JIMMA UNIVERSITY INSTITUTE OF HEALTH

Determining Length of Stay and Its Associated Factors in the Emergency Department of Karat Primary Hospital, Konso, SNNPRS, Ethiopia.

A thesis submitted to Jimma University, Institute of Health, Faculty of Public Health, Department of Health Economics, Management and Policy, for Partial Fulfillment of the requirements for the degree of Master of Health Care and Hospital Administration.

BY: ARARSO GARO, (B-PHARM)

Advisors:

1. Mr. Negalign Berhanu
2. Mr. Melaku Haile

May/2017

Jimma, ETHIOPIA

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Abstract

Background: The emergency department is an important part of a hospital as this department is one of the points of hospital entrance for patients, a place where life threatening and serious problems are dealt with. Prolonged ED length of stay is not only a cause but also a result of emergency department crowding, yielding a vicious cycle. The emergency department length of stay has significant correlation with factors that contribute to overcrowding in the emergency department. The objective of this study was to determine length of stay of patients and its contributing factors in the emergency department of karat primary hospital.

Method: Facility based cross-sectional study was employed to collect data from 297 patients. The study used systematic random sampling by observing the natural journey of every third patient from time of arrival to exit from emergency department in which first comer was the first to be observed at the beginning of data collection. Data was analyzed using SPSS version 20.0. Bi-variate analysis was done and variables with p-value less than 0.25 were included in multiple logistic regressions analysis.

Result: The mean length of stay of Karat primary hospital emergency department was found to be 311.4 (SD=256.2) minutes which is 5.2 (SD=4.27) hours. Boarding (AOR=4.4 CI (2.4, 8.0)), the treatment service within the emergency department ((AOR= 5, CI(2.7, 9.4)), radiology service ((AOR= 5.91, CI (3.1, 11.2)) and laboratory test ((AOR= 3.2, CI (1.76-5.98)) significantly affected the emergency department length of stay of Karat primary hospital.

Conclusion and Recommendation

The emergency department length of stay in Karat primary hospital was found to be long. The main factors that contributed to the prolonged stay in the hospital were then analyzed and treatment service within the emergency department, radiology tests, boarding and laboratory tests were finally found to be the most significant factors that contributed to this prolonged length of stay.

Karat primary hospital management has to improve emergency department service by investing on ways to identify reasons and ways to reduce boarding time, the laboratory waiting time, has to work hard on ways to fasten the emergency department treatment services and radiologic investigations so as to improve the standard of care in the department.

Finally since this research identified factors that contributed to the overall length of stay but did not deeply searched for the reasons of delay of the main factors, other researchers are recommended to do so.

Key words:-waiting time, radiology tests, and emergency department length of stay, boarding, laboratory test, treatment service and referrals waiting for ambulance.

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List of Abbreviations

AFI: Acute febrile illness

AHA: American Hospital Association

ALOS: Average length of Stay

CCO: Chief Clinical Officer

CEO: Chief Executive Officer

COPD: Chronic obstructive pulmonary diseases

DC: Data Collector

ED: Emergency Department

ED LOS: Emergency Department Length of stay

EHRIG: Ethiopian Hospitals Reform Implementation Guideline

EHSTG: Ethiopian Hospitals Services transformation guideline

KPH: Karat Primary Hospital

KPI: Key Performance Indicator

MHA: Master of Health Care and Hospital Administration

PFA: Patient Flow Analysis

PFCA: Patient Flow Challenges Assessment

PTB: pulmonary Tuberculosis

PI: Principal Investigator

SAPZ: Segen Area peoples Zone

SD: Standard deviation

SMT: senior management team

Acknowledgments

Above all it is a great pleasure and an honor to me to elucidate my deep hearted indebtedness and my great gratitude to my advisors, Mr. Negalign Berhanu (PHD candidate) and Mr. Melaku Haile (BSC, MPH) who have devoted their invaluable time while providing honest and valuable guidance and constructive advice.

My appreciation goes to Jimma University, Institute of Public Health and Medical sciences; Department of Health Economics, Management and Policy.

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CHAPTER ONE

1. Introduction

1.1 Back ground

The emergency department length of stay (EDLOS) is measured from first arrival of patient to ED until the patient exits from ED. The ED is an important part of a hospital as this department is the point of hospital entrance for patients, a place where life threatening and serious problems are dealt with. Patient flow analysis consists of two aspects, flow mapping which is mapping what actually happens in the current process in the department and cycle time measurement that actually computes the waiting times at each point of patient journey which enable investigators to gain a complete picture of patient journey and identify the factors that contribute to delay in patient flow in the emergency departments. As the result suitable strategic plans can be designed to tackle the problems of unnecessary delays in the emergency departments (1).The latter aspect of patient flow analysis is specifically applied in this study.

The mean ED length of stay is considered a measure of crowding. ED mean LOS (length of stay) per patient measured from the patient's arrival to departure has been promoted as a surrogate indicator of crowding in the absence of a standard or universal definition. It is also frequently considered a key process indicator for performance improvement and clinical and operational efficiency (2).

Properly designed and implemented hospital based emergency medical care services will reduce patient emergency triage and treatment times, increase provider efficiency and staff and client satisfaction as well as improve overall quality of care. Increasing emergency department (ED) volume and concomitantly ED crowding represents a major problem for health care systems worldwide. The situation when demand for emergency services outstrips available resources can be caused by multiple factors. These can generally be considered to be a combination of input, throughput and output components of ED crowding (3-4).

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The ED LOS has significant correlation with factors that contribute to overcrowding in the emergency department. (5).

In ED the time is considered a significant tool to measure the quality as this waiting time can affect the outcomes of patient situation and satisfaction, as well the problem of long waiting time can also indicate a poorly resourced, poorly managed and/or poorly co-ordinate department (5).

A number of studies have discussed the adverse impacts of ED crowding, which include prolonged waiting times, increased complications, and increased mortality. Previous literature has also demonstrated that prolonged ED length of stay (LOS) is not only a cause but also a result of ED crowding, yielding a vicious cycle Therefore, it is worthwhile to elucidate the factors associated with ED LOS in order to alleviate ED crowding and improve quality of care. Many factors are responsible for ED LOS. Recent studies have shown that increased testing, consultation, radiology studies, and provision of less substantial treatment cause a significant increase in ED LOS (26).

The objective of this study was to determine the mean LOS in ED of KPH (Karat Primary Hospital) and identifying major factors that contributed to the LOS.

1.2. Statement of the problem

Health care facilities worldwide face the challenge of providing high-quality care while struggling with large patient volumes and process inefficiencies in EDs (2).

Increasing ED volume and concomitantly ED crowding represents a major problem for health care systems worldwide. The situation when demand for emergency services outstrips available resources can be caused by multiple factors (3).

A number of studies highlighted factors associated with access block and overcrowding in emergency departments. They can be categorized in to three phases; namely input (number of non emergency patients in ED and waiting in triage area), throughput (laboratory tests, radiological examinations, and the time taken on the decision to admit) and outcome (number of boarders) (4-6).

The ED LOS has significant correlation with factors that contribute to overcrowding in the emergency department. Delay in any step of patient flow in emergency department will play an important role in the development of overcrowding, since it contributes to prolonged stay of patients in the emergency department (7-13).

In South Africa, Public sector Emergency Departments are under enormous pressure with large patient numbers, understaffing, poor resources and patients have to wait long time in most hospitals decreasing waiting time in hospital Emergency Departments in South Africa is one of the preoccupations of the National Department of Health (14).

Likewise there was apparently visible overcrowding and congestion of people around the ED in Karat Primary Hospital, but the mean EDLOS as well as its main possible related factors were not actually known based on scientific evidence.

Furthermore, to the best of the researcher's knowledge, there is no any published article regarding patient flow analysis in Ethiopia. Studies done elsewhere might not be done in a similar context, either. Therefore determining ED LOS and its associated factors in the Karat primary hospital emergency department is apposite.

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1.3. Significance of the study

The findings of this study could serve as baseline for further monitoring of the changes in quality of service and also provides evidence for hospital management and staff that are engaging in improving quality of ED services by indicating targeted areas of intervention.

Understanding patient flow in the emergency department in terms of length of stay could help program managers and decision makers to devise effective health care strategy and operational plan for the betterment of service.

Therefore the benefits of this research are that it will lead to improvements in patient care at ED by reducing waiting times since the areas of contributing factors for potential Delayance in the ED were identified and clear recommendations were given to both the hospital SMT (senior management team) and the emergency case team members. The hospital can use the results of this study to improve treatment services, laboratory test services and the way to reduce boarding in the ED. Even the ED service leaders can use the result of the study so as to improve services via reducing length of stay in the department. Moreover, this study also initiates further research in the area.

CHAPTER B TWO

2. Literature review

Emergency patient flow/pathway

Properly designed and implemented hospital based emergency medical care services will reduce patient emergency triage and treatment times, increase provider efficiency and staff and client satisfaction as well as improve overall quality of care. Increasing ED volume and concomitantly ED crowding represents a major problem for health care systems worldwide. The situation when demand for emergency services outstrips available resources can be caused by multiple factors. These can generally be considered to be a combination of input, throughput and output components of ED crowding. Patients entering the hospital through the separate ED entrance, via ambulance, from the reception desk or those referred to the ED from Central Triage should undergo Emergency Triage. If further investigations and/or treatments are required following triage, these should be provided by the Emergency Case Team. Patients that are not classified as emergency cases should be referred to Central Triage (3).
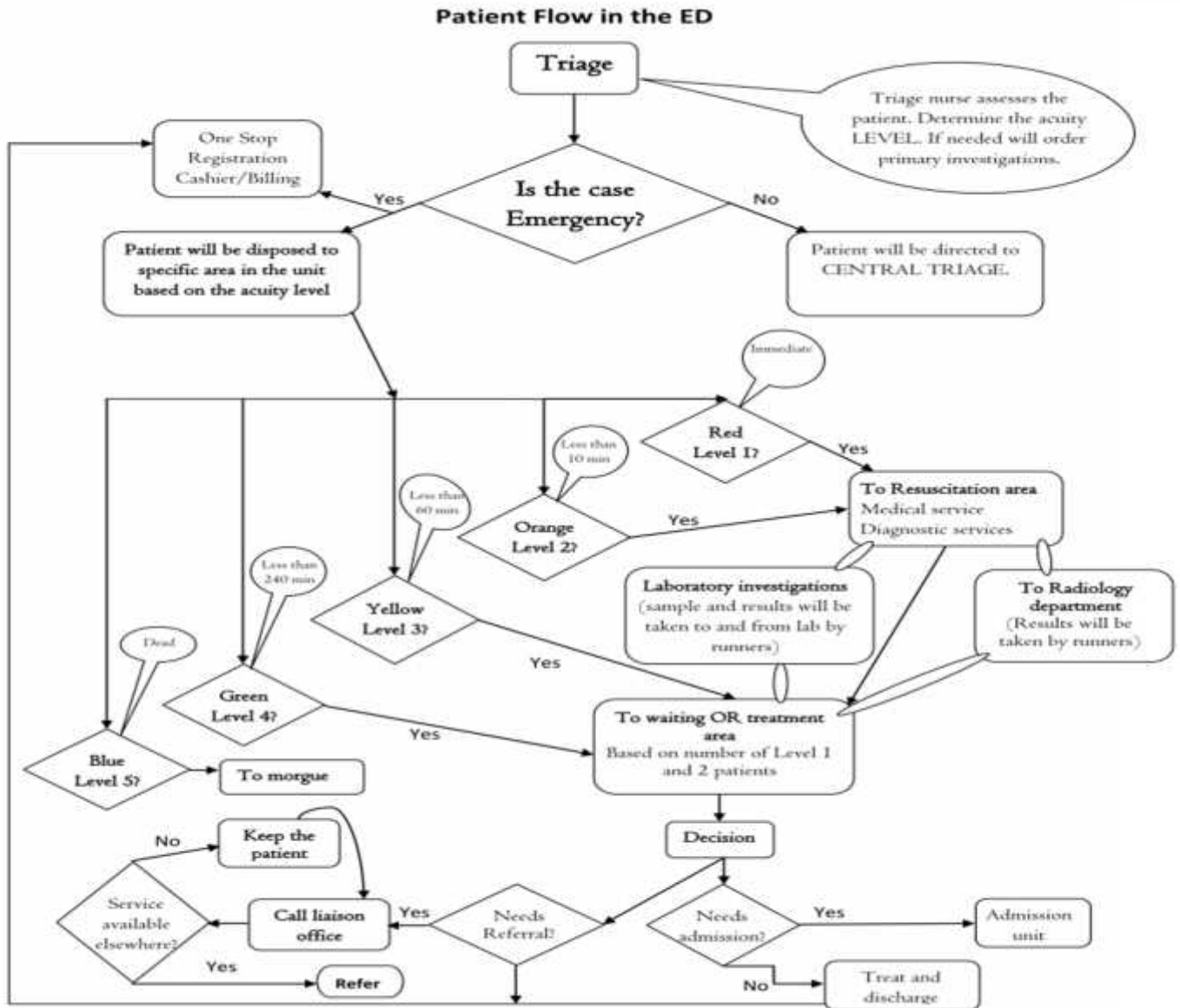
Fig1. Patient flow path way in Ethiopian hospitals emergency departments, FDRE MOH,AA, Ethiopia,2008 (3)

Emergency Department Length of stay (EDLOS)

Increasing ED volume and concomitantly ED crowding represents a major problem for health care systems worldwide. The situation when demand for emergency services outstrips available resources can be caused by multiple factors. The ED LOS is measured from the first arrival to ED until the patient is admitted or discharged from the ED (4).

The ED LOS is measured from the first contact in triage until the patient is admitted or discharged from the ED. Several studies have identified the role in each step of the patient journey through the ED and correlated this with an increased in mean of ED LOS. Long waits at triage is one of the factors that contribute to slow patient flow in the emergency department. Prolonged time to admit decision results in increased length of stay in ED. An increase in an ED waiting time therefore results in increased patient length of stay in the ED (5).

In a study done in Kintampo Municipal Hospital in Ghana, the overall total median visit time from arrival to disposition was 5.2 hours (interquartile range [IQR]=4.1–6.2 hours; mean=5.1 hours, SD=1.6). Additionally, median time between arrival and first-provider contact was 4.6 hr (IQR=3.4–5.6 hours; mean=4.4 hours, SD=1.6). Longest wait times were between arrival and registration (median=2.3 hours, IQR=1.4–3.2 hours; mean=2.2 hours, SD=1.3) and between history taking and first-provider contact (median=1.4 hours, IQR=0.7–2.1; mean=1.5 hours, SD=1.1). Other long delays were noted between registration and triage, and between laboratory testing and processing for treatment at the ED (6).

Another research conducted in two different hospitals namely: the VU Medical Center (VUmc), an academic level 1 trauma centre run and the St. Antonius Hospital, a large community hospital in Nieuwegein, Netherlands, in 2015, it was found that 89% of the patients in VUmc had a completion time less than four hours. The average completion time (n=2262) was 2:10 hours, (median 1:51 hours, range: 0:05-12:08). In the St. Antonius hospital, 77% of patients had a completion time shorter than four hours (n=1656). The average completion time in hours was (n=1655) was 2:49 (median 2:34, range: 0:08 – 11:04) (7).

In Singapore, the patient length of stay in the ED was variable. The majority of EDs (77%) reported an average length of stay of between 1 and 6 hour. No ED reported an average length of stay of over 6 hour (7). For the 7604 patient visits analyzed in Saudi Arabia, Emergency Department of Al-Noor Specialist Hospital, the mean ED LOS was 3.02 hour (SD = 5.03 hour). About half of the patients spent less than 59 minutes (44%), 32.6% spent 1 to 3:59 hour, 15.2% spent 4 to 7:59 hour, and 8.2% of the patients spent more than 8 hours (8).

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According to study conducted in ED of Saint Rita's Hospital of South Africa in 2010, the total EDLOS was 397 minutes which was about 6.6hours(14).

In general the internationally recommended benchmark ED LOS range in minutes is 120-240.Likewise the recommended time for Waite to triage, time for the triage processing, Laboratory turnaround time, Radiology turnaround time and boarding time are 0, 10, 30-40, 20-30,and 24 all in minutes respectively(9).

Factors contributing to disruption of patient flow in emergency department

The ED LOS has significant correlation with factors that contribute to overcrowding in the ED. Delay in any step of patient flow in ED will play an important role in the development of overcrowding, since it contributes to prolonged stay of patients in the ED (5).

A number of studies highlighted factors associated with access block and overcrowding in EDs. They also identified the role in each step of the patient journey through the ED and correlated this with an increased in mean of ED LOS. Long waits at triage is one of the factors that contribute to slow patient flow in the ED. Prolonged time to admission decision results in increased LOS in ED. An increase in an ED waiting time therefore results in increased patient LOS in the ED (6).

<div align="center">Socio-demographic factors</div>

According to the study conducted in Teledo university Medical center ED in USA, entitled "Emergency Department Length of Stay: Accuracy of Patient Estimates" in 2012, there was no statistically significant difference detected between male (−7 minutes (IQR −26, 14)) and female (−8 minutes (IQR −31, 12)) estimations of their LOS compared to their actual total LOS. For age also, there was no statistically significant difference detected between patients under age 60 (−8 minutes (IQR −29, 12)) and those older than 60 (−5 minutes (IQR −16, 8). In this study, there was no statistically significant difference between gender, age, education and other socio-demographic characteristics (10).

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Laboratory tests

The other factor that determines ED progression is the throughput phase. Two studies that recently investigated patient flow have shown that laboratory blood tests significantly impede patient flow during the throughput phase (13).

Turnaround time (TAT) is one of the most noticeable signs of laboratory service and is often used as a key performance indicator of laboratory performance and a 90% completion time of <60 minutes for common laboratory tests is suggested as an initial goal for acceptable TAT (14). According Multihospital Longitudinal Study conducted in New south Wales and Australia entitled "The Effect of Laboratory Testing on Emergency Department Length of Stay, 2015", an average ED waiting time was 5.57 hours. Regression analysis showed that each minute of increased laboratory turnaround time increased ED LOS by 7 minutes. They found that as the number of laboratory test order episodes increased, so did the duration of patient ED LOS ($p < 0.0001$). For every five additional tests ordered per test order episode, the median ED LOS increased by 10 minutes (2.9%, $p < 0.0001$); each 30-minute increase in TAT was, on average, associated with a 5.1% (17 minutes; $p < 0.0001$) increase in ED LOS, after adjustment for other factors (14).

A research conducted in ED of a teaching hospital in Iran in 2016 showed that the mean total laboratory turnaround time of all tests ranged from 1.3 to 3.1 hour (15).

Radiology service waiting time

The measurement of turnaround times is the most commonly adopted performance metric to gauge the success of radiology service today. Prolonged radiological examinations waiting times also considered as factors that significantly impede patient flow during the throughput phase (16).

Research has cited laboratory and radiology delays as one of the causes of increased waiting time in EDs. Delays from these two services have been included in the list of "Bottleneck" culprits in EDs (17).

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Boarding

The other factor that previous studies reported as a significant determinant of ED LOS is boarding. Prolonged time to admission decision results in increased LOS in ED. According to Study conducted on the topic "Prolonged length of stay in the Emergency department in high-acuty patients at a Chinese tertiary hospital,, it was found that patients with a boarding time of more than two hours are associated with prolonged ED LOS (18). In a study conducted by Khare in 2009, it was demonstrated that decreasing boarding time without adding more beds in the ED can reduce LOS from 240 to 218 minutes (19). Another study conducted by other scholars, namely Bair and Powell found that delay associated with boarding is one of the most significant factors associated with prolonged EDLOS (20).

Consultation service

A study conducted at two tertiary Canadian EDs on the impact of consultation on length of stay in tertiary care emergency departments, in 2013; found that consultation time contributes significantly to ED LOS. The study was entitled "The impact of consultation on length of stay in tertiary care emergency departments, and concluded that consultation time contributes significantly to ED LOS. According to this study, median time from for consultation accounted for approximately 28% of the total median LOS in admitted patients compared to 46% for discharged patients. Consultation time accounted for 33% and 54% of the LOS for admitted and discharged patients, respectively (21).

This paper measures the association between LOS and factors that potentially contribute to LOS measured over consecutive shifts in the ED of KPH.

CONCEPTUAL FRAMEWORK OF THE STUDY
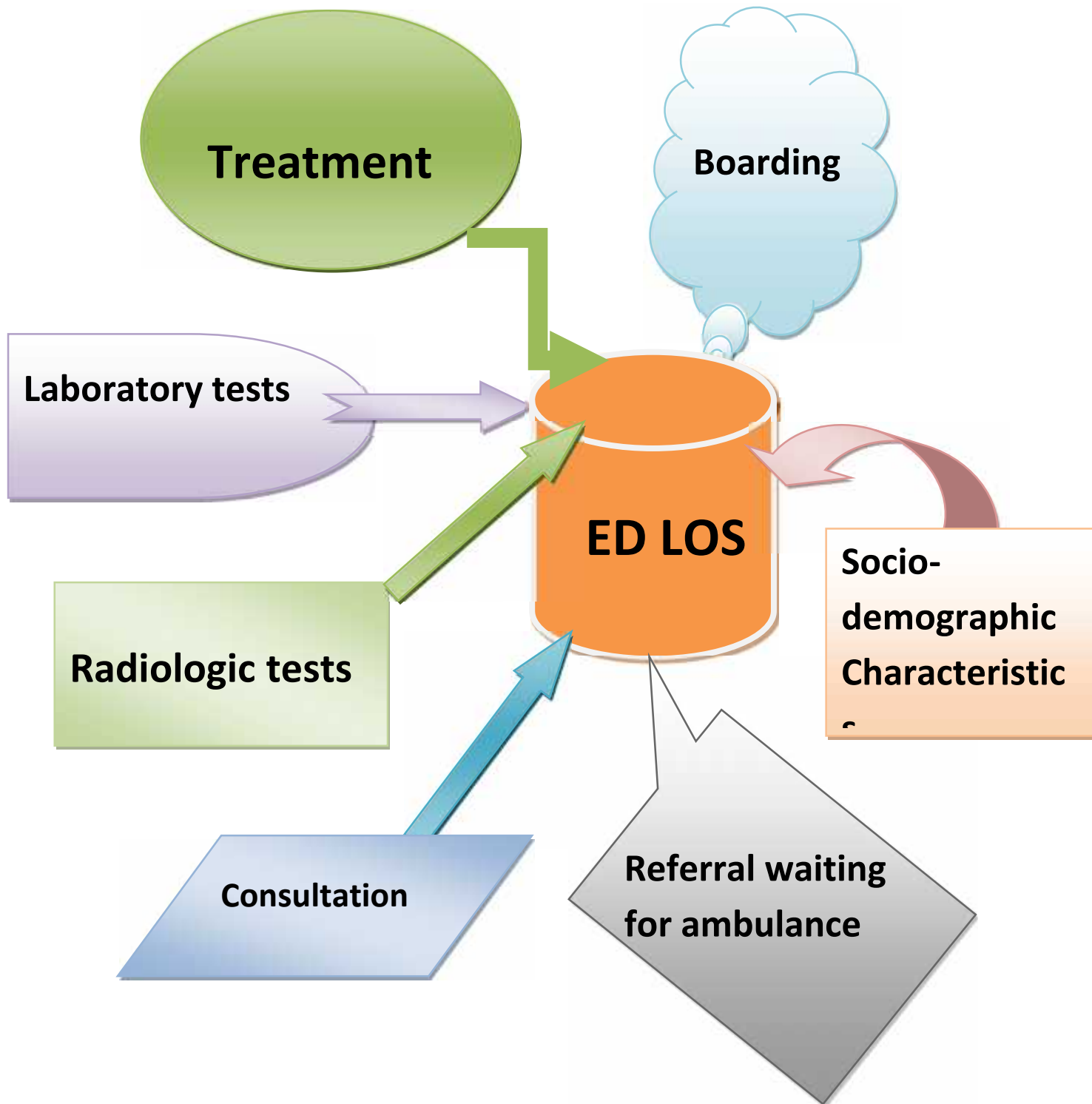
Fig2. Conceptual frame work of determining length of stay and its associated factors in the Emergency Department of Karat Primary Hospital, Konso, SNNPR, Ethiopia, 2017.

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CHAPTER THREE

Objective

3.1 General objective

To determine EDLOS and its associated factors in karat primary hospital Emergency department, Konso Woreda, Segen Area peoples Zone, SNNPRS, April/ 2017

3.2. Specific objectives

1. To determine the overall average length of stay in the ED of Karat primary hospital Emergency department, Konso Woreda, Segen Area peoples Zone, SNNPRS, April/ 2017.

2. To identify factors that have significant contributions to the LOS in Karat primary hospital Emergency department, Konso Woreda, Segen Area peoples Zone, SNNPRS, April/ 2017.

CHAPTER FOUR

3.   Methods

4.1 . *Study Area and period*

Konso is one of the Woredas in Segen Area Peoples Zone, Southern Nations and Nationalities and People's Regional State which is 595 Kms from the capital of the country and 365kms away from Hawasa, the capital of the region. The people of Konso are named Konsita, as the name originated from the name of the Woreda. The language is ***Konsigna***. The population lives in 41 traditional rural towns locally known as ***Paleewwa*** *and* two modern small towns of which ***Karat*** is the capital of the Woreda (22).

The population of Konsita is estimated to be 269,119of which 131,668 males and rest are females (23).

Karat primary hospital is the only hospital in the woreda. On the top of the organizational chart of the hospital is the governing board which is led by the chief zonal superintendent and the hospital chief executive officer (CEO). The structure then divided in to two broad areas called the clinical and non clinical service directors. The clinical service of the hospital is directed by the chief clinical officer (CCO) who monitors the clinical services being provided by the outpatient which in turn is directed by the outpatient service director, the service being provided by the inpatient service department directed by the inpatient service director and the other broad service area in the hospital, emergence service area, led by the Emergency service director. There are also other service areas that are nominated as case teams which include the pharmacy case team, laboratory case team, Delivery case team, OR case team and Medical record room that are directly accountable to the CCO. There is also environmental health department directly accountable to the CCO (23).

On the other hand the non clinical part of the organizational chart includes the laundry case team, the meal preparation case team, the housekeeping case team, the guards' case team, and the gardeners' case team who are accountable to the facility manager and the finance and procurement case team, the ethics office, the internal auditor the, human resource management, the human resource records and statistics office all are accountable to the non-clinical service director who in turn is directly accountable to the CEO (23).

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Among the major service areas of the hospital, Emergency department is the central and is given an attention by the senior management so as to improve service quality. There are 4 nurses, 5 Health officers and on general practitioner regularly assigned in the ED serving an average daily patient flow of 30 patients (23).

The data collection procedure started on March 12 and completed on April27/2017 G.C, until when the predetermined representative was reached.

4.2. *Study design*

Facility based cross-sectional study design using quantitative method of data collection was employed to gather fundamental information about those factors contributing to the LOS in the ED of the hospital.

4.3. Source population

  All emergency patients visiting the hospital ED during the data collection period.

4.4. *Study population*
  ➢ Selected patients in the source population who visited the ED during the study period (April/2017)

4.5 Inclusion and exclusion criteria
4.5.1. Exclusion criteria
  ➢ Patients triaged at central triage but are sent to ED because time spent at central triage is out of this study.
4.5.2. Inclusion Criteria
  ➢ Patient triaged at emergency triage room

4.6 Sample size

By considering p=50%, the following formula was used to calculate sample size for single population proportion and making the following specific assumptions 95% confidence interval; Z $_{/2}$=1.96 and 5% margin of error (d=0.05), the sample size was calculated as follows:

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$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

n = $\frac{(1.96)^2 \ (0.5)(0.5)}{(0.05)^2}$

n = $\frac{3.84 \times 0.25}{0.0025}$

n = 0. 96/0.0025=384

But since monthly average of emergency room attendance is 920(25) to mean the source population N is finite and less than 10,000; the sample size will be adjusted using the formula;

n= n_0/ (1+n_0/N)

n=n_0/ (1+384/920)

n=384/ (1+0.42)

n=384/1.42

n=270

By adding 10% , of this sample size; i.e 10% of 270which is

10/100 x 270=27; a total of 270+27=297 was the final sample size determined.

4.7 Sampling procedure

In the process of selecting study participants that represented the population so as to make inference about the population, this study used the systematic sampling technique by observing the natural journey of every third patient from time of arrival to exit from the ED either via discharge or admission to the ward. The first comer every day at the beginning of data collection has been the first to be observed. This was made on the first day of the data collection period when the first patient to be included in the study was identified by lottery method and is made to include every third patient since the average daily patient flow of ED was 30 and 10 study participants have planned to be observed every day (i.e K= 30/10=3, the first by lottery and then every third patient to observe at least 10 patients per 24 hours).

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4.8 Data collection procedures

Observational method of data collection was used and the data collectors were expected to collect the data only by registering the arrival and exit times of the emergency patient to and from the ED with few interviews about the demographic data from the patients or otherwise from care givers if the patient is a child or unconscious that cannot communicate. The data therefore was collected using the data collection tool by trained health professionals from Gidole primary hospital ED. The recruited health professionals collected the data using a data collecting tool (annex 5) which was adopted from a research done in Indonesian ED of a major teaching hospital(1). The patients were also observed and registered for the need for consultation, laboratory tests, radiology test, boarding if patient was to be admitted.

Every day, six data collectors were assigned in such a way that a group of two observers collected data with eight hours intervals shift until the number of patients to be observed per day reaches. The data collection started early in the morning from 8:00 AM and continued over 24hrs in such a way that the first group collected the data from 8:00 AM to 4:00 P.M, the next group from 2:00 P.M to 10:00 P.M and the last group collected from 10: 00 P.M to 8:00AM.

Every day while the data collectors observed patients, were supervised by the trained and recruited supervisor where every morning all the six data collectors were have meeting with the supervisor so as to report if they faced any problem in the preceding day of data collection and then have been submitting the filled data collection tool.

The data collectors were then being provided with new data collection tool every morning by the supervisor. The supervisor has been submitting the filled data to the principal investigator every week on Monday and then has been receiving new tools for a week. Since all data collectors have had mobile phone, no any other watches. At the point of starting data collection, every data collector has been making his/her stopwatch on and offs it exactly at the time patient leaves the ED there by registering the final time. The data collectors simply have been following the tool by registering the start and end time and finally they were subtracting the initial time from the exit time so as to come up on the LOS of each individual in hours and minutes.

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The time measurement format used was the one that measures time over 24hours i.e it was a 24hours format. At the beginning, every data collector was given a pen and a pencil to fill the tools.

4.9. Study Variables

4.9.1 Dependant Variable

➤ Emergency department length of stay (ED LOS)

4.9.2. Independent variable

➤ The Sociodemographic characteristics (age, sex, religion…)
➤ Laboratory tests
➤ Radiology tests
➤ ED consultation
➤ Type of emergency patient (AFI, COPD, Diarrhea with dehydration, traffic accident…)
➤ Boarding
➤ Referral waiting for ambulance
➤ Treatment service within ED

4.10. Operational definitions

The following defined terms were used throughout this paper.

➤ **ED LOS:** The primary outcome for this study which was the measure time in minute from the moment of patient arrival until discharged or, if admitted, until the time the patient left the ED that latter used to compute the mean length of stay in the department.

➤ **Arrival time**:-the first recorded time of contact between the patient and emergency triage nurse/Health officer/doctor.

➤ **Boarding patient: -** patient who remains in the ED after he/she has been admitted, but has not been yet transferred to an inpatient unit.

➤ **Triage time:-**is the time from when the patient arrives in the ED to when the emergency triage nurse/Health officer/doctor completes triage assessment and determines the patients triage category.

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- **An emergency patient**: is a patient suffering from medical, surgical or any other health related condition that are sudden and, at the time, unexpected and requires immediate medical treatment and/or an operation.
- **An Emergency department**: is a unit where the emergency patient is served.
- **Referrals waiting for Ambulance: -** Referred patients waiting for ambulance to leave the hospital ED and transported to other higher health institution.
- **Treatment time:**- The measure of time the patient enters ED just after triage until the responsible health professional decides admission, discharge or referral during when emergency treatment is being provided.
- **Consultation service time:** The time from when the first attending health professional decided for consultation by the higher special professional, General practitioner in the case of KPH, to the time when the consultant doctor completes and handovers the patient back to the attending professional.
- **Left ED-** The time at which an admitted or transferred patient physically leaves the Emergency Department treatment area.

4.11 Data Analysis Procedures

Data was checked and cleaned for completeness and accuracy every day after data collection by the supervisor and every week by the principal investigator and finally after the completion of data collection it was entered into SPSS version 20. First, descriptive analysis of the demographic data was conducted and then the mean length of stay computed over which the contributing factors were analyzed.. Secondly, bivariate analysis was done and variables with p-value less than 0.25 were included in multiple logistic regressions analysis

Based on the internationally recommended mean ED LOS, 240minutes (9), using this mean as a cut of point, LOS of less than or equal to 240minutes was taken as a normal range and the one greater than this internationally recommended benchmark taken as an abnormal range. Each covariate of ED LOS was then compared over these categories or ranges by their odds ratio within 95% confidence intervals.

4.12 Data quality management

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The data collecting tool once developed in English, data collectors were oriented on the data collection process and pre-testing of the tool was made at Gidole Primary hospital ED on 15 (i.e 5% of sample population) patients before the actual data collection. Each collected data has been checked on spot during the data collection period. A stop watch standard was used by every data collector to control the starting and end time of each patient.

4.13 Ethical considerations

Ethical clearance was obtained from the concerned body of the university, the Institutional Review Board; Permission for the study was then obtained from Segen Area peoples zonal Health Department and Karat Primary Hospital before the actual data collection. The clients and concerned staff were informed on the objectives of the study, benefits and requested for consent. The data was collected in a way to ensure confidentiality of the study participants. Information which explains the study purposes, benefit, methods was indicated on the data collection tool to ensure informed consent of the patients to be involved in the study.

In addition to the consent of the clients, the care providers were also informed on the objectives of the study, procedure, purpose and benefits and requested for consent.

CHAPTER FIVE
Results

5.1 Socio-demographic characteristics

During the 45-day study period, 297 (with 100% response rate) patients were observed in the ED and all of them were included in the analysis where the age of the patients ranged between a month to -90 years with a mean age of 28.6 years with SD + 19.11.. From the total of 297 patients included in the study, 51.15 were females and the rest were males. The majority of the patients observed were married, 172 (57.9%) followed by those who were single (30.3%). The total number of the protestant religion followers is more than half of the total clients, 63.3% followed by orthodox which accounts for 23.3% of the study population. The most common arrival mode is public transport. Ambulance was the second most common arrival mode. On foot transport is the smallest in proportion, with only four patients (1.3%). Health officer was the most predominantly first contact serving professional who evaluated and managed 232 emergency patients (78.1%). Clinical Nurses saw the least number of the emergency patients (only 4.7%) of the total study participants (Table 1).

Table1. Distribution of Emergency cases by socio-demographic characteristics, age, sex, marital status, religion, Mode of arrival and the first attending health professional in ED of Karat primary hospital, from March 12-Aprill 27/2017

Variable		
Age category in years	**Frequency**	**Percent**
0-14	60	20.2
15-64	219	73.7
>=65	18	6.1
Total	**297**	**100**
Sex		
Male	143	48.15
Female	154	51.85
Total	**297**	**100**
Marital status		
Single	90	30.3
Married	172	57.9
Widowed	22	7.4
Divorced	13	4.4
Total	**297**	**100**
Religion		
Protestant	188	63.3
Orthodox	70	23.6
Muslim	20	6.7
Others	19	6.4
Total	**297**	**100**
Mode of Arrival to ED		
Public transport	251	84.5
Ambulance	42	14.1
On foot	4	1.3
Total	**297**	**100**
First attending health professional		
Health officer	232	78.1
General Practitioner	51	17.2
Clinical Nurse	14	4.7
Total	**297**	**100**

The following figure describes the type of patient cases involved in this study. The majority of the patients were presented with Acute febrile illness, AFI (85, 28.6%), followed by Chronic obstructive pulmonary disorders, COPD (51, 17.2%), diarrhea with dehydration (43, 14.5%) and

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traffic accident (38, 12.8%). The rest of the type of cases all together account only for 26.9% of cases.
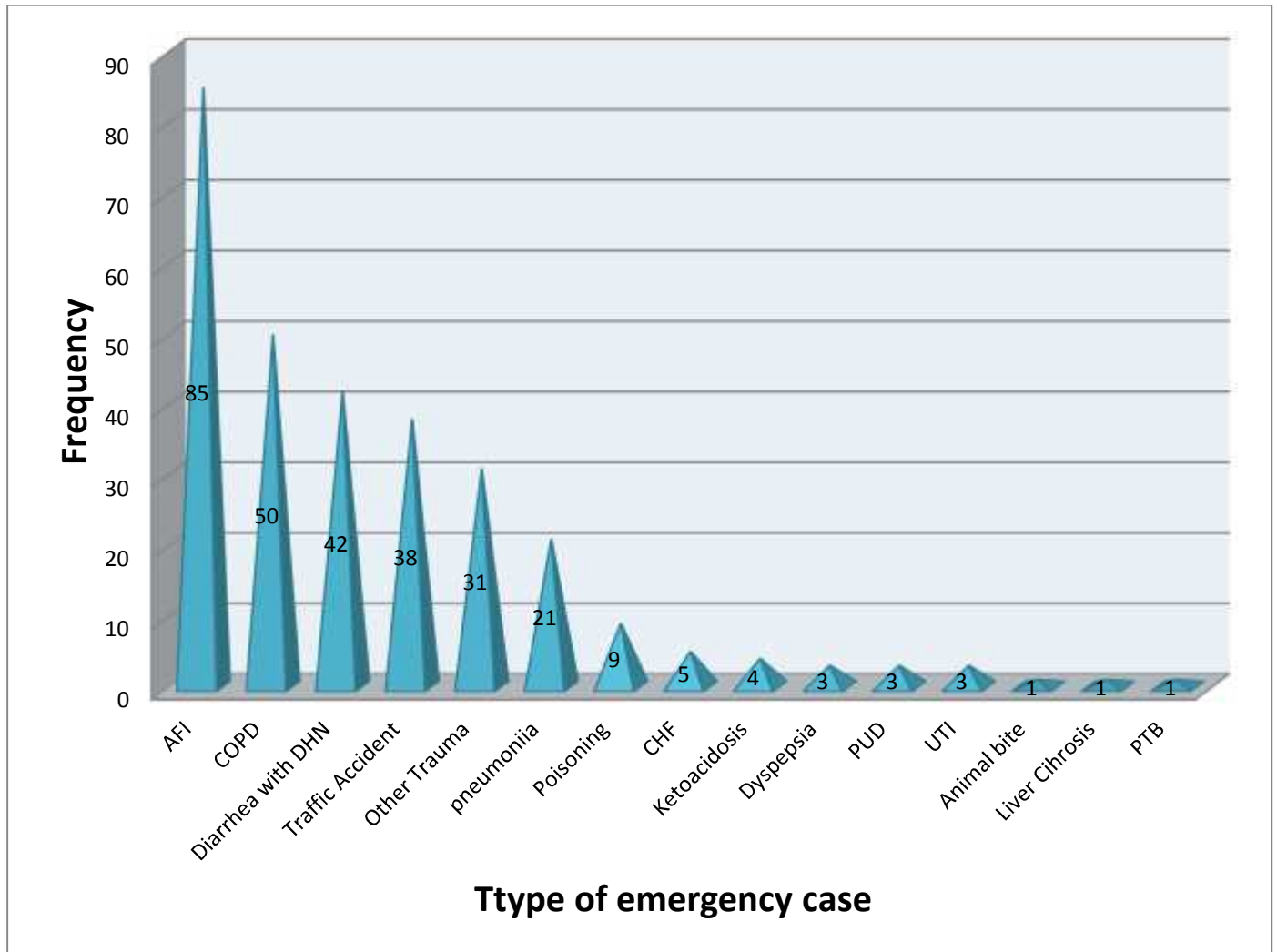
Fig3. Distribution of Emergency cases by type in Karat primary hospital, from March 12-Aprill 27/2017

The Mean ED LOS of KPH

The mean ED LOS of KPH was finally found to be 311.4 minute which is 5.2 hours which is one hour longer than the internationally recommended mean, 4houurs. Among the total sampled population, 153(51.5%) were served within the internationally recommended mean length of stay, 240minutes, and the rest 144 (48.5%) stayed in the department for more this recommended benchmark.

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Bivariate analysis

Table 2: Socio demographic associated with EDLOS of Karat primary hospital, from March 12-Aprill 27/2017

Variables	EDLOS		COR(95%CI)	Sig
	Normal range, n(%)	Abnormal range		
Sex				
Male	74 (51.7%)	69(48.3%)	0.9 (0.65, 1.61)	0.916
Female	79 (51.3%)	75(48.7%)	1	
Age in years				
0-14	36 (60%)	24 (40%)	1.5 (1.2, 2.61)	0.052*
15-65	111 (50.7%)	108(49.3)	2.0 (1,9)	0.164*
>=65	6(33.3%)	12 (66.7%)	1	
Marital status				
Single	41 (45.6%)	49 (54.4%)	0.53 (0.15, 1.9)	0.321
Married	96 (55.8%)	76(44.2%)	1.35 (1.2,1.4)	0.092*
Widowed	12 (54.5%)	10 (45.5%)	1.37 (1.3,1.6)	0.178*
Divorced	4 (30.8%)	9 (69.2%)	1	11
Religion				
Protestant	98 (52.1%)	90 (47.9%)	1.3 (0.47, 3.3)	0.632
Orthodox	33(47.1%)	37(52.9%)	1.5 (0.55, 4.3)	0.406
Muslim	11 (55%)	9 (45%)	1.13 (0.32,4)	0.855
Others	11 (57.9%)	8 (42.1)	1	1
Mode of Arrival				
Public transport	128(51%)	123 (49%)	0.96 (0.13,6.9)	0.968
Ambulance	23 (54.8%)	19 (45.2%)	0.82 (0.11, 6.4)	0.826
Others	2 (50%)	2 (50%)	1	1
First Attending health professional				
Health officer	117(50.4%)	115 (49.6%)	1.8 (0.58, 5.4)	0.319
General practitioner	27 (52.9%)	24 (47.1%)	1.6 (0.47, 5.4)	0.452
Clinical Nurse	9 (64.3%)	5 (35.7%)	1	

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The table above showed that among the socio- demographic characteristics age from 15-65 (p-value =0.164) and from marital status, Married (p-value=0.092) and Widowed (p-value=0.178) had fulfill the multivariable analysis criteria (P. value below 0.25) and hence became candidates for the latter analysis. All others were found to have not been statistically significant.

Table 3: potential factors associated with the ED LOS of Karat primary hospital, from March 12-Aprill 27/2017

Factors of EDLOS	EDLOS		COR(95%CI)	P.value
	Normal range, n(%)	Abnormal range		
Laboratory test				
No	104(57.1%)	78(42.9)	1	1
Yes	35 (41.2%)	50 (58.8)%	1.8(1.12, 2.3)	0.015**
Consultation service				
No	125(54.6)	104(45.4)	1	
Yes	28(41.2)	40(58.8)	0.33 (0.1, 3.1)	0.353
Radiology service				
No	126 (62.4)	76 (3.6)	1	1
Yes	27 (28.4)	68 (71.6)	4.2 (2.5, 7.1)	0.001**
Treatment service in the ED (time in minutes)				
<120minutes	127(62.9)	75(37.1)	1	1
>=120minutes	26(27.4)	69(72.6)	4.5(2.6, 7.7)	0.000****
Boarding				
No	120 (60.3)	79(39.7)	1	1
Yes	33(33.7)	65(66.3)	3 (1.8, 4.9)	0.000****
Referral waiting for ambulance				
No	143(55.0)	117(45.0)	1	1
Yes	10 (27.0)	27 (73.0)	0.3(0.2, 2.1)	0.402
*Key; *** for p-value<0.005, ** for p Value=0.005, * for 0.005<p-value<0.05*				

The table clearly illustrates the association between the ED LOS and the factors that contribute for the hospital ED. Except consultation service (P=0.353, 95%CI (0.1, 3.1)) and Referral waiting for ambulance (p=0.402, and 95%CI (0.2, 2.1), all other listed variables fulfilled the multivariable candidate selecting criteria and the majority affected the LOS significantly.

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Multivariable analysis

Table 4: Multivariable Analysis of factors associated with EDLOS of Karat primary hospital, from March 12-Aprill 27/2017 G.C

Variable	EDLOS in minutes		COR	AOR (95%CI)	Sig
	Normal Range	Abnormal Range			
Age of the patient					
0-14	36	24	1.5	1.22 (0.62, 4.42)	0.580
15-65	111	108	3	2.9 (0.7, 11.9)	0.160
>065	6	12	1	1	
Marital status					
Single	41	49	0.53	0.82 (0.2,3.2)	0.775
Married	96	76	0.35	0.77 (0.2, 3)	0.699
Widowed	12	10	0.37	0.43 (0.08, 2.4)	0.342
Divorced	4	9	1	1	
Boarding					
No	120	79	1	1	
Yes	33	65	3	4.4 (2.4, 8.0)	0.000***
Radiologic tests					
No	126	76	1		
Yes	27	68	4.2	5.91 (3.1, 11.2)	0.001***
Laboratory tests					
No	104	78	1	1	
Yes	35	50	1.8	3.2 (1.76, 5.98)	0.000
Treatment service					
<120 minutes	127	75	1	1	
>=120 minutes	26	69	4.5	5(2.7,9.4)	.004**

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CHAPTER SIX

Discussion

Emergency Department Length of stay, the ED LOS

The Mean EDLOS of Karat primary hospital was found to be 5.2 hours, higher than the result of the study done in Saudi Arabia which was 3.2hours (5) but was exactly similar to a study done in Kintampo Municipal Hospital in Ghana, where the overall total median and mean visit time from arrival to disposition were found to be 5.2 hours and 5.1 hours respectively (6) but was found to be greater than the average EDLOS in Netherlands which was found to be only 2.1 hours (7). But when it is compared with the mean EDLOS of Singapore which was less than 6 hours (8) it was found to be similar. The mean was found to be higher than the maximum international standard benchmark for EDLOS which is 4hours (9).The discrepancy might be due low attention given to the EDs in our country as compared to other countries around the world. Even no single published article was found to be conducted concerning the issue as to the best of the researchers' knowledge.

 The result of the study showed that the EDLOS in karat primary hospital is prolonged enough that identification of the factors associated with the stay and hence planning to tackle with the primarily influencing factors is of paramount importance.

1. The factors that contributed to the ED LOS in karat primary hospital

The finding of this study showed that boarding (P=0.000), Radiology tests (P=0.001), laboratory tests (p=0.000) and treatment in the emergency department (p=0.004) significantly associated with ED LOS as displayed on multivariate analysis result (Table 5). Even though the Bivariate analysis showed that age and marital status were to be further analyzed by multivariable analysis, the latter analysis finally removed them and hence these two variables no more affected the EDLOS of Karat primary hospital because there was no statistically significant difference detected between patients under age 14 years (P=0.580, 95% CI(0.62,4.42)),15-65 years (P= 0.160, 95%CI (0.7, 11.9) and above age 65 years   . This was comparable to a study conducted in Toledo university Medical center ED in USA which concluded that there was no statistically significant difference detected between patients under age 60 (-8 minutes (IQR -29, 12)) and

those older than 60 (−5 minutes (IQR −16, 8). In this study, there was no statistically significant difference between gender, age, education and other socio-demographic characteristics (10).

A. Boarding

Boarding, the waiting time for bed availability, which is measured when the emergency department physician decides for admitting the patient to ward and requests an inpatient bed to when the patient is moved from the emergency department to its assigned ward bed was found to be one potential factor for the prolonged EDLOS in the health facility as those patients who waited for bed availability stayed about 4 times (95% CI ((2.4, 8.0), p=0.000) more than those who were not boarded or admitted. The contribution of boarding time to the LOS is in line with other studies which reported that delayed inpatient bed availability could make a significant contribution to prolonged ED LOS. Previous studies reported boarding time as a significant determinant of ED LOS. It was found that patients with a boarding time of more than two hours are associated with prolonged ED LOS (18). Another study also demonstrated that decreasing boarding time without adding more beds in the emergency department can reduce LOS from 240 to 218 minutes (19). The result of this study is hence comparable to the latter study demonstrated in that out of the 98 admitted patients 66.3% (n=65) fall in the abnormal range of the EDLOS and only 33.7% (n=33) stayed within the normal range and hence decreasing boarding time potentially decreases the total EDLOS.

B. Laboratory tests

The most significant bottleneck that contributes to a prolonged length of stay in Sanglah hospital emergency department, a general teaching hospital in Indonesia was found to be the mean laboratory tests turnaround time compared to other variables like radiology, consultation time and waiting for bed availability (1). The result of this study similarly showed that laboratory investigation significantly contributed to the ED LOS in konso, karat hospital.

According to this study, those patients who were ordered for laboratory tests waited in the ED by about 3 times ((P=0.000, 95%CI (1.76, 5.98) more than those who were not ordered to be tested at the central laboratory of the hospital. The result of this study was supported by other previous studies which found that shortening laboratory turnaround time and hence completing the laboratory tests within short period of time can significantly reduce the EDLOS (14). Even

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though there is no nationally or internationally published studies showed the relationship between EDLOS and treatment time /resuscitation time within emergency department resuscitation room, this study showed that treatment service in the emergency department significantly contributes to the overall EDLOS. Those patients who are treated for more than 120 minutes, taking 50% percent of the internationally recommended total LOS as a cut of point, waited in the department 5 times ((P=0.004, 95%CI (2.7,9.6)) more than those who were treated treatment time shorter than 120 minutes in the resuscitation room of the emergency department.

C. Radiologic tests

According to the finding of this study, after adjusting for other factors, those patients who were served at radiology department for their radiologic investigations around 6 times (95%CI (3.1, 11.2), P=0.001) more stayed than those who were not ordered for radiologic examinations and the statistical test hence confirms that this service was significantly associated with the ED LOS. This is hence comparable to a research that has cited laboratory and radiology delays as one of the causes of increased waiting time in EDs. Delays from these two services have been included in the list of "Bottleneck" culprits in EDs (17).

Limitations of the study

The observational prospective study may lead the care providers to give better service than usual because they are being observed that may have an effect on the result of the study.

The study was also limited to the major services related that are directly related to the emergency department services, but not dug in to the root causes of the main factors.

Though grouping may help data presentation, notably in tables, considering the impact of converting continuous data to two groups (dichotomizing), as this is the most common approach in clinical research, because it greatly simplifies the statistical analysis and leads to easy interpretation and presentation of results (24), dichotomizing leads to loss of information, so the statistical power to detect a relation between the variable and patient outcome is reduced. It may lead to underestimation of the extent of variation in outcome between groups, such as the risk of some event, and considerable variability may be occurring.

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CHAPTER SEVEN

Conclusions and recommendations

7.1 Conclusions

The EDLOS of KPH can be concluded as a prolonged ED LOS since it was found to be greater than the internationally recommended mean benchmark, 4 hours by more than an hour. The main factors that contributed to the EDLOS in karat primary hospital were found to be boarding; consultation service, referrals waiting for ambulance, laboratory tests, radiology tests and treatment time in the ED resuscitation room since they were found to be the most significantly contributing factors to the prolonged length of stay in the ED. The result of this study has an implication of reducing overcrowding on certain service points during taking care of emergency patients in the hospital.

7.2 Recommendations

➤ The hospital senior management team has to work hard to find causes of boarding so that admitted patients leave the ED as sooner as possible.

➤ The hospital has to find causes of delay of patient at laboratory service area and find ways to reduce the delay time so that patients will be served as fast as possible keeping the quality of care ensured.

➤ The hospital as well as the radiology department have to identify reasons of delay of patients at radiology department in order to serve patients from emergency patients as sooner as possible.

➤ Finally this research identified factors that contributed to the overall length of stay such as laboratory service, treatment in the ED, boarding and the like but not deeply searched for the reasons of delay at these service points. This is left for other researchers due to cost and time constraint.

Annexes

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Questionnair

1. Information Sheet
Greetings

My name is_____

This is to give you information regarding a study designed to determining emergency department length of stay and its associated factors and hence the quality of care in karat primary hospital, Konso Karat in collaboration with Jimma University institute of Public health and medical sciences MHA coordinating office. The aim of the study is to generate evidence on the emergency department length of stay and factors influencing length of stay in the hospital. The study will have a benefit in the effort to improve the quality service by the stakeholders and can influence decision makers.

The staff has the right for partial or non participation for the data collection. There is no risk for participating in the data collection and confidentially of the respondent will be maintained as the name is not required on the data collecting format.

2. Informed Consent

This is to respectfully requesting you to participate on this study. You can have full control to take time to understand and decide whether or not to take part on the study. You are also not obliged to answer a question you don't want to and you may end the interview at any time you want to.

However, your cooperation and genuine response for the study is highly appreciated. The interview together with the observation may take minutes to hours to complete the tool.

3. Contact detail of the Investigator

If you want to know more about the study you can contact the principal investigator of the study

ArarsoGaro through a mobile phone numbers +251-941-86 60 15, or an e-mail: address of ararsogarotabayo@gmail.com.

If you have any question that you want to ask us about the study; you are welcome!

4. Consent Form for the client

Observer: Please provide a paper copy of the Consent Form to the clients and concerned staff and explain it.

With due understanding of the abovementioned information, I am willing to participate in the study?

(Yes) Check box: □=> Proceed (No) Check box: □=> Stop

Name of the observer: _____ Signature _____ Date __/__/_____

Name of the supervisors: _____ Signature _____ Date __/__/_____

5. Consent Form for the staff

Observer: Please provide a paper copy of the Consent Form to the clients and concerned staff and explain it.

With due understanding of the abovementioned information, I am willing to participate in the study?

(Yes) Check box: □=> Proceed (No) Check box: □=> Stop

Name of the observer: _____ Signature _____ Date __/__/_____

Name of the supervisors: _____ Signature _____ Date __/__/_____

6. Data collection form

Date--------------------------------

Time--------------------------------

Patient card No-------------------------------

I.   Socio demographic Characteristics

1. Age in years ☐

2. Sex: A Male ☐   Female ☐

3. Educational status: A. Illiterate ☐   B. Primary school ☐ C. Secondary school ☐

D. High school ☐   E. College/University ☐

4. Occupational status: A. Farm ☐   B. Student ☐ C. Merchant ☐

D. Gov. Employee ☐   E. Others, ☐   Specify-----------------------------------

5. Marital Status: A. Single ☐ B. Married ☐ Widowed ☐

D. Divorced ☐ Others, Specify-------------------------------------

6. Residence: A. Karat town ☐   B. Rural Kebele ☐

7. Religion: A. Protestant ☐   B. Orthodox ☐ Muslim ☐

4. Others, specify--

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II. Observation and time measurement

1. Arrival mode   :A. Private transport [____]   B. Ambulance [____]   C. Public transport [____]

   D, Others, Specify; -----------------------

2. Type of arrival;   A. Transfer from HC [____]   B. Self-Referral [____]

   C. Others; Specify; --

3. Arrival to triage time period/triage waiting time:

   I. Arrival time in hrs&min [____]   II. Time triage process started [____]

   III. Diff in min [____]

4. Triage time period

   I. Time triage process started [____]   II. Time pt exit from triage room [____]

   III. Diff in min [____]

5. ED waiting time period in ED waiting area after triage

   I. Time pt exit from triage room [____]   II. Time pt enters ED [____]

   III. Diff in min [____]

6. First attending medical staff in the ED

   A. Clinical Nurse diploma [____]   B. BSC nurse [____]   C. Health Officer [____]

   D. Doctor [____]   E. Other, Specify--

7. Time period spent in ED with medical staff in the first contact

   I. Time pt enters ED [____]   II. Time pt exits from ED [____]

   III. Diff in hrs/min [____]

8. Need for consultation by another special professional: A. Yes [____]   B. No [____]

If Q no 8 is yes, then fill the following two questions; otherwise jump both.

9. Time period spent b/n end time of first medical staff and consultant arrival

35   [____]

I. Time the first contact medical staff decided for consultation [ ] II. Time consultant arrived [ ]

III. Diff in hrs/min [ ]

10. Time period of consultation

I. Time consultant arrived [ ] II. Time consultation completed [ ]

III. Diff in hrs/min [ ]

11. Is laboratory request ordered? A. Yes [ ] B. No [ ]

12. If the answer to the above question is yes, then measure the laboratory waiting time:

I. Time of request order [ ] II. Time of result return from lab [ ]

III. Diff in hrs/min--

13. Time period b/n laboratory result return and contact with responsible ED professional

I. Time result returns from lab [ ] II. Time patient find the ED professional [ ]

III. Diff in minutes [ ]

14. Treatment time:

I. Entrance time to ED room after return from [ ] II Time treatment completed [ ]
III. Diff in minutes

15. Radiology test request: A. Yes [ ] B. No [ ]

16. If Q no 15 is yes, measure the radiology waiting time.

I. Time of order of radiolog [ ] II. Time result retu [ ]
III. Diff in minutes [ ]

17. Time period b/n radiology result return and contact with responsible ED professional

I.Time result return from radiology dep't [ ]

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II. Time patient find the ED professional [   ]   III. Difference in minute [   ]

18. Treatment time after radiologic investigations.

   I. Entrance time to ED room after the investigation [   ] II. Time treatment ended. [   ]

   III. Diff in min [   ]

19.   Type of case: A. Traffic accident [   ]   B. Trauma other than traffic accident [   ]

   C. Diarrhea with DHN [   ]   D. AFI [   ]   E. COPD [   ]

F. others, specify, --------------------

20. Final decision made by the attending professional: A. Admission [   ]   B. Referral [   ]
C. Discharged to home [   ]

21. If an answer to question number 20 is Admission, measure the boarding time:

   I. Time and date of admission: Date----------------Time--------------

   II. Time and date pt left ED: Date-------------time--------------------

   III. Diff in hrs-------------

22. If the final decision is referral, what is the measure of referral waiting time?

   I. Time and date referral form written: Date----------------Time-----------

   II. Time and date pt left the hospital: Date----------------Time-------------

   III.   <u>Diff in min----------------------------</u>

23. If the final decision is discharge, summarize the ED waiting time

   I. Date and time of arrival (refer to Q no 3): Date------------------- time-------------

   II. Date and time of discharge: Date------------------------- time----------------------

III. Total time spent in hrs and minutes: -------------hrs------------minutes

Name of data collector: ------------------------------------signature----------------------date---------------

Name of supervisor: ---------------------------------Signature--------------------------Date-----------------

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ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and condition of the institute of health in effect at the time grant is forwarded as the result of this application.

Name of the student: **Ararso Garo Tabayo**

Date--------------------------------------Signature -----------------------------

Approval of the Advisers

Name of the first adviser: **Mr. Negalign Berhanu**

Date--------------------------------------Signature -----------------------------

Name of the second Adviser: **Mr. Melaku Haile**

Date--------------------------------------Signature -----------------------------

Approval of the examiner

Name of the examiner---

Date--------------------------------Signature------------------------

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