assessed, waiting time was a core thing in the study done in Malawi [16]. When assessing patient flow in health facilities, it is inevitable to consider the waiting time. Waiting time is the length of time between enrolling a patient on a waiting list and the period that a patient takes at each point of service before being treated. Waiting time differs from regions and countries. For instance, in a West Indian tertiary hospital, the average total waiting time was 2.10 hours [17]; whereas in Nigeria, the average waiting time to see the doctor was 1.25 hours [18]. When we look at Ethiopia (especially in Addis Ababa), the average waiting time to see the doctors were one hour which less than the above-mentioned countries [19].

2.2 Patients' experience in hospitals

Patient experience encompasses the various occurrences and events that occur both independently and collectively throughout the continuum of care [20]. Most of the time patient experience and patient satisfaction are used interchangeable but patients' experience explores what the patient has encountered through the process of care. Even though there are many definitions about patient experience, it is generally the patient journey in the health care facility. Patient experience is crucial in various aspects. For instance, having and improving patient experience in a hospital will lead to better health outcomes because when patients get good support and quality of care from health providers, it heals them mentally leading to better recovery and good health outcome. In today's competitive healthcare environment, poor patient experience leads them to switch to other health facilities. On the other hand, if patients have good experience, they become loyal and recommend it for friends and families which leads to good reputation. Having good reputation in the industry attracts new patients. All this will help hospitals to gain more revenue. Patient experience includes several aspects of healthcare delivery that patients value highly when they seek and receive care, such as getting timely appointments, easy access to information, and good communication with health care providers [21].

Patient experience differs within departments and different region. A study done in South Africa ART clinic patients had positive experience regarding time that they spent with doctors, clean clinics, and private and safe counseling areas. Their negative experience was difficulties in interactions with nurses, unfavorable attitudes of staff, impolite behavior of staff members, insufficient information, occasional insufficient counseling, appointments that are inconsistent and rigid, difficulties with data recording and registration systems, differing frequencies for collecting ARV medication, varying health tests and procedures depending on the location, and the lack of patient committees and representatives [22]. In case of Ethiopia, a qualitative study done at Arba Minch Hospital on inpatient experiences showed patient experienced staff kindness, their appointments were respected and had positive health outcomes [23]. On the contrary, they had negative experience with the hygiene of toilets, lack of bed sheets, and lack of drugs. In another study done in Addis Ababa at Yekatit 12 Hospital, there were similar issues with having negative experience with the infrastructure like unclean toilets, lack of waiting area, lack of drugs and laboratory services. Additionally, issues were raised like disorganized directions, invasion of privacy, lack of respect and courtesy partiality, lack of patient center care, and delay in providing services [24].

2.3 Hospital Efficiencies

Hospital efficiency - like any other efficiency evaluates the result achieved with the resource consumed in a hospital setting. Increase in hospital efficiencies is the ability to do more with few or equal resource like providing more quality services without increasing cost in the same proportion. Hospital inefficiencies have been studied in many regions where the majority of the literature used Data Envelopment Analysis (DEA) method. The fundamental concept of DEA is to establish an optimal performance boundary for efficient Decision-Making Units (DMUs) that encompasses all the inefficient DMUs. The DEA method has been fruitfully used in many countries in Asia, Europe and North America to shed light on the efficiency of health facilities. In a literature review done on the use of DEA in health care, most of the publications were from Africa and Asian regions with majority of the research were conducted to answer specific management questions [25]. When choosing inputs and out to conduct DEA is challenging. A literature review done on identifying the variables for DEA, the common variables taken as inputs were the number of beds, the number of medical personnel, the number of non-medical staff, operational cost, and the output variables used were the number of inpatients, the number of outpatient services, the number of surgeries, days of inpatient, and the number of emergency visit [26].

Hospital inefficiencies have been issues in many countries. A study done in 36 African countries health systems 58% of them were efficient [27]. In a study done in Sierra Leone from the assessed hospitals around 59% of them were technically inefficient [28]. And when we see the case of Kenya 26% of the public hospitals were inefficient [29]. A study that was done in Eastern Ethiopian hospitals around 66.67% of the hospitals were inefficient [30]. And also, in a study on public hospitals in Ethiopia there most of the hospitals OPDs were efficient and the labor time of health professionals were one of the determinants of efficiency in hospital OPDs in Ethiopia [29]. A study done in northwest Ethiopia hospital on maternal health services there mean efficiency was high and hospitals managers experience in years, educational levels of hospital mangers and services years of the hospitals were positively associated with efficiency. And also, this hospitals waste around $ 6833.50 for salary and $ 3886.8 for non-salary expenditures [31].

Measuring hospital efficiency is complex and challenging in evaluating patients, providers, and the system sufficiently in a comparable manner. In addition, the production process in hospital is poorly understood creating difficulties to measure and capture hospital efficiency.

International comparison is also challenging because of the variation of institutional arrangements and the definitions across health system and countries. Despite those challenges measuring technical efficiency using DEA whereby taking benchmarks within the DMUs is the best alternative in comparing.

Understanding the production process i.e. patient flow and patients' experiences by linking it to hospital efficiency with a given resource is key to capture hospital improvement areas towards efficiency.

3. Conceptual Framework

Communication barrier among health service provider and patients impair understanding leading to poor patient flow. Lack of adequate infrastructure (waiting areas, examination rooms, toilets…etc…) narrows bottlenecks resulting poor patient flow. Smooth patient flow enhances hospital efficiency by optimizing resource use and reducing delays. Not only that it streamlines patients experience positively by providing timely care.

Based on the literature review, patient experience and hospitals inefficiency are the dependent variables; Patient flow, communication, infrastructure were the independent variables. Hence, the independent variables are interlinked significant cause and effect. Technology, resources allocation; and waiting time influences hospital efficiency and patient experience. The conceptual framework was constructed based on the literature reviewed.

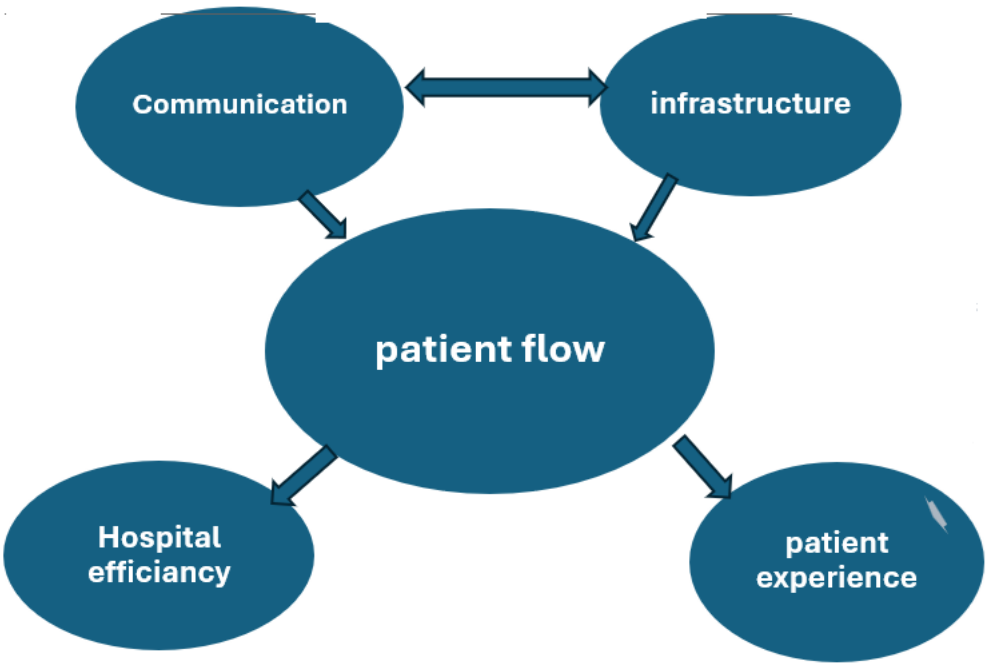

Fig 1: Conceptual framework

4. Objectives

4.1 General objective

To assess and explore patient flow and experiences, identifying areas of inefficiency for improvement in Tikur Anbessa specialized hospital.

4.2 Specific objective

- To assess the current patient flow process within Tikur Anbessa Specialized Hospital.
- To explore patients/caretakers experience during the patient flow process in Tikur Anbessa Specialized Hospital.
- To identify areas of inefficiency within the departments in Tikur Anbessa Specialized Hospital.

5. Methods and Materials

5.1 Study setting

Tikur Anbessa Specialized Hospital (TASH) is one of the tertiary hospitals that located in the capital city of Ethiopia. The hospital offers a variety of specialized treatments and care with 800 (eight hundred) beds in its inpatient departments. A 2019 survey found that the Tikur Anbesa Hospital serves between 370,000 and 400,000 patients throughout its many departments a year [6].

Tikur Anbessa Specialized Hospital is a teaching hospital where most of the students from school of medicine are trained. The School of Medicine that is a one of the schools of the College of Health Sciences at Addis Ababa University. The school has four undergraduate programs and eight MSc, six PhD, 17 specialty and nine sub-specialty programs.

5.2 Study design

The study used a mixed design. Facility-based cross sectional study design to conduct the time motion survey, data envelopment analysis (DEA) to measure the technical efficiency of Tikur Anbessa Specialized and Teaching Hospital and phenomenological study is conducted to explore the patient experience. DEA is a non-parametric method that evaluates the relative efficiency of decision-making units (DMUs) based on their inputs and outputs. In this study, the DMUs is the hospital departments or units.

5.3 Study population

The study population are patients or care takers and health workers at Tikur Anbessa Specialized Hospital.

Inclusion criteria

For the time and motion survey, patients that are from the selected OPDs were included. And for the patient experience survey, patients that have finished their stay in the hospitals. For those who are under 18-year-old, their care takers were included. In addition, health workers of the Hospital were also included.

Exclusion criteria

For the time and motion study, those who visited departments that did not implement the new iCare Electronic Medical Record (EMR) system were excluded.

For the patient experience interview, those who are mentally ill, those with hearing impairment, and those severely ill patients were excluded.

5.4. Sample size determination and sampling technique.

5.4.1 Quantitative data

For the time and motion survey, single proportion formula was used to determine the sample size. According to research done in Addis Ababa hospitals, 63.2% of patients had waiting time of over 30 minutes [19]. Using a 95% of confidence interval with width of ±5%, α= 0.05, and with a critical value of zα/2= 1.96.

$$n = (z\alpha/_2)^2 * pq/_d{}^2$$

Where n= desired sample size

P= proportion of patients waiting over 30 minutes

d = margin of error

z= the standard normal value at 95% of confidence level (=1.96)

q= 1-p

so n= (1.96) ²* (0.632) *(0.368)/ (0.05) ² = 363

The sample size for the time motion study is 363. Non respondent rate was not considered because the patients are tracked from the new iCare electronic medical record system (EMR). And for the DEA, the departments were used as DMUs, and in each, the inputs are number of health workers at the departments and the outputs are the number of patients treated/visits at those departments.

5.4.2. Sampling procedure

For the time motion study, the OPDs that treated the top ten diseases in the past 12 month are taken, and the sample size was divided based on the proportion of patients treated in the past three months using systematic random sampling. To calculate the interval, the average number of patients from the top ten diseases registered in the OPD units within the past three months are taken (this is done after obtaining the clearance from the school board to use the exact date).

5.4.3 Qualitative data

For the patient experience interview, semi-structured questioners were used. A heterogeneous purposive sampling was used to include both sexes and variety of service departments. When data saturation is reached, the interviews were discontinued. Health workers were interviewed in different areas of the hospital that include pre-triage, OPD, laboratory, and liaison office.

5.5 Data collection procedures

5.5.1 Time motion survey

The time motion survey was conducted for one month at TASH, Ethiopia. The survey was done on all weekdays except the weekends. The selected clients Medical Record Number (MRN) was extracted from the iCare system. A standardized format was used to register the time stamps on each contact points in the process of care from the start to the end of patient's journey. The data was collected by experienced data collectors.

5.5.2 Patient experience interview

As it was stated above, a phenomenological study was used. The data were collected through individual face to face interview using semi-structured interview guide. Every interview was arranged according to the participants' convenience in a quiet environment. An interview guide was prepared. The interview was done by data collectors who have experience on qualitative data collection skills after a one-day training was given on the interview guide. The interviews were transcribed in Amharic and translated to English.

5.5.3 Data Envelopment Analysis (DEA)

In the DEA the OPD was used as a Decision Making unit (DMU); the number health care providers as an input variable and the number of patients as an output variable assess the technical efficiency of the OPD. The data was collected from Electronic Medical Records (EMR) system and administrative records. From the EMR, the number of patients that visited a specialty OPD clinics were taken, and from the administrative records, the number of health workers that work on specific OPDs were considered. A data collection form was designed to capture the necessary input and output variables for DEA analysis.

5.6 Quantitative Data Analysis

For the time motion study, descriptive analysis is performed using means and proportion to characterize the patient population. And also, mean and standard deviation are used to characterize health worker contact time at the hospital OPDs by using STATA version 12.

In a DEA model, a Decision-Making Unit's (DMU) efficiency is determined by comparing the weighted sum of its outputs to the weighted sum of inputs. These weights are established by optimizing the efficiency of each DMU while ensuring that no unit's efficiency exceeds one [33]. The model computes the efficiency of individual Decision-Making Units (DMUs) by comparing them to the rest, indicating their relative efficiency. Hence, running the model for all units is essential to derive efficiency scores for each. A DMU is classified as "efficient" when its relative efficiency reaches one, signifying it as a benchmark for others. In this study the DMUs are the departments and health workers are taken as input and patient visits/treated were taken as output. The next step was normalizing the input and output values by using min-max normalization separately for the inputs and outputs. After the normalization of all the input and output values, a model was formulated to calculate the efficiency of each DMUs and compare their efficiency from the most efficient DMU. In this study, the BCC model (Banker, Charnas, and Cooper, 1984) which is also known as the VRS (Variable Return Scale) was used to measure the efficiency level. This model has the assumption that the ratio between input and output additions is not the same. For example, any input additions x times will not cause the output to increase by x times, but it can be decreasing returns to scale or increasing returns to scale. The mathematical model for DEA model is as follows:

Maximize: • θ

Subject to:

$$\sum_{j=1}^{m} \lambda j \cdot xij \leq \theta \cdot xi0 \qquad \forall i=1,2,\ldots,n$$

$$\sum_{j=1}^{m} \lambda j \cdot yrj \geq yr\ i \qquad \forall i=1,2,\ldots,n$$

$$\sum_{j=1}^{m} \lambda j = 1 \lambda j \geq 0 \qquad \forall j=1,2,\ldots,m \theta \geqslant 0$$

Where:

- xij and yij represent the inputs and outputs for DMU i and j, respectively.
- λj are the weights assigned to the DMUs (each j from 1 to m, where m is the total number of DMUs).
- θ is the efficiency score for the evaluated DMU.
- x_{io} is the target input for DMU i (determines if the returns to scale are increasing or decreasing).

The analysis is done using MaxDEA software.

5.7 Qualitative Data Analysis

For the patient experience interview, the transcript was read repeatedly to have an overview and coded. The codes with similar meaning were categorized into subgroups which then further classified into groups and themes that reflected the central idea. The data were analyzed using Atlas.ti version 9 software.

5.8 Data Quality Control and Trustworthiness

To ensure the exact time is taken at each step of the patient flow, the time similarities of each OPDs in the EMR system were checked and the time similarities were confirmed from the system operating officers of TASH.

For the patient experience interview, the trustworthiness was assessed through credibility, dependability, conformability, and transferability. To increase the credibility of the data, participants had variation in terms of the departments, sex, and education. To evaluate data dependability, the codes and extracted categories from the interview and texts are presented to audit the process of data extraction and categorization. To ensure conformability with the data, field notes were taken during the interview process. Furthermore, the interviews were tape-recorded so that the raw data are available. To ensure transferability, the results were reviewed and compared with other similar studies results.

5.9 Ethical Considerations

Ethical clearance was obtained from Institutional Review Board of the College of Health Sciences, Addis Ababa University. During the data collection every participant was informed of the study's purpose. Both oral and written informed consent were obtained. The confidentiality and anonymity for the audio record of the interview session was ensured. With the principles of respect, beneficence and justice, and assurance of the protection of human rights, confidentiality and informed consent of the participants is obtained. The study respected the cultural and political sensitivities of the context and avoided harm or coercion to the participants.

6. Results

The results are presented in three sections. The first part consists of characteristics of both the quantitative and qualitative data. In the second section, the key findings of the time-motion survey are presented - combined with the results of qualitative results within the sets of themes addressing key aspects. The results of the technical efficiency using the DEA model is presented at the end of the result section indicating the which OPD is technical efficient based on the number of health workers who is working in each OPDs and the numbers of patients visiting each OPD in year 2023 G.C.

6.1. Participant Characteristics

For the time motion survey, ten OPD departments that had the most patient visits from the 27 OPDs in TASH were taken. The number of samples for each OPDs were calculated proportional to the number of patient visits as described in table 1 below.

Table 1: ***Numbers of OPD, numbers of samples taken from each OPD for the time motion survey at TASH Addis Ababa, Ethiopia 2024G.C***

s. n	OPDs	Number of pts visited in 2023G.C	Number of samples
1	Oncology	95,504	47
2	Cardiac	93,931	46
3	Central triage, General medicine and Staff clinic	90,809	45
4	Infectious and Adult ART	78,629	39
5	ANC	77,315	38
6	Diabetic	69,656	34
7	Chest and GI	62,479	31
8	Orthopedic	58,096	28
9	Neurology and Rheumatology	57,909	28
10	Neurosurgery and Urology	54,293	27

The top ten OPDs with higher number of patient flow observed in the year 2023 G.C were: Oncology (95,504 pt), Cardiac (93,931 pt), Central Triage, General, Medicine& Staff Clinic (90,809 pt), Infectious Diseases &Adult ART (78,629 pt), ANC (77,315 pt), Diabetic (69,656

pt), Chest and GI (62,479 pt), Orthopedics (58,096 pt), Neurology and rheumatology (57,909 pt), and Neurosurgery and urology (54,293 pt). The majority numbers are females (222 pt), where the age groups with highest visit are the elderly, 65+ (71 pt), 30-34 (39 pt) and 40- 44 (36 pt) respectively.

Table 2: ***Demographic characteristics of participants for the time motion survey at TASH, Addis Ababa, Ethiopia 2024 G.C***

S. N	Age group in years	Female	male	Total
1	0 – 14	6	10	16
2	15-19	5	8	13
3	20 -24	17	7	24
4	25-29	22	5	27
5	30-34	23	16	39
6	35-39	16	10	26
7	40-44	29	7	36
8	45-49	20	5	25
9	50-54	17	8	25
10	55-59	16	15	31
11	60-64	14	14	28
12	65+	37	34	71
13	Total	222	139	361

Following the qualitative research guidelines, the participants were able to provide a deep and broad response to the questions presented. They provided a significant insight for the result of this study that were explained in the quantitative results of the time motion survey. In addition to that, it filled the gaps and the limitation by giving insight and pointing out the bottlenecks in the patient flow and area of inefficiency for further improvement. A total of 20 participants (15 of them being patients and caretakers and the five being health workers) were interviewed from laboratory, pre triage, liaison, OPD nursing, and OPD coordinating Office.

Table 3: ***Demographic Characteristic of qualitative study participants from TASH Addis Ababa, Ethiopia 2024G.C***

S. N	Characteristics	Frequency
1	Sex	
	Female	10
	Male	10
2	Age	
	20-34	5
	35-54	13
	55-64	3
	65+	4
3	Marital status	
	Single	4
	Married	16
4	Educational status	
	Uneducated	1
	Secondary school	6
	Diploma and above	13

6.2 Patient flow and operation bottlenecks

The patient flow in TASH starts from pre-triage if it is there first time where patients bring their referral paper. After that, patients get their card and then go to central triage to be directed to specific OPDs. However, if patients do not have referral paper, they go to liaison and get a paper that says without communication.

> "*Those who come without a communicating as an emergency, we give them a card that says without communication, they see the paper and receive them at triage, because we give them a Without communication, they accept them" (p17).*

Since the iCare system (which is the EMR) is not functioning in pre-triage room and liaison, the time-motion data collected from the system could not tell when and how much time it took the patients from triage to other point of services. On the contrary, patients typically activate their medical record number (MRN) at 10:00 am, and they typically contact their physician in the examination room at 12:00 pm. After card activation, patients go to central triage, different OPDs, laboratories and radiology department.

Table 4 summarizes the results from the time motion in the survey from different contact points including Laboratory, Pharmacy and radiology. It also shows the average contact onset of care at each contact points.

Table 4: Average onset of care at each contact point area in TASH Addis Ababa, Ethiopia, 2024 G.C

Contact points	*Average onset of care at each contact point*	95% CI
Card activation room	10.06AM	9.6 - 10.34
OPD	12.00 PM	11.50 – 12.06
Laboratory	12.33 PM	11.81 – 12.84
Pharmacy*	12.00 PM	11.53-12.34
Radiology*	12.00 PM	10.91- 12.47

**Radiology department results are not used because from the 362 sample only 44 of them used the radiology services and also the results from pharmacy are not also used because the timestamp in the Icare system (EMR) only shows the time when the prescription is written not the time of dispensing.*

Table 5 indicates the theme, group and subgroup of the qualitative study. The themes focused on patient flow and operation bottle necks, and patient and care takers experiences, each theme groups and subgroups listed in table 5.

***Table 5**: Thematic area, group and subgroups of the qualitative study in TASH Addis Ababa, Ethiopia 2024 G.C*

s. n	Theme	Group	Subgroup
1	Patient flow and operation bottlenecks	➢ Bottlenecks in operating the routine activities.	➢ Lack of fulltime doctors at OPDs ➢ Patient queues and appointments ➢ Communication
		➢ Availability and access to services	➢ Laboratory ➢ Pharmacy ➢ Radiology
2	Patient and care takers experience	➢ Experience with the hospital services.	➢ Delay in providing services. ➢ Respect and courtesy
		➢ Experience with the hospital environment and infrastructure	

6.2.1. Bottlenecks in operating the routine activities.

There are many challenges faced on daily bases while operating the routine activities in TASH. This group pinpoint main challenges in subgroups which include communication, working hour and patients' queues and appointments which will be discussed as follows.

Lack of fulltime doctors at OPDs

This subgroup explores the operational working hours of the OPDs with related to punctuality of doctors and its implication in the patient flow and their satisfaction. According to this time motion study, patients typically activate their medical record number (MRN) at 10:00 am, and they typically contact their physician in the examination room at 12:00 pm which is almost afternoon. This finding is also supported by both patients and health care providers interviews. They noted that OPDs do not work full day. Not only that, but frequently doctors do also not get in their shifts (OPD) on time. This all leads to significant delays in consultation and treatment which in turn disrupts the appointment schedules causing longer waiting time for the patients. In addition to this, half day operation of OPDs limits the availability of services provided leading to congestion during the operating hours and exacerbating the delays which was mentioned by a healthcare provider.

> *"Another problem is that most of the time, the clinics are not functioning in the afternoon, like ninety percent of them, which is another problem. It is better if sixty-five patients seen in half a day, and the other sixty-five in other half day. But if we leave it and make it a little less in the afternoon, even if we make it seventy-forty, seventy percent are seen in the morning and the rest are seen in the afternoon, and this is one of bottleneck, ninety percent of the clinics are working only in the morning. And as I told you, in the morning, there is morning sessions, the doctors enter at the clinic three and a half (in the morning) , this means that it is a big bottleneck. Now if it is afternoon, the compound is empty, it is something that anyone can see." (p19)*

Patients and healthcare providers suggested for supervision of the working hours of healthcare providers (especially doctors' working hours) so that they abide by the operational working hours of the OPDs, the extension of working hours of OPDs, and the provision of information about doctors' schedules. All the mentioned suggestions will help mitigate the

delays caused by the doctors, reduce congestion at peak time, and facilitate patient flow to improve.

> *"If a half day treatment at the OPD is changed to a full day, it will reduce the disruption. If these things are fixed, the appointment days that we give them will be reduced, we can make the appointment that we give in two months, because we can see the patient sooner, we will see the change sooner." (p18)*

Patient queues and appointments

Patient queues and appointments subgroup highlights the significant challenges related to patients flow and appointment managements. Even though the time-motion survey did not pick the appointments issues of the patients since it only took the time stamps of the patients whereabouts, but as has been pinpointed in the above section, patients go in OPDs at 12:00 PM. However, from the qualitative study, challenges in appointments are frequent, and there are appointments without getting any treatments or diagnoses leading to frequent visits without diagnosis which accounts delay in care and patient frustration. One participant who is a care- taker described her frustration like this:

> *"We did the test in private (private diagnostic center) to avoid going on appointments, and it's been three weeks since we came here, and so far, we've been going on appointments, we haven't taken a single medicine, having too many appointments, at least they should see the situation, for example, if they appointed me for a month or two, it won't be a problem. Appointing a patient that comes with a support of another person, it's like saying that person should die or waiting on him to die." (p5)*

The other challenge in appointments are doctors not appointing patients properly for follow-ups leading to confusion in subsequent care provided. Extension of appointment dates because of lack of doctors and difficulties in prioritizing patients are further issues related to the patient flow and delaying treatment.

> *"So, I say it is good if the number of appointments is based on the severity of the disease. There is illness that gives time, there are illness that doesn't give time and it good if these situations are noted and shortened the appointments." (p3)*

There are challenges in patients' queues caused by patient overload, as the hospital experiences high patient flow coming from all over the country. This overload causes long queues at different service points like OPDs, CT scan, and laboratory services. The high patient overload is also exacerbated by not having many referrals out of the system but only referral into the system as described by a healthcare provider who works at the Liaison Office:

> *"The number of patients is high, Tikur Anbessa takes in but does not take out, it does not have a referral out system, and these are the problems."*

Related to patient queue, there is shortage of hospital beds which leads to long patients' waiting time. However, there many reasons associated with this challenge. One of the reasons mentioned was the fact that the Liaison Office sometimes lose track of the beds that are in the wards, In addition, patients from other regions do not usually come on the day where beds are available because of security and other reason. When such patients arrive after their appointment dates, they face many challenges leading to arguments and dissatisfaction. These are some of the reasons where patients are unable to adhere to their appointments.

> *"Especially when patients come from other region and wonder around because there are no beds. For example, someone came because he was called in and told there is a bed, and at the time his arrival, the patient was told there is no bed now and told to come in the afternoon or another day. The same thing happens, if patient has surgery, if they have to come out tomorrow, they will come out the day after tomorrow missing their appointment date, because they are in a different region, we call them to come and be prepared for surgery. The bed is not kept open when they came in, this is a big hospital, patients come from all four directions, there can be an emergency, so the bed (which was available on the patient's appointment day) is not waiting, because we (the liaison office) call them (the patients) to let them in as soon as there are free beds." (p17)*

Communication

This subgroup pinpointed positive and significant challenges in communication between patients and healthcare providers, healthcare providers and the iCare system.

Most patients received good care from the doctors, received good advice on personal care from the doctors. In addition, patients were involved in the decision-making process and their

concerns were addressed. On the contrary, there is a significant issue related to communication among health care providers and patients such as not getting the information about their health status. One participant said when asked how much information he got from the health care providers regarding personal health:

> *"They (the doctors) examine you, takes a sample, but does not tell us the results. It is better if the doctors says that this is the disease, because disease is not cured only by medicine. Food by itself is a disease and we will have trouble with it. And transparency is generally lacking." (p5)*

The other issues highlighted include lack of information about test results and about next steps, and language barriers leading to ineffective conversation between the health care providers and patients creating misunderstanding and services delays. One healthcare provider said that:

> *"I told you that Tikur Anbessa is known as a referral hospital, they(patients/clients) come from different countries(region), so there is a language problem, lack of knowledge of the culture is problem because of language misunderstanding they(patients/clients) may not come on their appointment day; they may not take amount of medicine as they should" (p18)*

Reports of mistreatment, neglects and conflict with the guards at the gates indicating the failure of communication between patients and supporting staff. And there was a suggestion for the need of improvement:

> *"I was at gate, especially there is no respect for people, they (the guards) tease, when you see a grown man being teased, it makes me angry. If there is something that can be done it should because it is wrong." (p9)*

6.2.2. Availability and access to services

This group emphasized on availability and access of services areas laboratory, pharmacy, and radiology (where radiology services are namely CT scan and MRI) by dividing them into subgroups. Not only that it indicated the bottlenecks caused by the challenges of availability and access of the mentioned services each.

Laboratory

In this subgroup, the strength, and areas of improvements in the laboratory services is pinpointed. The laboratory service of TASH is one of the services areas where patients had good experiences with receiving good care (mentioning their satisfaction with the services). They mentioned not only that the laboratory is easy to access by patients, but the fact that it is contributing for better patient flow. In addition to that, the laboratory services have uninterrupted and smooth workflow shortening the long queues for patients.

> *"This one is the outpatient service that serves the highest flow of patients. Patients come, in the order they came in, we use electronics now, we don't use paper, so when they come and receive what the doctor ordered according to their appointment, they (healthcare providers) receive it according to their appointment, post a barcode, and record them accordingly. It is a situation where people enter knowingly, then they are told the day when they will receive their results and they can go. Therefore, our biggest system to handle the flow is the system where we make the workers come in before 12 o'clock (in the morning) to do the work, and the workers who are here at night come down early and do the sample collection work, so the work is handled without interruptions, without congestion." (p16)*

Even though the laboratory services are praised by many participants, challenges were raised that are related to lack of test and resources, communication problems between the health care providers themselves and the patients leading to misunderstanding and mistreatment of patients. There is also long waiting times and queues because of the very small sample taking rooms compared to the high patients being served. Improvements in the availability of reagents and drugs were suggested to provide improved the laboratory services:

> " *Another thing is that the chemicals in the laboratory are not coming soon enough. It needs to be fixed." (p13)*

> *"There is a situation where patients bring their complaints to the laboratory in the hospital, but most of their complaints are not related to the results, but the relationship with the staff, and we are fixing it as a gap." (p16)*

Pharmacy

The service provided at Pharmacy also plays a crucial role in TASH's patient flow in the hospital system. The pharmacy faces a major challenge to provide good services due to lack of supply of drugs for different kinds of patient leading to patients' incurring extra expenses. This is not always the case, as there is good drug availability for diabetic patients. One patient expressed his experience like this:

> *"I spent the money that I shouldn't have spent. If it was here, I wouldn't have incurred the expenses because I have health insurance. I just bought three bottles of castor oil, one hundred and ten birr that is three hundred and thirty birrs together, and I bought the chewable pill at the same cost, which means that it has led me to another expense. Unnecessary expenditure has been incurred. Especially for health insurance users like me." (p12)*

Radiology

Regarding radiology services in TASH, it was suggested that there should be more CT scans since there are overload of patients leading to long queues due to unfunctional CT scan and unavailability of MRI. These challenges lead to patients incurring unexpected medical expenses. On participant said:

> *"CT scan and MRI often are done outside, then we pay a lot of money to get it done outside, and it's the same kind of equipment failure." (p12)*

6.2.3 Patient and care takers experience

This theme has two groups that emphasize on patients and caretakers' experiences with the services provided at different points. The groups give insights on patient experiences regarding the hospital environment and infrastructure and the consequence of the challenges.

6.2.3.1. Experience with the hospital services.

This group highlights patient experiences where patients experience delays when getting different services and the factors for these delays. The other subgroup highlights patients'

experiences related respect and courtesy while they are interacting with the hospital staff at different services providing areas.

Delay in providing services

Delays in providing services is frequently complained issues in TASH impacting the patient flow. This subgroup pinpoints different factors contributing for the delays in different points of service providing areas. One of the factors for delay in providing services is overcrowding in various departments such as OPD and radiology leading to long queues and significant delays thus becoming a bottleneck in the overall patient flow and hampering the timely service delivery. The other factor is challenges in system integration and resource allocation. Difficulties to integrate to the new system arise from whether patient don't have the necessary new numbers or health care providers are not integrating to the new EMR system.

> *"I think there are delays, from the starting room, pre-triage, post-triage, the place we send the patients, this a teaching center. When changing to a system, the issue of writing, the issue of integrating with the system has brought us a delay". (p20)*

> *"There is another resource problem, for example, radiation therapy has stopped at the moment, the machine is broken most of the time. There are many different clinics because there are sub-specialties, the hospital may not be able to provide all of their resources, ENT tests are requested from outside, there are big procedures if we go to neurology, what we call EEG, and procedure equipment's such as bone marrow equipment, biopsy equipment in hematology, aspiration equipment, these things are not purchased quickly. These are a problem of resources in the hospital." (p19)*

The other factors that contribute to delay in providing services arise from health care providers not arriving on time leading to extended waiting time for patients. The fact that the OPDs are not operating full day is also exacerbating the service delay. In addition to that, extension of appointments because of shortage of doctors and poor prioritization of patients resulting repeated visits without receiving treatment. Miscommunication between the health care providers resulting delays of services. In addition, lack of clear information on the treatment process. The unavailability and malfunctioning of essential services such as

radiology (CT scan and MRI) leads to the delay as well as to additional expenses when patients seek the services in other places.

> *"EEG is done in neurology. The nurses do EEG after the OPD services, and if they (the doctors) are late here (the OPD), it means that the patient sits and waits there. It's painful for us to sit and wait for them, because we can't do our job if the doctors don't come in on time, we can't do another job before the work here is done, so if they come in on time, a lot of things can be good." (p19)*

> *"The delay is in the CT scan service, waiting seven or eight days for the CT scan results. If the doctor has the results, he can treat me tomorrow, but I must wait eight days because the CT scan result is not delivered." (p2)*

Respect and courtesy.

In this subgroup, emphasis was made on patient interaction with guards, facilitators, nurses, and doctors with respect to compassionate and respectful care. Patients and caretakers often expressed having arguments and fights with the guards of the hospital. One participant expressed their interaction like this:

> *"There's a problem at the gate, something that's very sloppy, in fact, when we go inside the doctors are taking good care of us, but there's a problem at the gate. In fact, is it possible to write a comment? They have something to argue about with the patients, and I would be happy if it was corrected, especially the thing where they push us when we show them a paper. they don't respect people, it's not nice!" (p9)*

Other than the guards, majority of patients and care takers reported receiving good care from the doctors and nurses with good hospitality - except some patients experiencing mistreatment from the nurses and doctors.

> *" I especially appreciate the doctors, it's true. They took good care of me, the doctor who examined me first, and the doctor who examined me is also a specialist, they treated me with great care. I don't want to hide it, I saw good care, they treated me very respectfully" (p11)*

6.2.3.2. Experience with the hospital environment and infrastructure

This group explored patient experiences related to hospital environment and infrastructure such as waiting areas, examination rooms, toilets, and other hospital infrastructure.

Majority of patients and care-takers noted issues with waiting areas underlining inadequate and uncomfortable seats and overcrowding of waiting areas. Not only waiting areas but also examination rooms being small and overcrowded creating discomfort for the patients. Moreover, most of the patients noted lack of cleanness of toilets and suggested the need for better maintenance of toilets and more facilities.

> *"I can say that there is no clean toilet, and because of that I don't use it often. And I'd say it would be nice if they were fixed up a bit. It is not particularly comfortable for the patient." (p7)*

> *"Standing without a seat and waiting. I was angry. Similarly, I had a problem with the toilet. I had a urine test and it took me hours to walk around to even find that toliet. And what I can say is that I am sorry for is the lack of seats and toilets." (p8)*

The other issue raised often is lack of direction signs creating confusion and making difficult for patients. Exacerbating this challenge is the lack of wheelchairs and functioning elevators making hard for patients to move around within the hospital. One caretaker their problem like this:

> *"But from the moment we come in, we have to come here with referral paper, and from the moment we come in, wheelchair access is a problem here. When we come here, we bring a weak patient, but there is a wheelchair problem to move that patient. The biggest problem we have so far is that there is a problem with the provision of wheelchairs that we need to move around patient." (p3)*

6.3 Technical efficiency

The technical efficiency of ten OPDs were analyzed using the data envelopment analysis, the BCC model, and also choosing the variable return scale. The decision-making units are the OPDs, and number of nurses at the OPDs are taken as an input and the numbers of patients

treated each OPD in year 2023G.C as outcomes. The OPDs were selected based on the number of patient visits taking the top ten OPDS who had most visits. The technical efficiency was analyzed using the MaxDEA software.

Table 6: *DMU, INPUT and OUTPUT for the DEA analysis at TASH Addis Ababa, Ethiopia 2024G.C*

DMU(OPDs)	INPUT (number of health workers)	OUTPUT (number of patients visits in the year 2023)
Oncology	11	95504
Cardiac	5	93931
CT, GM& ST	5	90809
Infectious disease and Adult ART	7	78629
ANC	7	77315
Diabetic	5	69656
chest and GI	6	62479
Orthopedics	7	58096
Neurology & Rheumatology	4	57909
Neurosurgery& urology	5	54293

In table 7 the DMU are the OPDs from TASH and the efficiency scores indicate their efficiency where the value one indicating the DMUs are technically efficient. The rank is assigned based on the efficiency score where the lower number ranking indicating higher efficiency. The benchmark indicates the other DMUs serving as benchmark for efficiency frontier. The projection input and output indicate the amount of unit required to be on the efficiency frontier. And at last, the Return to scale (RTS) constant is the estimated value for each DMU, A value less 1 suggesting decreasing RTS and a value greater than one suggesting increasing RTS.

Oncology, cardiac, and neurology & rheumatology departments are efficient having the efficiency value of 1. And the other department are inefficient. Oncology and cardiac are used frequently as a benchmark due to their high value of efficiency. Almost all departments except neurology and rheumatology are experiencing negative RTS which indicates increasing the input which is the number of health workers will not proportionally increase the output on contrary it will decrease the output. But department neurology and

rheumatology which has a positive RTS value indicates will benefit to be efficient if its inputs are increased.

Table 7 *Results of technical efficiency of the OPDs using DEA at TASH Addis Ababa, Ethiopia 2024G.C*

DMU	Efficiency score	Rank	Benchmark (lambda)	Projection (INPUT)	Projection (OUTPUT)	RTS Constant
Oncology	1	1	Oncology (1)	11	95504	-0.9698
Cardiac	1	1	Cardiac (1)	5	93931	-0.98605
CT, GM& ST	0.966763	4	Cardiac (1)	5	93931	-1.01995
Infectious disease and Adult ART	0.832446	5	Oncology (0.333333), Cardiac (0.666667)	7	94455.33	-1.17794
ANC	0.818535	6	Oncology (0.333333) Cardiac (0.666667)	7	94455.33	-1.19796
Diabetic	0.741566	7	Cardiac (1)	5	93931	-1.32968
chest and GI	0.663307	8	Oncology (0.166667); Cardiac(0.833333)	6	94193.17	-1.48242
Orthopedics	0.615063	9	Oncology (0.333333) Cardiac (0.666667)	7	94455.33	-1.59426
Neurology& Rheumatology	1	1	Neurology & Rheumatology (1)	4	57909	1.48818
Neurosurgery& urology	0.578009	10	Cardiac (1)	5	93931	-1.70593

7. Discussion

The OPD patient flow at TASH begins with pre-triage, following which clients receive patient cards and proceed to main triage, whereby patients and care takers are connected to appropriate OPDs, or other departments based on the patients' needs and conditions. Their paths diverge once they get at OPD. According to this time motion study, patients typically activate their medical record number (MRN) at 10:00 am, and they typically contact their physician in the examination room at 12:00 pm. Patients encounter delays when receiving MRI, CT, and examination room services. In addition, unavailable and inaccessible of adequate and proper waiting areas, toilets and drugs and supplies were the main findings.

Of the ten TASH OPD specialization clinics ranked by the DEA as having the highest patient volume, just two are technically efficient. When there is just one TASH specialty OPD clinic with a positive return to scale (RTS) value. When DMU have positive RTS value, it means that raising input will increase output. On the contrary having a negative value of RTS means increasing the input will not increase the output indicating the need for improvement in the process. Based on this study, none of the other nine TASH specialty OPD clinics will able to achieve technically efficient output levels by simply raising input, rather improving the patient flow will help reach their technical efficiency.

Compared to a study done in Thailand hospital, TASH's patient flow is different. The study in Thailand hospital in patients flow begins by taking patients vital sign and then documentation after that the patients visits the consultation rooms in OPD, but patients wait longer to get diagnosis and treatment [14] which is similar with TASH where patients experience to long waiting time and frequent appointments without being diagnosed.

According to a Nigerian survey, most patients at tertiary hospitals arrive early in the day [15]. It is comparable to TASH patients arriving early in the day. In TASH, the average wait time for medical attention is around two hours. This is higher than the 1.25 hours on average seen in research conducted in Nigeria [18]. It is also higher than research conducted in hospitals in Addis Ababa, where patients had an hour-long wait on average to see a doctor [19].

The experiences of patients and carers at TASH are similar to a study conducted in South Africa, where participants reported feeling comfortable interacting with doctors but also reporting rude behaviors from other hospital staff members, a lack of information, and irregular appointments in both settings [22].
The patient and care takers experience at TASH are similar with Yekatit 12 hospital where patients had negative experience with the infrastructure like unclean toilets, lack of waiting area, lack of direction indicators, lack of drugs and supplies in pharmacy and delay in providing services [24].

When compared to Ethiopian public hospitals, where the majority of OPDs are technically efficient, only a small number of specialties OPD clinics at TASH are technically efficient [31]. This indicates that the inefficiencies of the OPDs were caused by the bottlenecks discussed above.

Smooth patient flow and operational process at all related services improve to provide quality services with minimal delay [13]. All the TASH bottlenecks in the patient flow and operational routine activations caused delays in service delivery, which negatively impacted patient experiences that ultimately resulted in inefficiencies in the outpatient departments.

Health care organization faces challenges while operating to provide quality health services that requires appropriate mix of health care professionals with different kinds of settings. Moreover, economic and demographic changes are becoming challenges for health care organization to provide quality health services to more patients at a lower cost. Hospital inefficiency is a concern because it may deny health gain who receive treatment because they don't receive the best possible care available within the hospital limited resource [34]. The health sector especially hospitals are prone to inefficiency serval reasons like information asymmetry, uncertainty of the demand for services and difficulties in linking inputs to outputs [35]. These increased financial pressures are leading health care organization to decrease the cost to provide health services by avoiding wastage and improving utilization of the existing health care resources [36].

When the resource is not available in a time of need, it creates a bottle neck leading to delay in treatment. A bottleneck in a patient flow can be due to lack of Physical capacity: The provider does not have a sufficient number of beds, examination rooms, etc., to accommodate

all demand, Scheduling: The provider does not take advantage of opportunities to balance demand for healthcare services with availability, Staff: The provider does not have a sufficient number health care providers to meet all demand, Equipment and supplies: Capacity and staff are available, but various equipment, supplies, medical devices, etc., needed to conduct a given test or procedure are not available at that time, Information: In many cases, a patient flow bottleneck can occur because the clinicians do not have access to key pieces of information, such as lab results, consult reports from specialists, or radiological images that must be available before treatment can be initiated or completed [36]. This is comparable to TASH, where study findings indicated that insufficient beds, waiting spaces, restrooms, and examination rooms created a physical bottleneck that hampered patient movement. In addition, there were scheduling conflicts that resulted in patients and carers not receiving the correct appointments or being late, that made the scheduling issue worse. The reported bottlenecks in the patient flow at TASH were a lack of staff, malfunctioning medical equipment (such as CT scans), a lack of supplies (such as drugs), and communication issues between patients and health service providers.

As previously mentioned, the TASH bottleneck is primarily caused by communication barriers between the various OPD units and healthcare providers; uncertainty about health service demand stemming from inadequate planning and forecasting leading to overcrowding of patients in OPD; an availability of medications and supplies; and challenges in connecting the inputs to the outputs, i.e., the availability of a suitable mix of healthcare providers in various OPD units. In order for this tertiary level hospital to attain its desired outcomes, these issues compound one another and worsen the gaps in accessing health service which leads to TASH inefficiency then ultimately results to patience dissatisfaction.

8. Limitations of the study

The study encompasses patients and care takers that came for OPD services that limited to study other areas like emergency and inpatient services because of time and resource constraints. While analyzing the technical efficiency it used only one input and output that limited to explore detailed factors contributing the inefficiency in the OPDs. In addition, the study did not asses the cost aspect of efficiency which would have given more insight to the inefficiency.

9. Conclusions

The main findings of this research are patients in average onset of time patients activate their patient card around 4:00AM in the morning and the average onset of OPDs contact time for a patient is around 12:00PM noon. And patient and care takers experience delays with the services that are provided. While receiving the services the patients/care takers experienced received respect and courtesy from the doctors but mistreated by the hospital guards. In addition, patients/caretakers' experiences difficulties in getting around the TASH because of lack of direction indicators, wheelchairs, elevators and inadequate waiting areas and clean toilets. From the ten OPDs that were assessed with DEA only three were of the are technically efficient.

Based on this research, the patient flow in TASH faces challenges to run smoothly. Services areas like OPDs, radiology and pharmacy are bottlenecks where the underling factors for those bottlenecks are lack of fulltime doctors at the OPDs; patient overload, lack of drug supply, inconsistence of radiology department services and problem in appointing patients properly. In addition to that communication challenges between the health works themselves and the patients/care takers has exacerbated the bottleneck in services area. These bottlenecks contributed for the OPDs not to function efficiently, where the results from the DEA indicating technical efficiency of OPDs need for improvement of patient flow process in order to be technically efficient.

The study of patient flow and inefficiencies at TASH has identified several critical areas for improvement. Key inefficiencies were found in OPD units. By implementing targeted

interventions such as reorganized triage protocols, enhanced coordination between the OPD units and appropriate planning for improved service, the TASH can significantly reduce patient wait times and improve overall patient satisfaction.

The study highlights the importance of adopting a holistic approach to patient flow management, incorporating both technological solutions and process re-engineering.
Future efforts should focus on continuous monitoring and evaluation to sustain improvements and adapt to changing patient needs. Ultimately, these enhancements will lead to better patient outcomes, increased staff efficiency, and optimized resource utilization.

10. Recommendations

Further research is need that include all the services and different dimension that affect the efficiency that would bring more insight to area of inefficiency for improvement. TASH needs system design that enhances the patient flow and resolve the bottlenecks by participating every stake holder in the patient flow process. Not only that uniform functional in every services area is in need to improve the patient flow.

Reduce the overlapping responsibilities of resident doctors that working OPDs because resident doctors are expected to attend academic activities like morning session and seminars, in the meantime they are expected to work in OPDs creating bottlenecks and long waiting times to the patients. And also a need for fulltime doctors at the OPDs. Improved planning and forecasting of the medication demand and supply to minimize shortages. Capacity building to improve communication skills of health professionals and supporting staffs.

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ANNEX 1

Qualitative data collection tools
For patients/clients
Consent form
In order to participate in the thesis project titled "Assessment of patient flow, areas of inefficiency for improvement in Tikur Anbessa specialized and teaching hospital: A mixed explanatory approach" it is necessary to obtain your consent. Your participation in this study will involve providing information and insights related to your experience in Tikur Anbessa specialized and teaching hospital during your stay. The purpose of this research is to assess the patient flow, patient experience and identify area of inefficiency. By participating, you will contribute to the understanding of the challenges and opportunities faced by patients during the treatment process in Tikur Anbessa specialized and teaching hospital. There are no anticipated risks associated with participating in this study. Your participation is voluntary, and you have the right to withdraw at any time without any negative consequences. Your personal information will be kept confidential and used solely for the purpose of this research. By signing this consent form, you indicate your willingness to participate in this study.
Upon consenting to partake in this study, you will be requested to engage in the interview with an estimated duration of approximately 25-45 minutes. The survey will ask question related to participants sociodemographic status, hospital experiences, quality of care, waiting time and accessibility about Tikur Anbessa specialized and teaching hospital. If you have any question regarding the question or need explanation you are welcome to ask.
The data obtained from this research endeavor will be securely and anonymously stored. Access to the data will be limited to the researchers directly involved in this project. The outcomes of this project have the potential to be disseminated through academic journals, reports, or presentations, while ensuring that the privacy and confidentiality of each participant is upheld, thereby preventing their identification.
If you have any questions or concerns about the study, you can contact the principal investigator Yemisrach Kedru via phone number +251924423537 or email yemsrach192@gmail.com
I have understood the information provided above. By voluntarily completing the questionnaire, I agree to participate in this research study.
Thank you for your collaboration and valuable input in this study
Name Signature_____ date_____

Questions
Participants code;_____
Interview date ;_____
Sociodemographic questions
Can you tell me about yourself?
Sex _____
Age _____
Occupation_____
Educational level_____
How far is your home from Tikur Anbessa specialized and teaching hospital?
Hospital Experience
Describe your overall experience during your visit to Tikur Anbessa specialized and teaching hospital.
What were the factors that made you decide to come or choose to this hospital?

How do you describe the level of communication between you and the healthcare provider during your visit?
Can you share positive or negative experience that you had with the hospital staff while interacting with them?
Quality of care
How would you rate the overall quality of medical care that was provided to you by Tikur Anbessa specialized and teaching hospital?
Were there any positive or negative aspect of care that stood out regarding the quality of care.
Can tell me your experience regarding involving you in a decision-making process in your treatment or care plan
How satisfied are you with the facilities infrastructure and amenities availability of this hospital?
Waiting time and accessibility
How would you describe waiting time of this hospital, From the beginning of registration to the end of your visit?
Were there are any challenges in accessing care or services at this hospital? If there is what were they?

Improvement suggestion and additional comment

What would you suggest enhancing the overall experience at this hospital?
Is there anything else you would like to add about your experience during your visit that we did not discuss?

የስምምነት ቅፅ
"በጥቁር አንበሳ ሆስፒታል ውስጥ የታካሚ ፍሰት ግምገማ፣የመሻሻል ብቃት የሌላቸው አካባቢዎች፡የተደባለቀ የማብራሪያ ዘዴ" በሚል ርዕስ በተዘጋጀው የመመረቂያ ፕሮጀክት ላይ ለመሳተፍ ፈቃድዎን ማግኘት ያስፈልጋል። በዚህ ጥናት ውስጥ መሳተፍዎ በቆይታዎ ወቅት በጥቁር አንበሳ ሆስፒታል ካለዎት ልምድ ጋር የተያያዙ መረጃዎችን እና ግንዛቤዎችን መስጠትን ያካትታል። የዚህ ምርምር ዓላማ የታካሚውን ፍሰት, የታካሚውን ልምድ እና የውጤታማነት ቦታን መለየት ነው. በመሳተፍ በጥቁር አንበሳ ሆስፒታል ህሙማን በህክምና ወቅት የሚያጋጥሟቸውን ተግዳሮቶች እና እድሎች እንዲገነዘቡ የበኩሉን አስተዋፅዖ ያደርጋሉ። በዚህ ጥናት ውስጥ ከመሳተፍ ጋር የተያያዙ ምንም የሚጠበቁ አደጋዎች የሉም. የእርስዎ ተሳትፎ በፈቃደኝነት ነው, እና በማንኛውም ጊዜ ያለ ምንም አሉታዊ ውጤት የመውጣት መብት አለዎት. የግል መረጃዎ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ዓላማ ብቻ ጥቅም ላይ ይውላል። ይህን የስምምነት ቅጽ በመፈረም በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ መሆንዎን ያሳያሉ።
በዚህ ጥናት ለመካፈል ከተስማሙ በኋላ በግምት ከ25-45 ደቂቃዎች የሚፈጅ ጊዜ በቃለ መጠይቁ ውስጥ እንዲሳተፉ ይጠየቃሉ። ጥናቱ ስለ ጥቁር አንበሳ ሆስፒታል ከተሳታፊዎች የሶሲዮዲሞግራፊ ሁኔታ፣ የሆስፒታል ተሞክሮዎች፣ የእንክብካቤ ጥራት፣ የጥበቃ ጊዜ እና ተደራሽነት ጋር የተያያዙ ጥያቄዎችን ይጠይቃል። ጥያቄውን በተመለከተ ማንኛውም ጥያቄ ካሎት ወይም ማብራሪያ ከፈለጉ መጠየቅ ይችላሉ።
ከዚህ የጥናት ሙከራ የተገኘው መረጃ ደህንነቱ በተጠበቀ እና በማይታወቅ መልኩ ይከማቻል። የመረጃው ተደራሽነት በዚህ ፕሮጀክት ውስጥ በቀጥታ ለሚሳተፉ ተመራማሪዎች ብቻ የተገደበ ይሆናል። የእያንዳንዱ ተሳታፊ ግላዊነት እና ምስጢራዊነት መከበሩን በማረጋገጥ የዚህ ፕሮጀክት ውጤቶች በአካዳሚክ መጽሔቶች፣ ሪፖርቶች ወይም አቀራረቦች የመሰራጨት አቅም አላቸው።
ስለ ጥናቱ ማንኛውም አይነት ጥያቄ ወይም ስጋት ካሎት ዋናውን መርማሪ በስልክ ቁጥር +251924423537 ወይም በኢሜል yemsrach192@gmail.com ማግኘት ትችላላችሁ
ከላይ የቀረበውን መረጃ ተረድቻለሁ። መጠይቁን በፈቃደኝነት በመሙላት፣ በዚህ የምርምር ጥናት ለመሳተፍ ተስማምቻለሁ።
በዚህ ጥናት ውስጥ ስላደረጉት ትብብር እና ጠቃሚ ግብአት እናመሰግናለን
ስም
ፊርማ _____ ቀን
ጥያቄዎች
የተሳታፊዎች ኮድ;_____
የቃለ መጠይቅ ቀን;_____
የሶሺዮዲሞግራፊ ጥያቄዎች
1. ስለራስዎ ሊነግሩኝ ይችላሉ?
ዕድሜ _____
ሥራ _____
የትምህርት ደረጃ_____
2. ቤትዎ ከጥቁር አንበሳ ሆስፒታል ምን ያህል ይርቃል?
የሆስፒታል ልምድ
1. ጥቁር አንበሳ ሆስፒታልን በጎበኙበት ወቅት ያጋጠመዎትን አጠቃላይ ሁኔታ ይግለጹ።
2. ወደዚህ ሆስፒታል ለመምጣት ወይም ለመምረጥ የወሰኑት ምክንያቶች ምንድናቸው?

3. በጉብኝትዎ ወቅት በእርስዎ እና በጤና እንክብካቤ አቅራቢው መካከል ያለውን የግንኙነት ደረጃ እንዴት ይገልጹታል?
4. ከሆስፒታሉ ሰራተኞች ጋር ሲገናኙ ያጋጠመዎትን አወንታዊ ወይም አሉታዊ ተሞክሮ ማካፈል ይችላሉ?
የእንክብካቤ ጥራት
1. በጥቁር አንበሳ ሆስፒታል ይሰጥዎት የነበረውን አጠቃላይ የህክምና አገልግሎት እንዴት ይገመግማሉ?
2. የእንክብካቤ ጥራትን በተመለከተ ጎልቶ የታየ ማንኛውም አወንታዊ ወይም አሉታዊ የእንክብካቤ ገጽታዎች ነበሩ?
3. በህክምናዎ ወይም በእንክብካቤ እቅድዎ ውስጥ በውሳኔ አሰጣጥ ሂደት ውስጥ እርስዎን ስለማሳተፍ ያለዎትን ልምድ ሊነግሩኝ ይችላሉ።
4. በዚህ ሆስፒታል መሰረተ ልማቶች እና አገልግሎቶች አቅርቦት ምን ያህል ረክተዋል?
የመቆያ ጊዜ እና ተደራሽነት
1. የዚህን ሆስፒታል የጥበቃ ጊዜ፣ከምዝገባ መጀመሪያ እስከ ጉብኝትዎ መጨረሻ ድረስ እንዴት ይገልፁታል?
2. በዚህ ሆስፒታል ውስጥ እንክብካቤ ወይም አገልግሎት ለማግኘት ተግዳሮቶች ነበሩ? ካለ ምን ነበሩ?
የማሻሻያ ጥቆማ እና ተጨማሪ አስተያየት
1. በዚህ ሆስፒታል ውስጥ ያለውን አጠቃላይ ልምድ ለማሳደግ ምን ይጠቁማሉ?
2. በጉብኝትዎ ወቅት ስላሳዩት ልምድ ያልተወያየንበት ሌላ ነገር ለመጨመር የሚፈልጉት ነገር አለ?

Qualitative tool for the health worker interview

Consent form

In order to participate in the thesis project titled "Assessment of patient flow, areas of inefficiency for improvement in Tikur Anbessa teaching hospital: A mixed explanatory study" it is necessary to obtain your consent. Your participation in this study will involve providing information and insights related to your experience in Tikur Anbessa specialized and teaching hospital during your stay. The purpose of this research is to assess the patient flow, patient experience and identify area of inefficiency. By participating, you will contribute to the understanding of the challenges and opportunities faced by patients during the treatment process in Tikur Anbessa specialized and teaching hospital. There are no anticipated risks associated with participating in this study. Your participation is voluntary, and you have the right to withdraw at any time without any negative consequences. Your personal information will be kept confidential and used solely for the purpose of this research. By signing this consent form, you indicate your willingness to participate in this study.

Upon consenting to partake in this study, you will be requested to engage in the interview with an estimated duration of approximately 25-45 minutes. The survey will ask question related to participants demographic and position of your work, experience with the patient flow, patient interaction, observation of patient experience and bottleneck areas about Tikur Anbessa specialized and teaching hospital. If you have any question regarding the question or need explanation you are welcome to ask.

The data obtained from this research endeavor will be securely and anonymously stored. Access to the data will be limited to the researchers directly involved in this project. The outcomes of this project have the potential to be disseminated through academic journals, reports, or presentations, while ensuring that the privacy and confidentiality of each participant is upheld, thereby preventing their identification.

If you have any questions or concerns about the study, you can contact the principal investigator Yemisrach Kedru via phone number +251924423537 or email yemsrach192@gmail.com

I have understood the information provided above. By voluntarily completing the questionnaire, I agree to participate in this research study.

Thank you for your collaboration and valuable input in this study

Name

Signature_____ date_____

Questions

Introduction:

Thank you for participating in this interview. Before we begin, Do you have any questions or concerns before we proceed?

1. Experience with Patient Flow:

a. Can you please start by describing your role within Tikur Anbessa Hospital and your role in the patient flow from?

b. What are the key responsibilities you have in facilitating the movement of patients through the hospital system?

2. Patient Interaction:

a. In your routine activity at your work, how do you typically interact with patients during their hospital stay?
b. what are the specific challenges or positive aspects related to patient interaction that you experience in your routine activity at work?
3. Observations of Patient Experiences:
a. From your vantage point, what are some common experiences that patients go through while navigating the hospital system?
b. Can you provide examples of any particularly challenging patient experiences that you have observed?
4. Identifying Bottleneck Area
a. In the course of your work, have you encountered any areas where the patient flow seems to be interfered or delayed?
b. How do these bottleneck areas affect the overall functioning of the hospital and the experiences of both patients and health workers?
5. Suggestions for Improvement:
a. Based on your experience and insights, what recommendations do you have for improving the patient flow process and enhancing patient experiences within Tikur Anbessa Hospital?
b. Are there specific initiatives or changes you believe could address the identified challenges?
Closing:
Thank you for sharing your valuable perspectives today. Your input will contribute significantly to our understanding of patient flow and experiences within Tikur Anbessa Hospital. If there is anything else you would like to add or any additional thoughts you have on the topic, please feel free to share. Again, your participation is highly appreciated. If there are no further questions, we have finished our interview.

የስምምነት ቅፅ
"በጥቁር አንበሳ ማስተማሪያ ሆስፒታል ውስጥ Assessment of patient flow, areas of inefficiency for improvement in Tikur Anbessa teaching hospital: A mixed explanatory study " በሚል ርዕስ በተዘጋጀው የመመረቂያ ፕሮጀክት ላይ ለመሳተፍ ፈቃድዎን ማግኘት አለብዎት። በዚህ ጥናት ውስጥ ያለዎት ተሳትፎ በጥቁር አንበሳ ስፔሻላይዝድ እና በማስተማር ሆስፒታል ውስጥ በቆይታዎ ወቅት ካለዎት ልምድ ጋር የተያያዙ መረጃዎችን መስጠትን ያካትታል። የዚህ ምርምር ዓላማ የታካሚውን ፍሰት, የታካሚውን ልምድ እና የውጤታማነት ቦታን መለየት ነው. በመሳተፍ በጥቁር አንበሳ ስፔሻላይዝድ እና ማስተማሪያ ሆስፒታል በህክምና ሂደት ወቅት ሀሙማን የሚያጋጥሟቸውን ተግዳሮቶች በመረዳት የበኩላቸውን አስተዋፅዖ ያደርጋሉ። በዚህ ጥናት ውስጥ ከመሳተፍ ጋር የተያያዙ ምንም የሚጠበቁ አደጋዎች የሉም. የእርስዎ ተሳትፎ በፈቃደኝነት ነው, እና በማንኛውም ጊዜ ያለ ምንም አሉታዊ ውጤት የመውጣት መብት አለዎት. የግል መረጃዎ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ዓላማ ብቻ ጥቅም ላይ ይውላል። ይህን የስምምነት ቅጽ በመፈረም በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ መሆንዎን ያሳያሉ።
በዚህ ጥናት ለመካፈል ከተስማሙ በኋላ በግምት ከ25-45 ደቂቃዎች የሚፈጅ ጊዜ በቃለ መጠይቁ ውስጥ እንዲሳተፉ ይጠየቃሉ። ጥያቄው ስለ ጥቁር አንበሳ ስፔሻላይዝድ እና የማስተማር ሆስፒታል ከተሳታፊዎች የስነ-ሕዝብ እና የስራ ቦታ፣ ከታካሚ ፍሰት ጋር ያለው ልምድ፣ የታካሚ መስተጋብር፣ የታካሚ ልምድ እና ማነቆ ጉዳዮች ጋር የተያያዘ ነው። ጥያቄውን በተመለከተ ማንኛውም ጥያቄ ካሎት ወይም ማብራሪያ ከፈለጉ መጠየቅ ይችላሉ።
ከዚህ የጥናት ሙከራ የተገኘው መረጃ ደህንነቱ በተጠበቀ እና በማይታወቅ መልኩ ይከማቻል። የመረጃው ተደራሽነት በዚህ ፕሮጀክት ውስጥ በቀጥታ ለሚሳተፉ ተመራማሪዎች ብቻ የተወሰነ ይሆናል። የእያንዳንዱ ተሳታፊ ግላዊነት እና ምስጢራዊነት መከበሩን በማረጋገጥ የዚህ ፕሮጀክት ውጤቶች በአካዳሚክ መጽሔቶች፣ ሪፖርቶች ወይም አቀራረቦች የመሰራጨት አቅም አላቸው።
ስለ ጥናቱ ማንኛውም አይነት ጥያቄ ወይም ስጋት ካሎት በስልክ ቁጥር +251924423537 ወይም በኢሜል yemsrach192@gmail.com ማግኘት ትችላላችሁ
ከላይ የቀረበውን መረጃ ተረድቻለሁ። በፈቃደኝነት በቃለ መጠይቁ ውስጥ በመሳተፍ, በዚህ የምርምር ጥናት ውስጥ ለመሳተፍ እስማማለሁ.
በዚህ ጥናት ውስጥ ስላደረጉት ትብብር እና ጠቃሚ ግብአት እናመሰግናለን
ስም ፊርማ _____ ቀን
ጥያቄዎች
መግቢያ፡-
በዚህ ቃለ መጠይቅ ስለተሳተፉ እናመሰግናለን። ከመጀመራችን በፊት. ከመቀጠላችን በፊት ጥያቄዎች ወይም ስጋቶች አሉዎት?
1. የታካሚ ፍሰት ልምድ፡-
ሀ. እባክዎ በጥቁር አንበሳ ሆስፒታል ውስጥ ያለዎትን ሚና እና በበሽተኛው ፍሰት ውስጥ ያለዎትን ሚና በመግለጽ መጀመር ይችላሉ?
ለ. በሆስፒታል ስርዓት ውስጥ በበሽተኞች እንቅስቃሴ ውስጥ ዋና ዋና ኃላፊነቶች ምንድ ናቸው?
2. የታካሚ መስተጋብር፡-
ሀ. በስራዎ ውስጥ በመደበኛ እንቅስቃሴዎ ውስጥ፣ በሆስፒታል ቆይታቸው ወቅት ከታካሚዎች ጋር እንዴት ይገናኛሉ?
ለ. ከታካሚ መስተጋብር ጋር የተገናኙት ልዩ ተግዳሮቶች ወይም አወንታዊ ገጽታዎች ምንድናቸው?
3. የታካሚ ተሞክሮዎች ምልከታ፡-

ሀ. ከእርስዎ እይታ አንጻር፣ ታካሚዎች የሆስፒታል ስርዓቱን ሲጎበኙ የሚያጋጥሟቸው አንዳንድ የተለመዱ ልምዶች ምንድናቸው?
ለ. በተለይ ያየሃቸው ታካሚ ገጠመኞች ምሳሌዎችን ማቅረብ ትችላለህ?
4. መሰናክሎች አካባቢን መለየት
ሀ. በስራዎ ሂደት ውስጥ የታካሚውን ፍሰት የሚያደናቅፉ ወይም የሚዘገዩ ነገሮች ምንድን ናቸው?
ለ. እነዚህ ማነቆዎች የሆስፒታሉን አጠቃላይ አሠራር እና የታካሚዎችን እና የጤና ባለሙያዎችን ልምድ እንዴት ይጎዳሉ?
5. የማሻሻያ ምክሮች፡-
ሀ. በእርስዎ ልምድ እና ግንዛቤ ላይ በመመስረት የታካሚውን ፍሰት ሂደት ለማሻሻል እና በጥቁር አንበሳ ሆስፒታል ውስጥ የታካሚዎችን ተሞክሮ ለማሳደግ ምን ምክሮች አሉዎት?
ለ. የተለዩትን ተግዳሮቶች ሊፈቱ ይችላሉ ብለው የሚያምኑባቸው ልዩ ለውጦች አሉ?
ዛሬ እይታዎችዎን ስላካፈሉ እናመሰግናለን። የእርስዎ አስተያየት በጥቁር አንበሳ ሆስፒታል ውስጥ የታካሚ ፍሰት እና ልምዶችን ለመረዳት ከፍተኛ አስተዋፅኦ ይኖረዋል። ሌላ ማከል የሚፈልጉት ነገር ካለ ወይም በርዕሱ ላይ ያሎትን ተጨማሪ ሃሳብ ካለ እባክዎን ለማካፈል ነፃነት ይሰማዎ። በድጋሚ፣ የእርስዎ ተሳትፎ በጣም የተከበረ ነው። ተጨማሪ ጥያቄዎች ከሌሉ ቃለ መጠይቁን ጨርሰናል።

Quantitative data collection tool

Template for Electronic Medical Record (EMR) Time Motion Study Data Collection
Date of Data Collection:
Observer(s):
Patient ID/Identifier:
Date of visit:

Time stamp	Task Activity	Duration (hh;mm;ss)	Comments/notes

Instructions for Data Collection:

Task/Activity: Record the specific task or activity performed within the EMR system.
Time Stamp: Capture the timestamp or time when each task/activity started.
Duration: Calculate the time taken for each task/activity (start time to end time).
Comments/Notes: Include any relevant details, observations, or issues encountered during the EMR interaction.
Ensure accurate recording of time stamps and duration.
Include all relevant tasks related to patient care, documentation, order entry, etc., performed within the EMR system.

Data Envelopment Analysis (DEA) Data Collection Template
Date of Data Collection:

List of DMUs	Input variables	Output variables

Annex 3

curriculum vitae

YEMSRACH KEDRU KERETA
CONTACT
yemsrach192@gmail.com
+251924423537
ADAMA, ETHIOPIA

Currently enrolled in graduate program MPH in Health economics at AAU. I am seeking a role which allows me to continue learning and perfecting my skills as I provide high- quality work with a good communication skill. Adaptable, observant and dedicated to accomplish any objective.

Education Qualification
Currently enrolled in graduate program in M.PH in Health economics department at AAU
B.Sc. Degree in public health, CGPA 3.68, from college of health science and medicine Wolaita Sodo university in 2022
Monitoring and Evaluation fundamental, from Global health e learning center in 2022
Pneumonia from Global health e learning center, 2022
Skills
Works well under pressure.
Exceptional interpersonal skills.
Trained in monitoring and evaluation fundamentals,
pneumonia community managements
Good computer skill
Can manipulate some advanced software like Epi data manager, STATA and spss
Good planning and time management
Have been enrolled PBF programs and sessions

Reference
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ASSURANCE OF PRINCIPAL INVESTIGATOR

I, the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisor and seek the necessary advice and approval from my primary advisors in the module of the research. I will communicate timely to my advisors all stakeholders involved in the study including any source of funding for this research.

Name of the student: Yemisrach Kedru Kereta

Date: 12/7/2023

Approval of the primary Advisor

Name of the primary advisor: Professor Damen Hail Mariam

Date: 12/7/2023

Signature: _____  _____