

2017-12

Involvement In Birth Preparedness And Complication Readiness And Associated Factors Among Male Partners In Bahir-Dar Zuria Woreda, North West Ethiopia

Abriham, Awoke

<http://ir.bdu.edu.et/handle/123456789/13488>

Downloaded from DSpace Repository, DSpace Institution's institutional repository



BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

TIME TO DISCHARGE AND ITS PREDICTORS AMONG

ADMITTED PATIENTS IN FELEGE HIWOT

COMPREHENSIVE SPECIALIZED HOSPITAL NORTH-

WEST ETHIOPIA, A PROSPECTIVE COHORT STUDY

BY AFEWORK HAILU (BSC)

NOVEMBER, 2020

DAR, ETHIOPIA

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS

TIME TO DISCHARGE AND ITS PREDICTORS AMONG ADMITTED
PATIENTS IN FELEGE HIWOT COMPREHENSIVE SPECIALIZED
HOSPITAL NORTH-WEST ETHIOPIA, A PROSPECTIVE COHORT
STUDY

BY AFEWORK HAILU (BSC)

A THESIS SUBMITTED IN PARTIAL FULFILLME OF THE REQUIREMENTS FOR
MASTER DEGREE OF PUBLIC HEALTH IN EPIDEMIOLOGY

PRINCIPAL ADVISOR: BERHANU ELFU (ASSOCIATE PROF)

EMAIL; ELFUFELEKE@GMAIL.COM

CO-ADVISOR: TAYE ABUHAY (ASSISTANT PROF)

EMAIL; TABU0918@GMAIL.COM

NOVEMBER, 2020

BAHIR DAR

© 2020 Afework Hailu

Declaration Form

This is to declare that the thesis entitled Time To Discharge And Its Predictors Among Admitted Patients In Felege Hiwot Comprehensive Specialized Hospital North-West Ethiopia, submitted in partial fulfillment of the requirements for the degree of Master of public health in Epidemiology from Department of Epidemiology and Biostatistics, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Afewerk Hailu June, 2020 Bahir Dar

Email; Afeworkhailu866@Gmail.Com

Phone; 0921387225

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF EPIDEMIOLOGY AND BIostatISTICS

Approval of Thesis for Defense

I hereby certify that I have supervised, read, and evaluated this thesis “Time to Discharge and Its Predictors Among Admitted Patients in Felege Hiwot Comprehensive Specialized Hospital North-West Ethiopia” by Afework Hailu prepared under my guidance. I recommend the thesis be submitted for oral defense.

Advisor: Berhanu Elfu (Associate Prof) Signature-----Date-----

Co-Advisor: Taye Abuhay (Assistant Prof) Signature-----Date-----

Dep’t Head: Ababayehu (Assistant Prof) Signature----- Date-----

BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF EPIDEMIOLOGY AND BIostatISTICS

Approval of thesis for defense result

As members of the board of examiners, we examined this thesis entitled “Time to Discharge and Its Predictors Among Admitted Patients in Felege Hiwot Comprehensive Specialized Hospital North-West Ethiopia” by Afework Hailu. We hereby certify that the thesis is accepted for fulfilling the requirements for the award of the degree of Masters in epidemiology.

Board of Examiners

External examiner ----- Signature----- Date-----

Internal examiner: ----- Signature----- Date-----

Chairperson: -----Signature-----Date-----

Acknowledgements

First of all, I would like to honestly express my heartfelt gratefulness towards my kind and great advisors Brehanu Elfu (Associate professor) and Taye Abuhay (Assistant professor) for their frank, constructive comments and suggestions, they have provided throughout my thesis and its proposal. And also, my deepest gratitude goes to Felege Hiwot comprehensive specialized hospital for willingness to share necessary information for my thesis. And final I have heartfelt gratefulness to data collectors and participants in this research.

Table of contents

Declaration Form	I
Approval of Thesis for Defense	II
Approval of thesis for defense result	III
Acknowledgements.....	IV
Table of contents.....	V
List of tables.....	VII
List of figures.....	VIII
List of appendixes.....	IX
Acronyms and Abbreviations	X
Abstract.....	XI
1. Introduction.....	1
1.1. Background.....	1
1.2 statement of the problem.....	2
1.3 significance of the study	5
2. Literature review	6
2.1 Socio-demographic characteristics	6
2.2 Disease characteristics	7
2.3 Hospital related factors	9
3. Conceptual frame work.....	11
4. Objectives	12
4.1 General objective	12
4.2 Specific objectives	12
5. Methods and materials	13
5.1 Study setting	13
5.2 Study design.....	13
5.3 Study participant	14
5.4 Sample size determination	14
5.5 Sampling technique/procedure.....	15
5.6. Study variables.....	16
5.6.1 Dependent variable	16
5.6.2 predictors of discharge.....	16

5.7 Operational definitions/measurements.....	17
5.8 Data collection instrument and process	19
5.9 Data quality.....	19
5.10 Statistical methods	20
5.11 Ethical consideration.....	21
6. Results.....	22
6.1 Population profile.....	22
6.2 Survival status of admitted patients	24
6.2 Predictors of Discharge.....	29
7. Discussion	32
8. Conclusion and Limitation.....	36
8.1 Conclusion	36
8.2 Limitation of the study.....	36
8.3 Recommendation.....	37
9. Reference	38
10. Annexes	44
10.1 Annex I: Consent Form.....	44
10.2 Data collection Tools (questionnaire).....	46
10.2.1 English version interviewed type of questionnaire	46
10.2.2: Study information sheet form in Amharic version.....	50

List of tables

Table 1. Socio-demographic characteristics of admitted patients in Felege Hiwot compressive specialized hospital 2020 (n = 812)	23
Table 2. Life table for discharge of admitted patients in Felege Hiwot compressive specialized hospital 2020 (N = 812)	24
Table 3. life table for discharge of medical ward admitted patients in Felege Hiwot compressive specialized hospital 2020 (n1 = 408)	26
Table 4. Life table for discharge of surgical ward admitted patients in Felege Hiwot compressive specialized hospital 2020 (n1 = 404)	27
Table 5. The log rank test of medical and surgical wards	28
Table 6. Predictors of discharge in Felege Hiwot compressive specialized hospital,2020	30

List of figures

Figure 1: conceptual frame work of factors associated with delayed discharge in hospital synthesized from above literature reviews (29, 38, 43-45).....	11
Figure 2; sampling procedure for study participant from two major wards in Felege Hiwot compressive specialized hospitals March 2020	15
Figure 3. Kaplan Meier curve showing time to discharge in Felege Hiwot compressive specialized hospital, 2020	25
Figure 4. Kaplan Meier curve of medical and surgical ward admitted discharges in Felege Hiwot compressive specialized hospital, 2020	28
Figure 5. Plot of hazard function from Weibull regression to show model fitness	31
Figure 6. Goodness of fit Plot of cumulative hazard function from Weibull regression.....	31

List of appendixes

Annex I: Consent Form

Annex II: Check List for Medical Records and Patients Response Review

Acronyms and Abbreviations

AHR.....	Adjusted Hazard Risk
AIC.....	Akaike information criterion
AOR.....	Adjusted Odds Ratio
CI.....	Confidence Interval
ED.....	Emergency Department
EHRIG.....	Ethiopian Hospital Reform Implementation Guideline
ETB.....	Ethiopian Birr
G.C.....	Gregorian calendar
ICU	intensive care unit
IQR.....	inter quintile range
LOS.....	length of stay
L&D.....	Labor and Delivery
NSW.....	New South Wales
OR.....	Odds Ratio
SD.....	Standard Deviation
WHO.....	World Health Organization

Abstract

Background: Hospital long stay is a serious social and economic problem, leading to elevated medical expenses and dissatisfaction, and increased workload and financial burden. Patients discharge time was different in admitted patients in hospitals. In Ethiopia, there were limited evidence why the patients' length of stay is different in roughly the same condition.

Objective: The aims of this study were to determine time to discharge and its predictors among admissions in Felege Hiwot hospital in Bahir Dar, northwest Ethiopia, 2020 G.C

Methods: Prospective cohort study was conducted among 812 systematically selected study participants. The data was collected by well-trained data collectors and supervisors using check list. Then entered into EpiData Version 3.1, and exported into Stata version 15. Median, range of age and proportion of respondents were stated. Incidence density to estimate time to discharge. Life table and Kaplan Meier curve to determine the cumulative survival of patients in the wards were used. Cox proportional hazard (Weibull) model was used to investigate predictors of discharge. Variables from bivariate analysis with $p < 0.25$ were candidate for final model. Adjusted Hazard Ratio with their 95% CI at $p < 0.05$ used to predict discharge. Model fitness was diagnosed.

Results: A total of 812 (408 from medical ward and 404 from surgical ward) admitted patients participated in the study giving total response rate of 95%. Fifty-five percent were females; median age was 32. The total times at risk/admission in medical wards were 1802 and in surgical wards 2074 days. The incidence densities of discharge in medical and surgical wards were 364/1803 (2019/10000)-person days and 356/2074 (1716/10000)-person days respectively. Median time to discharge of all participant admission was four days. Median discharge time was five days in medical and four days in surgical ward. Predictors of discharge were age (AHR 1.04(95% CI 1.02-

1.06)), family care (AHR .69(.51-.94)), admission source (AHR 2.07(1.39-2.90)), admission time (AHR .57(.49-.67)). Lab.-result delay (AHR .67(.55-.81)), radiological result delay (AHR .78 (.64-.95)), comorbidity (AHR.50(.42-.60)), disease burden group (AHR 2.15(1.84-2.66)), specialty (AHR 0.66 (0.56-0.78)), nurse-to-patient ratio (AHR 1.95 (1.57-2.43)), and medication adherence (AHR 2.83(2.29-3.51)).

Conclusion: Generally surgical admitted patients discharged in longer time than medical even median time of surgical was less than medical. It is important to emphasize on good communication of respective specialty on lab and radiology result test waiting time and also teaching the benefit of medication adherence to the patients.

Key-words; admission, length of stay, inpatients.

1. Introduction

1.1. Background

Hospitals are vital part of a health system that, in coordination with other parts, provides health to the community. In fact, hospitals have an important role in providing health services; consequently, they have a major impact on the efficiency of a health system. The most important tool for evaluating hospital performance is hospital indicators. Among these indicators, length of stay (LOS) in a hospital is one of the most important indicators that are widely used today to measure the efficiency of hospitals (1-3).

The appropriate time to discharge as ideal time in each department varies from country to country. In Ethiopia ideal time to be discharged from emergency is 24hr regardless of disease type and severity. In others ward ideal timeliness of hospital stay in hospitalized patients is the average length of stay in respective wards. It is measured as average number of days from admission to discharge for each inpatient(2, 4).

Hospitals are struggling to provide timely care to a progressively increasing number of out of the blue visits to the facility. Government of Ethiopia health minister also established hospital reform implementation guideline in 2010 to measure quality improvement. In which each hospital should have liaison and referral service that is responsible for manage hospital bed management, facilitate emergency and non-emergency (elective) admission, and provide social service support to the emergency, inpatient and outpatient case teams. To achieve hospital bed occupancy optimum no patient should remain in hospital any longer than necessary time due to irregular ward rounds, timely mannered required investigations or procedure, delay in arranging necessary follow up

appointments, discharge or referral papers, lack of hospital administrative or cashier functions to handle discharges 24 hours a day, 365 days a year (3).

One of clinical outcome measures is length of hospital stay which is important to monitor implementation of Health Sector Development Program. As indicated in guidelines the major important function of determining hospital length of stay as clinical outcome indicators is to measure the appropriate utilization of inpatient service and, support and strengthen facility efficiency (2, 4).

1.2 statement of the problem

Discharge time in hospital is varies according to the patient's variation during presentation to and hospital process. But in some cases, the variation is beyond expected length of stay in hospitals. It is worldwide problems that burden in emergency and other different departments of hospital reported that activities were not gone as scheduled. Patients wait in admission beyond scheduled time due to different reasons. Most problems or stresses observed in the public hospital system of New South Wales find expression, in one form or another, be it a lack of senior doctors, ineffective bed management practices, the widespread use of locums or poor communication with patients or their attendants (5). Length of hospital stay was longer in the patients unable to gain access to an appropriate hospital inpatient bed than those gain access to an appropriate hospital inpatient beds which is also linked to increased waiting time for medical care in the health facility(6).

In Ethiopia where health resources limited and under development is crucial problems, patients in hospital complain about long stay which is serious social and economic problem, leading to elevated medical expenses as well high workload and financial burden to hospitals (7).

Quality management and improvement to advance the quality of health service delivery by health facilities across the country, remarked positive improvements, including the reduced outpatient waiting time, reduced institutional mortality rate, bed occupancy, the average waiting time for surgery and patient satisfaction. However, no reports seen in the country on inpatients admission improvements (8).

In spite of unclear relationship between longer hospital stay and quality of care, longer hospital stay is associated with financial burden of both hospitals and patients leading to overall raise in health care cost of the country. Everyone agrees that prolonged hospital stay due to emergency and inpatient boarding is unsafe; is associated with excess deaths, decreases hospital efficiency, and makes the lives of clinicians difficult, resulting in dissatisfaction and burnout.

It is also associated with complications like nosocomial infections, immobility pressure sores deep vein thrombosis deconditioning and then worsening patient's quality of life in inpatient admission. Which also requires extra cost to get treated and disturbs the efficiency of services. Longer stay of hospitalized patients, their discharge pattern and admission rate were described to decrease acute bed availability leading to overcrowding and hospital utilization blockage (9-14).

Annual admission rate in Ethiopia mental health care facility reported 4 in 100000 population with 63 days' median length of hospital stay(15). To have quality health care including inpatient in hospitals, government finances enormous amount of budget and oversee hospital operations by establishing hospital key performance indicator(4).

The hospital related factors such as inability of patients into access hospital beds, delayed laboratory test, radiological results, and consultation delay were associated with longer stay and the major issue currently facing hospitalized patients as worldwide problem. These are some of

the factors that lead to long stay in hospital in many literatures. During the last several years, it has been reported prominently in Australian northern America and European (6, 7, 16-19).

However, longer stay in hospital may not be exclusively in emergence department problem in Ethiopia. It might be problem of wards admitted patient which may be affected by facility, patient and disease characteristics as well. Study to reason out long stay in hospitals is a few in Ethiopia such health resource-limited settings. And also reported studies of the extent of hospital stay vary between studies due to restriction of study to particular wards or age groups and types of methodology used.

There are questions raising why some patients stay longer and some shorter duration even though in similar conditions like the same case, ward, admission or beyond average length of stay. Little is known about the causes of variation in lengths of stay at the different department and in referral hospitals in Ethiopia, principally because of the shortage of visibly available data about patient's length of stay.

Therefore, this study would search for factors predicting to discharge inward patients. Interest in quality of health care has increased by health care professionals and policy makers due to the perceived need for continuous quality improvement and transparency to the public. Hence, it is important to get insight into the quality of health care indicators such as patients length of stay in hospitals(3).

1.3 significance of the study

The intention of this study is to establish factors related to the facility, patients and disease characteristics that can explain the length of hospital stay. Interests are growing on policymakers and health professional to predict time to discharge and then optimize the use of hospital resource. Because, increasing demand of service users globally and nationwide on quality health care, it is important to examine problems which can be modifiable regarding service areas and patients related characteristics of the length of hospital stay.

Hospital managers and policy makers design systems that allow services to be performed more efficiently through identification of predictors of time to discharge which may represent the potential target for interventions. It also tries to investigate whether patients stay longer due to clinical implication or perhaps due to non-clinical reasons. In addition, knowledge of the predictors to timely discharge benefits users regarding expectations of stay in terms of cost, time and other resources. And furthermore, it would try to disclose information for future research on predictors of hospital stay.

2. Literature review

2.1 Socio-demographic characteristics

For many conditions the social circumstances of patients are likely to be important determinants of the speed with which patients can be discharged from the hospital. In particular, without adequate care at home may need to stay longer in hospital than other patients, if only for reasons for social care rather than health care was explained in inpatient length of stay in the National Health Service of England(20).

Study conducted on risk factors and barriers to discharge on long and short stay patients in public and private institution, unmarried status is significantly associated with long hospital stay, unemployed were stayed longer followed by employed, social pension and others grouped as housewife and students. Patients with higher education level were hospitalized for significantly longer than those with lower education level. While another study to determine factors associated with hospital stay revealed married and employed stayed significantly longer(1, 21).

Study done in Malborne, Australia, Emergency department length of stay as independent predictor of inpatient length of stay showed males (OR:0.9) stayed inward significantly lower excess time than females(22) while in study to ascertain length of stay in youth population and socio-demographic like gender, ethnicity, age, socio-economic position status no significant association(1, 23).

Study to determine association between insurance status and hospital outcome like length of stay those with insurance had significantly longer stay and higher hospital cost than those without insurance (1, 24, 25).

In study to assess the characteristics of long-stay inpatients in public and private hospitals in Italian and delayed discharge and factors associated with the delay and inter hospitals variation in length of stay in England and somewhere showed probability of experiencing prolonged stay in hospital is significantly associated with increasing age (1, 21, 26, 27).

2.2 Disease characteristics

Hospital stay associated with more than cure for patients. Study conducted on elders causes of delayed discharge from hospitals shows significant association of longer stay and developing complications associated with hospital stay, such as nosocomial infection, loss of function, immobility, falls and confusion(9).

The degree of clinical complexity presented by different patients varies considerably, even for the same diagnosis. Staying in admission ward depends on specific case severity, co-morbidity, clinical condition of different diseases. Study face difficulty in measuring disease severity due to its complexity to determine length of hospital stay. But few tried to characterize by staging, classifying by ward or type of treatments patients seeks or using different severity scores scales in specific disease whilst others few characterized numbers of case in single measurement scale like diagnosis related grouping (DRG). Others left characterizing disease due to lack of standardized tools and fear of validity problem on tools in their study, so mentioned as drawback of their studies (1, 20, 28).

Lawton R. et al. and Appelros P. explained patient's condition of severity has a positive correlation with length of stay ($p < 0.0001$) and increasing odds of patient mortality, they used to measure the severity of conditions by age and comorbidity (Table 4) (28, 29). However, Antonella G at.al showed no significant difference in long stay and short stay of patients for disease severity and

informed that validity and reliability of measuring disease severity is a challenging problem on their study (21).

Study conducted on Factors influencing the length of hospital stay of patients with heart failure and a similar study of elder patients delayed discharge and its determinants in England showed an increased length of stay in hospital is significantly associated with comorbidities like the development of renal impairment (OR 9.8) and concurrent respiratory problems requiring specific treatment (OR 3.8) (26, 30). Also another study dealt on the hospital out comes and comorbidity showed significant increase in length of hospital stay (31).

Study to identify clinical parameters of longer length of stay in patients of 45 years old and above with acute exacerbations of chronic obstructive pulmonary disease admitted to intensive care units demonstrated significant increase in length of hospital stay with co-morbidities like pleural effusions on chest x-ray, requiring intubation, and with a high apache ii score (32).

To decrease length of stay in hospital, efforts had been done by different strategies but reasonable concern raised that early discharge could increase rates of readmission. Evidence suggests readmission in a month significantly decreased hospital length of stay (33). In contrast study on length of hospital and associated factors showed that patients with history of previous hospital admission had significantly longer stay (1).

Patients in admission can takes multiple medication. Concurrent use of many drugs or polypharmacy significantly increased admission times in elders more than 65 years old case mix studies while no significant effect of polypharmacy on length of stay of polypharmacy in similar case mix study (34-36).

Medication adherence yet in studies examined for similar cases. studies showed increasing medication adherence significantly reduces the risk of negative outcomes like length of hospital stay in heart failure patient and infectious disease studies (37-39).

2.3 Hospital related factors

Facility related factors explained length of hospital stay was a wide range of problems discussed. Length of hospital stay varies in different departments care and other wards can occur at a variety of health care levels. Negari et.al reported that overcrowding, waiting time for radiological service and waiting time for laboratory results significantly and positively affected(7). In study of women hospital the number of laboratory tests, radiographies and sonographies had positive significant effect on the length of hospital stay(40).

Sufficient numbers of staffs in hospitals may prevent patient adverse events that cause patients to stay longer than necessary. Studies weren't contradicting on nurses to patient's ratio length of stay. Increased nurses per patients significantly reduced length of stay (41, 42). Also, in regard to workload and patient's outcome study like for length of stay is compared between hospitals and wards. Study to demonstrate association between workload of the nursing staff and patient safety outcomes like length of stay indicated that higher workloads that are patient to nurse staff ratio were related to significant longer hospital stays (43, 44).

Ward admission takes place at any time of hospital service time even in weekends. Those patients admitted to the inpatients outside normal working hours were stayed significantly longer excess time compared to office our presented patients. Similarly, in the same country study to ascertain the relationship between delay to reaching an inpatient bed/ access block and inpatient length of

stay showed significant longer stay of off-hour admitted patients in both accesses blocked and non-blocked patients inward (6, 22).

In addition, in young adults to see association between longer stay and socio-demographic status off hour admitted patients were significantly associated with longer hospital stay (23).

Patients admitted in wards get through emergency and out patients departments. study shows that patients admitted through emergency have a significantly shorter length of stay as compared to those with elective admission or outpatient admission root among adult admitted patients in acute care (34).

3. Conceptual frame work

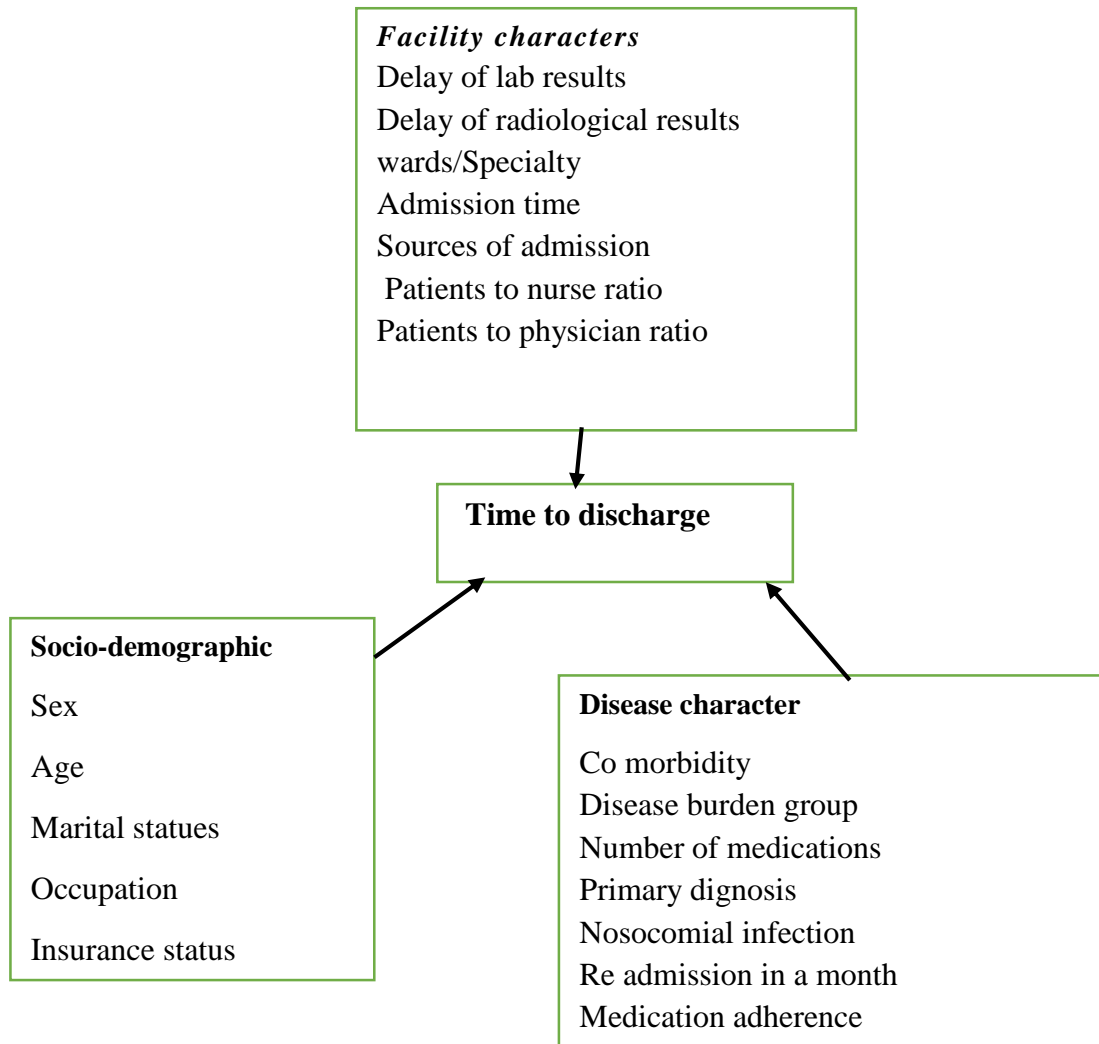


Figure 1: conceptual frame work of factors associated with delayed discharge in hospital synthesized from above literature reviews (30, 39, 44-46)

4. Objectives

4.1 General objective

To determine time to discharge and its predictors among admitted patients in Felege Hiwot comprehensive specialized hospital in Bahir Dar, northwest Ethiopia, 2020G.C

4.2 Specific objectives

1. To estimate the median survival time of discharge among admitted patients in medical and surgical wards in Felege Hiwot Comprehensive Specialized Hospital in 2020
2. To estimate the incidence density for discharge among admitted patients in medical and surgical wards in Felege Hiwot Comprehensive Specialized Hospital in 2020
3. To identify predictors of discharge among admitted patients in Felege Hiwot Comprehensive Specialized Hospital in 2020

5. Methods and materials

5.1 Study setting

The study was conducted from March to May in 2020 at Felege Hiwot comprehensive specialized hospital which is found in Bahir Dar city. Bahir Dar is the capital city of Amhara national regional state and is found 563km northwest from Addis Ababa. It was established in 1963 G.C. and located at northern end of the city near Lake Tana. The hospital is intended to serve five million people. Currently the hospital delivers health service as outpatient and inpatient management in different departments.

The hospital has 482 beds in 11 different specialized cares which has one emergency ward and Inpatient wards such as Gynecological & Obstetric, Surgical, orthopedics, Medical, Pediatric, L&D, Eye unit, NICU, psychiatrics, oncology and 22 OPDS and. Inpatient admission roots were from emergency, OPD and ICU. In 2011 annual there were report admission of 25962 patients in all wards (47).

For purpose of this study inpatient wards were classified into two major wards named as medical wards and surgical wards. Medical wards include in this study adult medical ward, pediatrics and oncology. Under Surgical wards general surgical ward, orthopedics, gynecology and, labor and delivery categorized (48, 49).

5.2 Study design

Prospective cohort study which has better ability to accesses missed information from registrations to determine hospital stay was used. Out of 854 respondents, 812 respondents each followed for maximum of fourteen days from March to May in 2020.

5.3 Study participant

All admissions from March to May in 2020 were source population for the study. Patients admitted in general surgical, orthopedics, gynecology, labor and delivery, adult medical, pediatrics and oncology wards admitted patients in study period from March to May in 2020 at Felege Hiwot Comprehensive specialized hospital were being candidates for the study.

Inclusion criteria: Patients admitted in general surgical, orthopedics, gynecology, labor and delivery, medical wards include adult medical, and pediatrics and oncology wards admitted patients in study period.

Exclusion criteria: Moved from one study to other study wards (staying in different study wards was difficult to determine how long stayed in admission) was excluded.

The Selected individual in ward was followed daily in inpatients for the follow up variables and recorded according to the checklist.

Events: being discharged.

Censored: loss to follow-up, transferred, died and not discharged in data collection period

5.4 Sample size determination

Epi info version 7.2.0.1 was used to calculate the minimum sample size by considering 95% confidence interval, power of 80, and 1:1 ratio of medical and surgical ward patients. Proportion of discharge in 14 days stay 50% in internal medicine wards and the proportion of inpatient taken as 10% deference of surgical ward, due to lack of similar study done in Ethiopia. The total sample size calculated for medical and surgical ward patients each was 388, gave the total sample 776,

and 10% added to compensate lost follow up and drop out of patients, and the final sample size became 854.

5.5 Sampling technique/procedure

stratified random sampling was used to select patients in both groups. The total patients flow from the previous year during the same period was used to calculate the sampling interval. From each wards medical every other and from each surgical wards every third admissions were selected (figure 2).

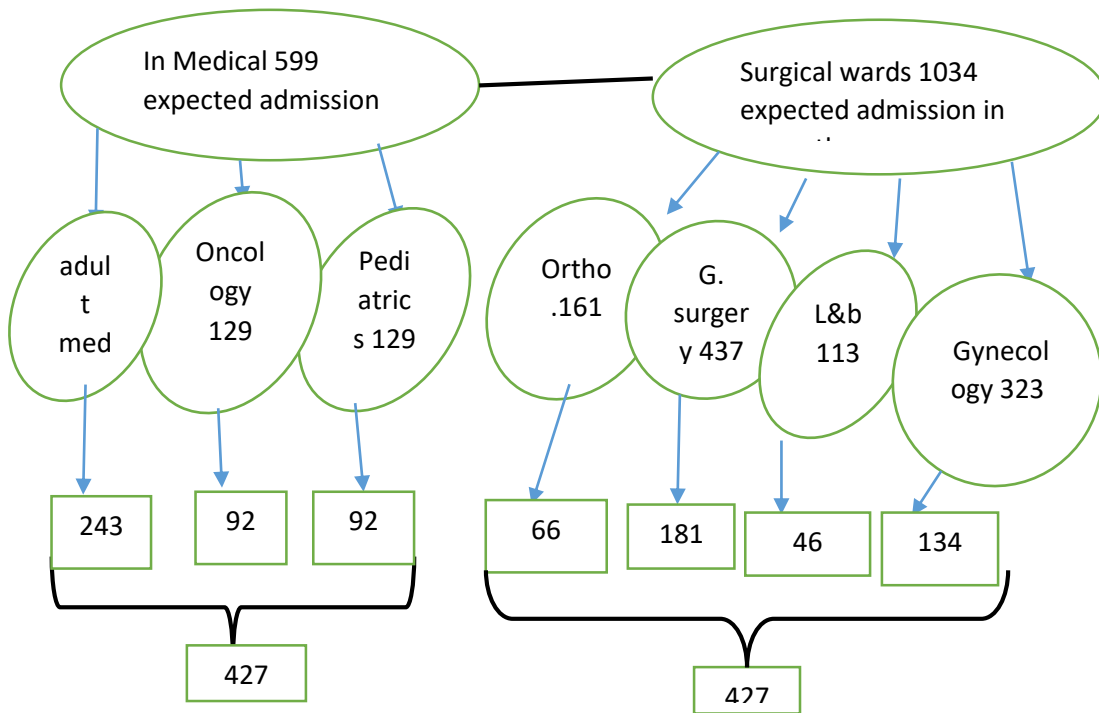


Figure 2; sampling procedure for study participant from two major wards in Felege Hiwot compressive specialized hospitals March 2020

5.6. Study variables

5.6.1 Dependent variable

Time to discharge

Discharge status

5.6.2 predictors of discharge

Patient's characteristics/ base line characteristics

- Sex
- Age
- marriage
- Occupation
- Insurance status
- Education
- Family care

Facility characters

- Delay of lab results
- Delay of radiological results
- Specialty
- Admission time
- Sources of admission
- Nurse to Patients ratio
- Physician to Patients ratio

Disease character

- Diagnosis
- Co morbidity
- Disease burden group
- Nosocomial infections
- Number of medicines
- Medication adherence
- Re admission in a month

5.7 Operational definitions/measurements

- Time to discharge: in this study, time taken from admission till discharged from inpatients to home or other facility in follow-up period.
- Discharge: discharging of patient within 14 days in admission to home or other facility. To measure inpatient service efficiency hospitals, use two-week duration data from patients. So, this paper uses two-week duration for each patient to gather almost similar information from patients (4).
- The primary diagnosis is the main diagnosis for admission (10). Recorded from patients card as soon as diagnosed.
- Nosocomial infection: presences of hospital acquired infection registered on patients' card as nosocomial infection.
- Disease burden group: in this study primary diagnosis were categorized as global burden of disease into four categories; communicable, non-communicable, injuries and maternal, perinatal conditions.

- Arrival of lab/radiological results; any result report come after its usual time known as turnaround time for each test (24).
- Comorbidity; presence of more than one diagnosis
- Number of medications; number of medicines each patient taking and registered in patients' card.
- Time of admission; off and office our admission. Those admitted at 8:30 am to 5:30pm from Monday to Friday excluding Holy days are office hour admission. And other ways off-hour admission.
- Family care; presence of attendant during stay period.
- Nurse to Patients ratio; number of nurse divided by number patients at admission
- Physician to Patients ratio; number of physician divided by number patients at admission
- Medication adherence; using morisky scale 4 questions scores was given from 0-4 according to the answer by each patients it is validated tool in researches (50, 51).

Morisky Scale Scoring systems

1. Do you ever forget to take your medicine?
2. Are you careless at times about taking your medicine?
3. When you feel better, do you sometimes stop taking your medicine?
4. Sometimes if you feel worse when you take the medicine, do you stop taking it?

Yes=0 and No=1

- Zero is the lowest level of medication adherence
- 4 is the highest level of medication adherence

Patients who scored 0-2 were non-adherent while 3-4 scored were adherent

5.8 Data collection instrument and process

Data collected by trained collectors prospectively from participants' admission data, medical records and short interview. The checklist was derived from related literature. All candidate patients were registered and given an ID with checklist bearing base line data. Three-degree nurses who had day training on how to record data filled the checklist.

The base line data like age, sex, primary diagnosis and date of admission were recorded from patient card while education, insurance status, marriage and occupation short interview at admission were carried out as soon as patient admitted. Then any laboratory and radiological investigations report came after its turn round time was not applicable since investigation results were so late. Even investigation stays more than days in ward admitted patients and no results reports were available at its usual time known as turnaround time., so this study used number of days' investigation reported back to the patients were recorded. For nosocomial infection followed presences of hospital acquired infection registered on patients' card is recorded in follow up period. Comorbidity was recorded from cards if more than one diagnosis presents.

5.9 Data quality

The checklist was pre-tested in other similar hospital study area on 5% of sample to overcome any difficulties in variables measuring during data collection and any further valid and reliable ways to measure. Principal investigator had close supervision to overcome any mistakes from data collectors. After checking all checklists for consistency and completeness the data collectors submitted the filled checklist to the principal investigator. Incorrectly filled or missed records were

sent back to the respective data collector for correction. Data collectors had no information which ward was related to outcome variables to reduce bias.

5.10 Statistical methods

The collected data was coded, cleaned and entered into EpiData Version 3.1, and exported into Stata version 15 for data processing and analysis. The first analysis were descriptive statistics to examine proportion of participants responded then the median and range of age was determined after checking the normality. Using person days, incidence density of discharge was determined. Cumulative probability of survival time to the discharge was determined by life table and Kaplan Meier survival curve. Log rank test to compare survival of medical and surgical wards was used. Variables from bivariate analysis with $p < 0.25$ were candidate for final model. Final model was determined by forward variable selection method with $p < 0.05$. Continuous variable, age was checked for its log linearity by grouping and fractional polynomial method and each methods model compared using the list Akaike information criterion (AIC) value model. Age as continues log hazard with list AIC was selected and for meaning full interpretation 5-year increase was used. Nurse to patient ratio and medication adherence data were grouped according to previous literatures. Final model was checked for statistical test of hazard proportional assumption using global test and violated, so farther parametric survival model with list AIC (Weibull hazard) was used. Post-estimation plots for Weibull distribution assumption was checked for model fitness. Adjusted Weibull Hazard risk with their 95% CI and $p < 0.05$ was used to identify the predictors of discharge.

5.11 Ethical consideration

Approved ethical clearance was obtained from Bahir Dar University, College of medicine and health science Institutional Review Board. Formal letter of cooperation was written from the university of Bahir Dar ethical clearance committee to Felege Hiwot comprehensive specialized hospital.

Written consent was taken from each study participants during provision of information about the purpose and benefit of the study and was told about their right to withdraw from the study at any time. Confidentiality of the information was maintained throughout the study period by using anonymity identifiers.

6. Results

6.1 Population profile

A total of 812 admitted patients participated in the study giving total response rate of 95%. Five percent (19 from medical and 23 from surgical wards) refused the consent at admission. From participants 55 present were females and about 43% were illiterate. Participants age range from one month to 88 years with median age of 32 years.

In medical ward, half of the study participants were males and 41% of the study participants were more than 40 years old. About forty percent were illiterate. In surgical ward about fifty-nine percent of the study participants were female and 18% of the study participants were less than 20 years old. Forty-six percent were illiterate (table 1).

Table 1. Socio-demographic characteristics of admitted patients in Felege Hiwot compressive specialized hospital 2020 (n = 812)

variables		Medical ward		Surgical ward		Total	
		frequency	%	frequency	%	Frequency	%
Age group	0-20	119	29.24	72	17.78	191	23.52
	21-30	57	14	151	37.28	208	25.62
	31-40	66	16.22	109	26.9	175	21.55
	40+	165	40.54	73	18.02	238	29.31
Sex	Male	197	48.40	167	41.23	364	44.83
	Female	210	51.60	238	58.77	448	55.17
Education	Illiterate	165	40.44	186	46.04	351	43.23
	Primary	86	21.08	98	24.26	184	22.66
	Secondary	112	27.45	90	22.28	202	24.88
	Tertiary	45	11.03	30	7.43	75	9.24
Marital status	Married	207	50.86	270	66.67	477	58.74
	Single	200	49.14	135	33.33	335	41.26
Insurance	Insured	201	49.26	202	50	409	50.37
	Uninsured	207	50.74	202	50	403	49.63
Family care	Present	387	94.85	379	93.81	766	94.33
	Absent	21	5.15	25	6.19	46	5.67

6.2 Survival status of admitted patients

The total time admitted patients followed was 3877 days. The incidence density of discharge was 720/3877 person days. One fourth, 50% and 75% of the admitted patients discharged at day 3, 4 and 6 respectively (table 2 and figure 3). The discharge time was longer for surgical wards admitted patients compared to medical ward admitted patients (figure 4).

Table 2. Life table for discharge of admitted patients in Felege Hiwot compressive specialized hospital 2020 (N = 812)

Interval	Beg. Total	discharges	censored	C.Survival	(95% conf.int)
1-2	812	70	12	0.9132	0.8915-0.9306
2-3	730	76	10	0.8174	.7889-0.8425
3-4	644	128	16	0.6529	0.6185-0.6850
4-5	500	126	8	0.4871	0.4514-0.5218
5-6	336	121	9	0.3240	0.2909-0.3575
6-7	236	73	4	0.2229	0.1937-0.2535
7-8	159	43	3	0.1621	0.1364-0.1897
8-9	113	23	3	0.1286	0.1054-0.1543
9-10	87	18	0	0.1020	0.0811- 0.1256
10-11	69	8	1	0.0901	0.0704- 0.1127
11-12	60	15	1	0.0674	0.0503-0.0877
12-13	44	11	1	0.0504	0.0357- 0.0686
13-14	32	6	1	0.0408	0.0276- 0.0577
14-15	25	2	23	0.0347	0.0219-0.0520

In medical ward 408 patients followed during the study period with response of rate 96%. The total time at risk/admission in medical wards was 1803 days. The incidence densities of discharge in this wards were 364/1803 (2019/10000)-person days. Most of the patients (97%) discharged in 9 days. One fourth, 50% and 75% discharged at day 3, 5 and 6 days (table 3 and finger 4).

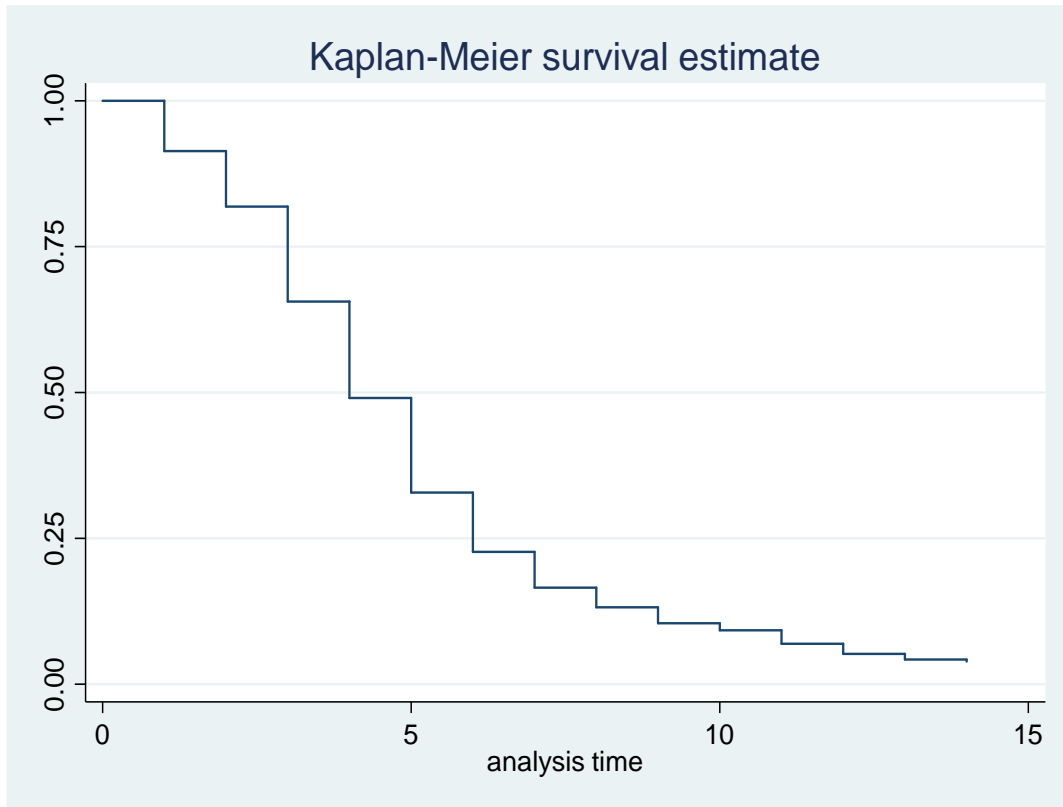


Figure 3. Kaplan Meier curve showing survival time to discharge in Felege Hiwot compressive specialized hospital, 2020

Table 3. life table for discharge of medical ward admitted patients in Felege Hiwot compressive specialized hospital 2020 (n1 = 408)

Interval	Beg.	Discharges	censored	Survival	(95% conf.int)	
	Total					
1-2	408	47	10	0.8834	0.8478	0.9111
2-3	351	29	4	0.8100	0.7679	0.8452
3-4	318	61	12	0.6516	0.6022	0.6965
4-5	245	58	0	0.4974	0.4464	0.5462
5-6	181	71	8	0.3044	0.2585	0.3514
6-7	108	43	2	0.1821	0.1443	0.2234
7-8	63	20	0	0.1243	0.0926	0.1609
8-9	43	17	2	0.0740	0.0496	0.1046
9-10	24	8	0	0.0493	0.0298	0.0760
10-11	16	1	1	0.0461	0.0273	0.0723
12-13	14	6	1	0.0256	0.0121	0.0477
13-14	7	2	0	0.0183	0.0073	0.0386
14-15	5	1	4	0.0122	0.0033	0.0336

In surgical ward 404 admitted patients followed with response rate of 95%. The total time at risk/admission in surgical wards was 2074 days. The incidence densities of discharge 356/2074 (1716/10000)-person days. Most of the patients (97%) discharged in 11 days. One fourth, 50% and 75% discharged at day 3, 4 and 7 in surgical wards (table 4 and figure 4)

Table 4. Life table for discharge of surgical ward admitted patients in Felege Hiwot compressive specialized hospital 2020 (n1 = 404)

interval	Beg. total	Discharges	censored	Survival	(95% conf.int)	
1-2	404	23	2	0.9429	0.9154	0.9617
2-3	379	47	6	0.8251	0.7841	0.8589
3-4	326	67	3	0.6544	0.6053	0.6990
4-5	255	68	8	0.4771	0.4267	0.5258
5-6	179	50	1	0.3435	0.2963	0.3911
6-7	128	30	2	0.2624	0.2191	0.3075
7-8	96	23	3	0.1985	0.1597	0.2404
8-9	70	6	1	0.1814	0.1440	0.2222
9-10	63	10	0	0.1526	0.1179	0.1914
10-11	53	7	0	0.1324	0.1000	0.1695
11-12	46	15	1	0.0888	0.0621	0.1212
12-13	30	5	0	0.0740	0.0497	0.1044
13-14	25	4	1	0.0619	0.0398	0.0905
14-15	20	1	19	0.0560	0.0343	0.0852

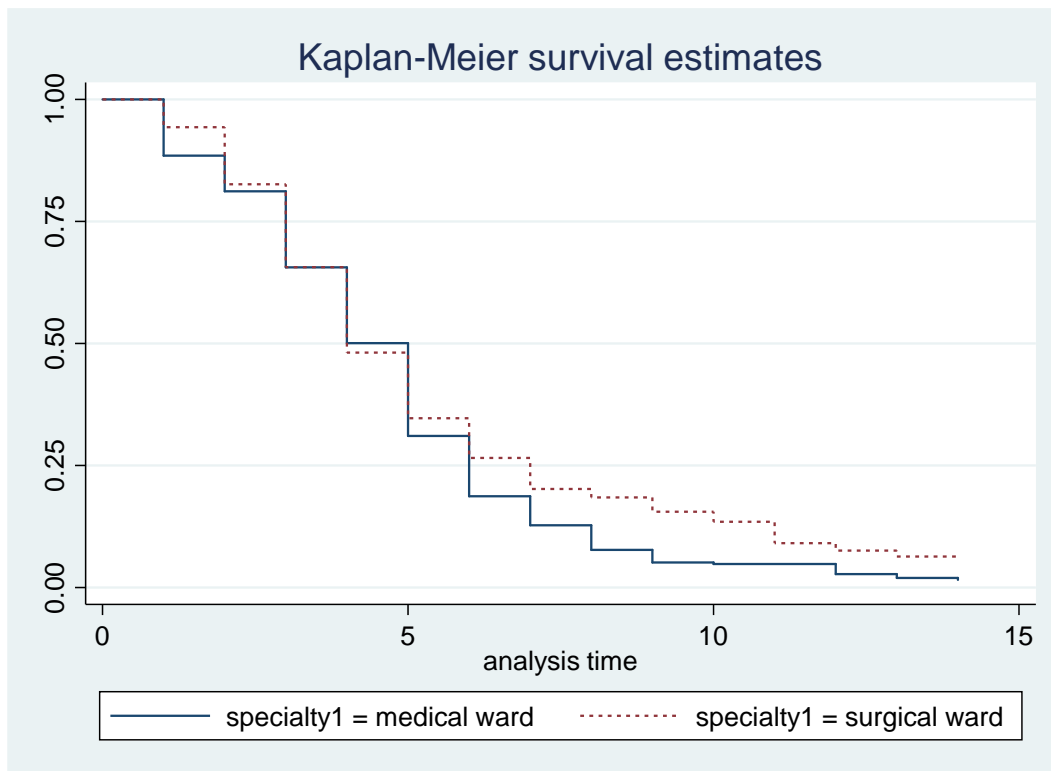


Figure 4. Kaplan Meier curve of medical and surgical ward admitted discharges in Felege Hiwot compressive specialized hospital, 2020

Table 5. The log rank test of medical and surgical wards

wards	Events	
	observed	expected
Medical wards	364	333.21
Surgical wards	356	386.79
total	720	720.00
Chi2=6.96	p<0.00	

The survival function of medical and surgical wards was significantly different.

6.2 Predictors of Discharge

The variables included in the final model after forward selection ($p < 0.05$) were age, presence of family care, admission source, admission time, lab. result delay, radiological result delay, disease burden group, presence of comorbidity, specialty, nurse to patients' ratio, and medication adherence (table 5).

In this study, the discharge time was longer in children, i.e. as the age of the patient increase by 5 years, probability of discharge decreased by 4% (AHR 1.04(1.02-1.06)). Radiology result arrival more than one-day delay increased discharge by 22% (AHR .78 (.64-.95)) compared to first day delay. Presence of comorbidity increased discharge by 50% (AHR.50(.42-.60)) compared to without comorbidity. Admission from emergency decreased discharge by about 2 folds (AHR 2.07(1.39-2.90)) compared to admission ICU. Admission from OPD decreased discharge by about 1.6 fold (AHR 1.59 (1.08-2.33)) compared to admission ICU.

Discharges of off hour admission increased length of stay by 43% (AHR .57(.49-.67)). Discharge of combined non-communicable, maternal and prenatal condition admission was decreased by 2.2 times compared to discharge of combined infectious and injuries admission (AHR 2.15(1.84-2.66)). Discharge time of surgical ward was increased by 34% (AHR .66(.57-.78)). In this study, patients with family care showed 31% (AHR .69(.51-.94)) higher discharge compared to without family car.

Patients with a lab result arrival second or latter day increased discharge by 33% (AHR .67(.55-.81)) compared to first day arrival of lab results. At patient admission nurse to patient ratio $\geq 1:2$ decreased discharge time by two fold (AHR 1.95 (1.57-2.43)). In addition, patient with adherence of medication decreased discharge by 2.8 fold (AHR 2.83(2.29-3.51)) compared to non-adherent.

Table 6. Predictors of discharge in Felege Hiwot compressive specialized hospital,2020

Variables	CHR	AHR	P-value	95% CI AHR
Radiology result delay	.35(.29-.41)	0.78	0.012	0.64-0.95
Comorbidity	.37(.32-.44)	0.50	0.000	0.42-0.60
Admitted from				
Emergency	2.92(2.04- 4.19)	2.01	0.000	1.39-2.90
OPD	2.20(1.52-3.19)	1.59	0.017	1.08-2.33
Admission time	.47(.40-.55)	0.57	0.000	0.49-0.6
diseaseburdengroup22	3.2(2.67-3.80)	2.22	0.000	1.84-2.66
specialty1	.88 (.76-1.02)	0.66	0.000	0.56-0.78
Family care	.78(.58-1.05)	0.69	0.017	0.51-0.94
Lab. result delay	.44(.38-.51)	0.67	0.000	0.55-0.81
Age/5	1.02(1.00-1.04)	1.04	0.000	1.02-1.06
Nurse/patient	2.80(2.32-3.36)	1.95	0.000	1.57-2.43
Medication adherence	4.25(3.44-5.25)	2.83	0.000	2.29-3.51

Post-estimation plot of hazard function shows increasing of discharge through time but not increasing or decreasing i.e. in Weibull distribution if the model is fit enough the plot is increasing or decreasing not both at the same time (figur5). Also estimated cumulative hazards plotted against the Cox–Snell residuals is close to the reference line (figure 6)

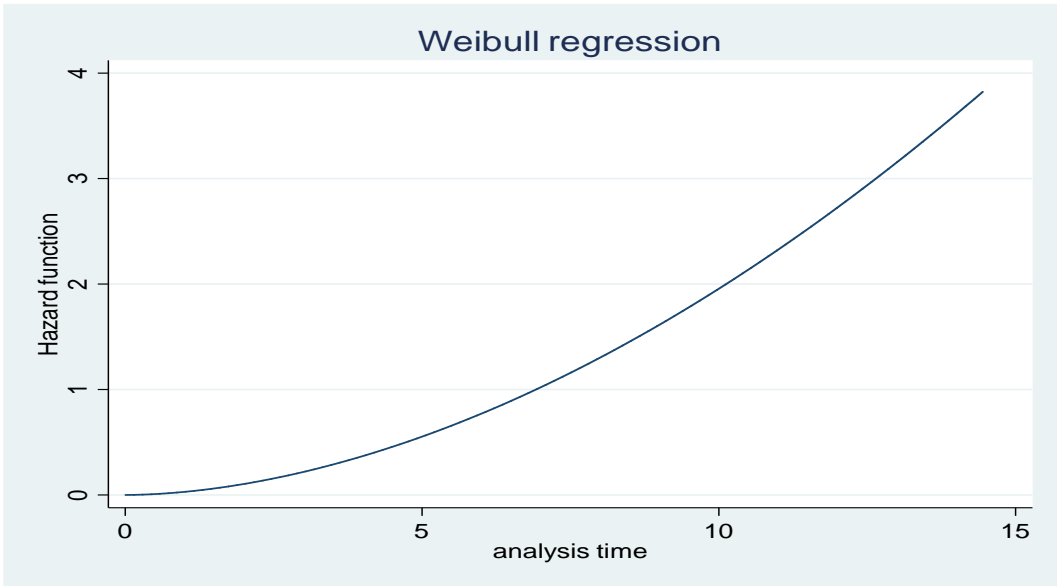


Figure 5. Plot of hazard function from Weibull regression to show model fitness

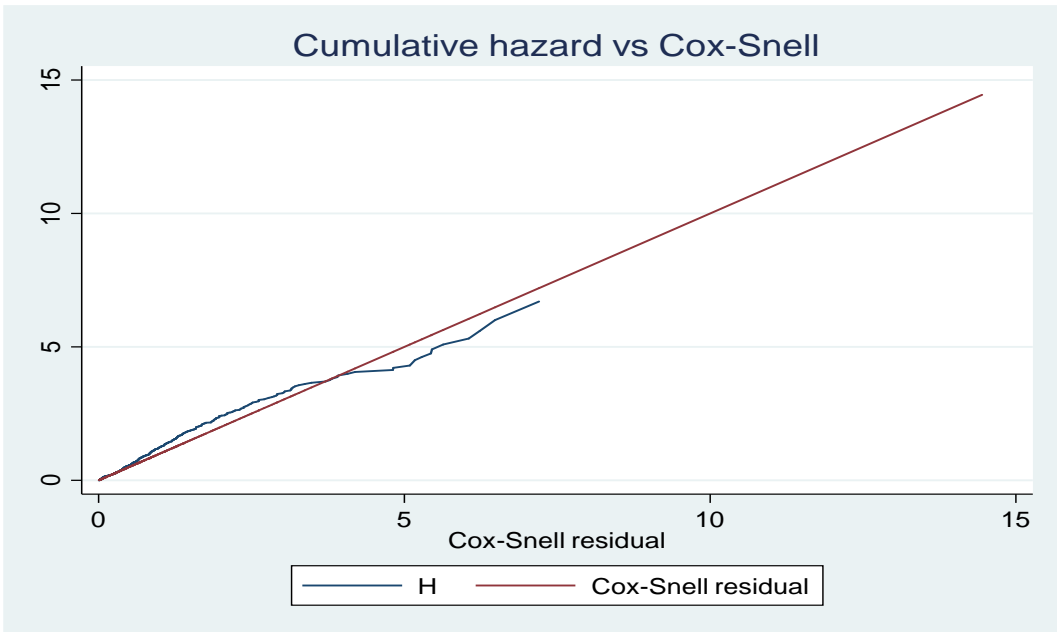


Figure 6. Goodness of fit Plot of cumulative hazard function from Weibull regression

7. Discussion

In this study incidence density to be discharged in 14 days was 720/3877 person days. This means if we follow 3877 admissions for one day 720 patients would be discharged. The incidence density of discharge in medical wards were 364/1803 i.e. if we follow 1803 admitted patient in medical ward for one day 364 patients would be discharged. Fifty percent of medical ward were discharged within five days while in surgical with in four days. Even though surgical ward admission stays longer, the median discharge time is shorter than medical.

In this study, as the age of the patient increase by five years, discharge decreased by 4%. This finding opposes with researches finding which showed probability of experiencing prolonged to discharge from hospital is significantly associated with increasing age (1, 21). In this study population, older patients were more admitted with disease which take shorter time to discharge like conditions gynecological and oncological problems and also it included broad age ranges than other studies. This study is important for consideration and seeking attention for young ages, being admitted for longer duration, to have sufficient resource allocation bearing in mind the limitation of the studies. In this study, patients with family care showed 29% increase in discharge compared to patients without family care. This finding is inconsistent with findings from England national health service on length of hospital stay, in case of absence of a family care a patient cannot be discharged home until he/she is able to manage independently or patients without adequate care at home stayed longer for social reason than medical reason (13, 20). Attendants of patients are key decision maker. So the absence of such person therefor may affect finding suitable place. Further research is need why this statistical association exist in family care and longer time to be discharged. This finding is important in understanding of how family care affects hospital stay.

In this study patient with comorbidity showed 50% increases in discharge. This is confined to the study from England and New Zealand (26, 30, 31). This is due to presence of concomitant problems requiring further treatment time leads to longer than average length of hospital (30). The significance of the medical comorbidities in this study may suggest that length of stay in admitted patients with comorbidity may not be further modifiable, but it may be more appropriate for future interventions to target on such conditions to reduce longer time hospitalization.

Discharge time of combined non-communicable, maternal and prenatal condition admission was 2.2 times higher discharge of combined infectious and injuries admission. Gynecology and obstetrics length of stay in Felege Hiwot Comprehensive Specialized Hospital is shorter than other wards and also orthopedics admitted patients stayed longer to be discharged which can contribute discharge difference in two wards (47). This evidence is important to emphasis on hospital stay in these disease group. However, individual case severity and other conditions should be considered. Patient with adherence of medication discharged 2.8 than non-adherent patients. Which is similar with findings from research findings in Indian which showed good medications adherence has favorable effect on health outcomes including reducing length of hospital stay(38). Even though this study was limited to determine individual health conditions, patients with good medication adherence benefited with early discharged.

Discharge of surgical wards were 34% higher than medical ward. Although the discharge time variation in ward exists, no established reason for this difference. possible explanation for this variation is admission of elective surgical case which had longer hospital stay time than other ward admissions in case of this hospital annual report depicts (47). This evidence is important to realize

that surgical patients are admitted for longer duration and should be considered even there are hidden factors in this study.

Radiology result arrival more than one-day increased discharge by 22% compared to first day arrival admissions. Similarly, Patients with a lab result arrival second or latter day discharge time increased by 34% compared to laboratory result arrival in first day. This finding is consistent with finding from south Ethiopia and Brazil which states waiting time for radiological service and waiting time for laboratory results significantly affected hospital discharge time (7, 45). It is obvious that whenever there is delayed test results then medical treatment and decision would wait longer time. Awaiting the results of tests for care team to make clinical decisions were responsible for the majority of extra time spent in hospital (45). It is important to notice that each investigation results reported at their scheduled turnaround time to insure effectiveness of hospital performance thereby to maintain length of hospital stay(4).

Admission from emergency decreased discharge by about 2 fold, while from OPD decreased by 1.6 fold compared to ICU admission. This finding is similar with research which showed that patients admitted through emergency have a significantly shorter length of stay as compared to those from other admission root(34). Outpatient admissions were planed and significantly related to higher need of instrumental and diagnosis exam which tend prolong length of hospital stay (34). This finding is also important to understand admission source are important determinants of discharge time and should be investigated how it determines considering drawback of this study.

Discharge of admission for off-hour admission was 43% increase compared to discharge of office hour admission. This finding is similar with studies from Australia (6, 22). Possibly due to off-hour admissions were found to have somewhat higher length of stay due to decreased quality of

care including like increased medication error rates, workload and low intensity of inpatient care (52). Even though, individual disease severity is different, this study result is important evidence to show admission time variation will determine discharge time length and consideration of off hour admissions care quality is vital.

Patients admitted to nurse to patient ratio $\geq 1:2$ discharged in 2 times lower length of stay than nurses to patient ratio $< 1:2$ at admission. This result is consistent with findings of studies which stated increased nurses per patients significantly reduced length discharge from hospitals (41, 42). This is evidenced in study which showed increased workload or nursing staff numbers significantly affected patient's outcome like length of stay and complication (41). Even though the practical meaning of this result needs further experience on staffing and time to discharge, it is important to consider recommendations of safe staffing to maintain patient's safety and to reduce length of hospitalization(53).

8. Conclusion and Limitation

8.1 Conclusion

Median time to discharge from medical ward was longer than from surgical wards. Generally surgical admitted patients were more prone to stay in hospital than medical admitted patients. Increased age, combined non-communicable, maternal and prenatal condition admission, increasing nurse to patients' ratio and higher medication adherence decreased discharge time. presence of family care, lab and radiological result delay, presence of comorbidity, admission from ICU, off-hour admission, surgical wards admission increased discharge time.

8.2 Limitation of the study

Although range of participant was broad: men and women, from children to elderly people were included in this study, generalizability of duration of discharge in other hospital in the country should account other possible confounders like staffing, standards of hospitals. Because of failing to measure severity of disease due to a lack of validated/standard tools to study setting, the generalizability of this results were in fact limited to broad categorization of patients into wards. But the research question was answered moderately by considering the difference grouping into wards. And also faced with problems to measure clinical investigation turnaround time for wards admitted patients as predicted, resulting in difficulty to measure the specific time of investigations result arrival time. Thus this study considered number of days, investigations results take to arrive at patient's bedside to consider its effect on time to discharge. In addition, similar topic researches were limited in Ethiopia and Africa to compare the results with expectation from previous studies.

8.3 Recommendation

Administrators of hospital should have emphasized on good communication of respective specialty in order to avoid delay of test results, and also practitioner should consider on teaching the benefit of medication adherence to the patients to reduce hospital stay. Further research is needed to establish more close prediction of discharge time using disease severity and others hidden confounders.

9. Reference

1. Khosravizadeh O, Vatankhah S, Bastani P, Kalhor R, Alirezaei S, Doosty F. Factors affecting length of stay in teaching hospitals of a middle-income country. *Electronic physician*. 2016;8(10):3042-7.
2. Minsiter Of Health. Ethiopian Hospital Services Transformation Guidelines In: INITIATIVE EHM, editor. first edition ed. Addis ababa2016. p. 19-8.
3. Health MO. Ethiopian hospital reform implementation guidelines. In: initiative Ehm, editor. Addis Ababa: Minister Of Health,; 2010.
4. Minister Of Health. Hospital Performance Monitoring and Improvement Manual. In: Directorate HSQ, editor. Second Edition ed. Addis ababa2017.
5. Garling P. Final Report of the Special Commission of Inquiry: Acute Care in NSW Public Hospitals, 2008. State of NSW through the Special Commission of Inquiry: Acute Care Services in New South Wales Public Hospitals Retrieved January. 2008;16:2011.
6. Richardson DB. The access-block effect: relationship between delay to reaching an inpatient bed and inpatient length of stay. *Medical Journal of Australia*. 2002;177(9):492-5.
7. Negari KG, Rodamo KM, Hirigo AT. Factors associated with the length of stay in emergency departments in Southern-Ethiopia. *BMC research notes*. 2019;12(1):239.
8. FMOH E. Health Sector Transformation Plan. HSTP 2015/16-2019/20. August; 2015.
9. Cameron PA. What is the bed availability gap underlying chronic emergency department access block? *Canadian Journal of Emergency Medicine*. 2019;21(2):165-6.
10. Lim S, Doshi V, Castasus B, Lim J, Mamun K. Factors causing delay in discharge of elderly patients in an acute care hospital. *Annals-Academy of Medicine Singapore*. 2006;35(1):27.

11. Leroyer A, Bedu A, Lombrail P, Desplanques L, Diakite B, Bingen E, et al. Prolongation of hospital stay and extra costs due to hospital-acquired infection in a neonatal unit. *Journal of Hospital Infection*. 1997;35(1):37-45.
12. Vegasi AA, Jodra VM, García ML. Nosocomial infection in surgery wards: a controlled study of increased duration of hospital stays and direct cost of hospitalization. *European journal of epidemiology*. 1993;9(5):504-10.
13. Victor CR, Healy J, Thomas A, Seargeant J. Older patients and delayed discharge from hospital. *Health & social care in the community*. 2000;8(6):443-52.
14. Rojas-García A, Turner S, Pizzo E, Hudson E, Thomas J, Raine R. Impact and experiences of delayed discharge: A mixed-studies systematic review. *Health Expectations*. 2018;21(1):41-56.
15. Fekadu A, Desta M, Alem A, Prince M. A descriptive analysis of admissions to Amanuel Psychiatric Hospital in Ethiopia. *Ethiopian Journal of Health Development*. 2007;21(2):173-8.
16. REPRESENT H. Reducing patient time in the emergency department. *The Medical Journal of Australia*. 2003;179(10):516-7.
17. Taylor DM, Bennett D, Cameron PA. A paradigm shift in the nature of care provision in emergency departments. *Emergency Medicine Journal*. 2004;21(6):681-4.
18. Langhan TS. Do elective surgical and medical admissions impact emergency department length of stay measurements? *Clinical and Investigative Medicine*. 2007:E177-E82.
19. Forster AJ, Stiell I, Wells G, Lee AJ, Van Walraven C. The effect of hospital occupancy on emergency department length of stay and patient disposition. *Academic Emergency Medicine*. 2003;10(2):127-33.
20. Martin S, Smith P. Explaining variations in inpatient length of stay in the National Health Service. *Journal of Health Economics*. 1996;15(3):279-304.

21. Gigantesco A, De Girolamo G, Santone G, Miglio R, Picardi A. Long-stay in short-stay inpatient facilities: risk factors and barriers to discharge. *BMC Public Health*. 2009;9(1):306.
22. Liew D, Liew D, Kennedy MP. Emergency department length of stay independently predicts excess inpatient length of stay. *Med J Aust*. 2003;179(10):524-6.
23. Heys M, Rajan M, Blair M. Length of paediatric inpatient stay, socio-economic status and hospital configuration: a retrospective cohort study. *BMC health services research*. 2017;17(1):274.
24. Tashkandy MA, Gazzaz ZJ, Farooq MU, Dhafar KO. Reasons for delay in inpatient admission at an emergency department. *J Ayub Med Coll Abbottabad*. 2008;20(1):38-42.
25. Cho SK, Egorova NN. The Association Between Insurance Status and Complications, Length of Stay, and Costs for Pediatric Idiopathic Scoliosis. *Spine*. 2015;40(4):247-56.
26. Jasinarachchi KH, Ibrahim IR, Keegan BC, Mathialagan R, McGourty JC, Phillips JR, et al. Delayed transfer of care from NHS secondary care to primary care in England: its determinants, effect on hospital bed days, prevalence of acute medical conditions and deaths during delay, in older adults aged 65 years and over. *BMC geriatrics*. 2009;9(1):4.
27. Parker MJ, Todd CJ, Palmer CR, Camilleri-ferrante C, Freeman CJ, Laxton CE, et al. Inter-hospital variations in length of hospital stay following hip fracture. *Age and Ageing*. 1998;27(3):333-7.
28. Burns LR, Wholey DR. The effects of patient, hospital, and physician characteristics on length of stay and mortality. *Medical care*. 1991:251-71.
29. Appelros P. Prediction of length of stay for stroke patients. *Acta Neurologica Scandinavica*. 2007;116(1):15-9.
30. Wright S, Verouhis D, Gamble G, Swedberg K, Sharpe N, Doughty R. Factors influencing the length of hospital stay of patients with heart failure. *European Journal of Heart Failure*. 2003;5(2):201-9.

31. Rochon PA, Katz JN, Morrow LA, McGlinchey-Berroth R, Ahlquist MM, Sarkarati M, et al. Comorbid illness is associated with survival and length of hospital stay in patients with chronic disability: a prospective comparison of three comorbidity indices. *Medical care*. 1996;1093-101.
32. Limsuwat C, Mankongpaisarnrung C, Dumrongmongcolgul N, Nugent K. Factors influencing the length of hospital stay in patients with acute exacerbations of chronic obstructive pulmonary disease admitted to intensive care units. *Quality Management in Healthcare*. 2014;23(2):86-93.
33. Heeren O, Dixon L, Gavirneni S, Regenold WT. The association between decreasing length of stay and readmission rate on a psychogeriatric unit. *Psychiatric Services*. 2002;53(1):76-9.
34. Vetrano DL, Landi F, De Buyser SL, Carfi A, Zuccalà G, Petrovic M, et al. Predictors of length of hospital stay among older adults admitted to acute care wards: a multicentre observational study. *European journal of internal medicine*. 2014;25(1):56-62.
35. Nobili A, Licata G, Salerno F, Pasina L, Tettamanti M, Franchi C, et al. Polypharmacy, length of hospital stay, and in-hospital mortality among elderly patients in internal medicine wards. The REPOSI study. *European journal of clinical pharmacology*. 2011;67(5):507-19.
36. Tosato M, Settanni S, Antocicco M, Battaglia M, Corsonello A, Ruggiero C, et al. Pattern of Medication Use Among Older Inpatients in Seven Hospitals in Italy: Results from the Criteria to Assess Appropriate Medication Use Among Elderly Complex Patients (CRIME) Project. *Current Drug Safety*. 2013;8(2):98-103.
37. Castellanos-Ortega Á, Suberviola B, García-Astudillo LA, Holanda MS, Ortiz F, Llorca J, et al. Impact of the Surviving Sepsis Campaign protocols on hospital length of stay and mortality in septic shock patients: results of a three-year follow-up quasi-experimental study. *Critical care medicine*. 2010;38(4):1036-43.

38. Hood SR, Giazzon AJ, Seamon G, Lane KA, Wang J, Eckert GJ, et al. Association between medication adherence and the outcomes of heart failure. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*. 2018;38(5):539-45.
39. Alupo P, Ssekitoleko R, Rabin T, Kalyesubula R, Kimuli I, Bodnar BE. Improving inpatient medication adherence using attendant education in a tertiary care hospital in Uganda. *International Journal for Quality in Health Care*. 2017:1-6.
40. Ravangard R, Arab M, Zeraati H, Rashidian A, Akbarisari A, Mostaan F. Patients' length of stay in women hospital and its associated clinical and non-clinical factors, tehran, iran. *Iranian Red Crescent Medical Journal*. 2011;13(5):309.
41. Amaravadi RK, Dimick JB, Pronovost PJ, Lipsett PA. ICU nurse-to-patient ratio is associated with complications and resource use after esophagectomy. *Intensive care medicine*. 2000;26(12):1857-62.
42. Thungjaroenkul P, Cummings GG, Embleton A. The impact of nurse staffing on hospital costs and patient length of stay: a systematic review. *Nursing Economics*. 2007;25(5):255.
43. Magalhaes AMM, Costa DGD, Riboldi CO, Mergen T, Barbosa ADS, Moura G. Association between workload of the nursing staff and patient safety outcomes. *Revista da Escola de Enfermagem da U S P*. 2017;51:e03255.
44. Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine*. 2002;346(22):1715-22.
45. Silva SAd, Valácio RA, Botelho FC, Amaral CFS. Reasons for discharge delays in teaching hospitals. *Revista de saude publica*. 2014;48(2):314-21.
46. Varga Z, Sabzwari SAR, Abusaada K. Impact of Consultation on Hospital Outcomes and Resource Utilization for Patients with Acute Congestive Heart Failure. *South Med J*. 2017;110(7):452-6.

47. HOSPITAL ANNUAL REPORT OF 2011EFY. Bahirdar: Felege hiwot comprehensive specialized hospital; 2011 EFY.
48. Shaffer EE, Pham A, Woldman RL, Spiegelman A, Strassels SA, Wan GJ, et al. Estimating the Effect of Intravenous Acetaminophen for Postoperative Pain Management on Length of Stay and Inpatient Hospital Costs. *Advances in Therapy*. 2016;33(12):2211-28.
49. Kishi Y, Meller WH, Kathol RG, Swigart SE. Factors affecting the relationship between the timing of psychiatric consultation and general hospital length of stay. *Psychosomatics*. 2004;45(6):470-6.
50. Ambaw AD, Alemie GA, Mengesha ZB. Adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia. *BMC public health*. 2012;12(1):282.
51. Rosen OZ, Fridman R, Rosen BT, Shane R, Pevnick JM. Medication adherence as a predictor of 30-day hospital readmissions. *Patient preference and adherence*. 2017;11:801.
52. Shanley LA, Lin H, Flores G. Factors associated with length of stay for pediatric asthma hospitalizations. *Journal of Asthma*. 2015;52(5):471-7.
53. Education LN. The Importance of the Optimal Nurse-to-Patient Ratio. *Lippincott Nursing Education Blog* Last accessed April. 2016;28:2020.

10. Annexes

10.1 Annex I: Consent Form

Hello. My name is _____ and I am here to collect health related data for the purpose of research.

I would like to ask you questions related to patient time discharge while you are at in admitted at Felege Hiwot comprehensive specialized hospital. The information you provide will help us to decrease the times of getting treatment and discharge from the hospital and improve the patient satisfaction and quality of care. We assure you that whatever information you provide will only be used for the purpose of this research and will not be made available to anyone. I appreciate you too much for your willingness and support to respond the interview. We also assure that the interview process will not bring any harm to you and your family. The interview process will require approximately 10 minutes of your time. Your participation is voluntary. If you choose not to answer a particular question, that is your right. You are also permitted to withdraw any time from the study when you feel uncomfortable with it.

The purpose of the study and confidentiality procedures has been explained to me and I on my own consent:

- a) Agree-----
- b) Disagree-----

Respondent ID's-----

Data collector name-----Signature.....

Thank you very much

የስምምነት ቅጽ

ሰላምነው. ስሜ _____ ነው። እኔ ለምርምር ዓላማ ከጤና ጋር የተዛመደ መረጃ ለመሰብሰብ እዚህ መጥቻለሁ። ተኝቶ ሕክምና ክፍል ውስጥ የታካሚ ቆይታ ጋር የሚዛመዱ ጥያቄዎችን መጠየቅ እፈልጋለሁ። እርስዎ የሚሰጡት መረጃ ከሆስፒታሉ ህክምና እና ቆይታ መዘግየትን ለመቀነስ እና የታካሚውን እርካታ እና ጥራትን ለማሻሻል ይረዳናል። እርስዎ የሚሰጡት ማንኛውም መረጃ ለዚህ ምርምር ዓላማ ብቻ የሚውል እና ለማንም የማይገኝ መሆኑን እናረጋግጣለን። በቃለ- ምልልሱ ላይ ምላሽ ለመስጠት ለሰጡት ፈቃደኛ እና ድጋፍ በጣም አመሰግናለሁ። የቃለመጠይቁ ሂደት እርስዎንም ሆነ በቤተሰብዎ ላይ ምንም ዓይነት ጉዳት እንደማያስከትሉ ዋስትና አለን። የቃለመጠይቁ ሂደት ጊዜዎ በግምት 10 ደቂቃዎችን ይፈልጋል። የእርስዎ ተሳትፎ በፈቃደኝነት ነው። ለአንድ ልዩ ጥያቄ ላለመመለስ ከመረጡ ይህ የእርስዎ መብት ነው። እንዲሁም ለጥናቱ የማይመቹዎት ከሆነ ከጥናቱ ማንኛውንም ጊዜ እንዲወጡ ተፈቅዶልዎታል ። የጥናቱ ዓላማ እና ምስጢራዊ አሠራሮች ለእኔ እና እኔ በራሴ ፈቃድ ተብራርተውልኛል።

ሀ) እስማማለሁ -----

ለ) አለስማማም -----

መልስ ሰጪው መታወቂያ -----

የመረጃ አሰባሳቢ ስም -----

ፊርማ-----

በጣም አመሰግናለሁ!

10.2 Data collection Tools (questionnaire)

10.2.1 English version interviewed type of questionnaire

Annex II: CHECK LIST FOR MEDICAL RECORDS AND PATIENTS RESPONSE REVIEW

Part II; OBSERVATION CHECK LIST will be collected by data collectors			
Part II a: socio demographic characteristics			
S.N	Variables	Responses	Measurements
01	Admission date	d/m/y
02	Age	-----	
03	Sex	1 Male 2. Female	
04	Education	1 Unable to read and write 2 Primary 3 Secondary 4 Tertiary level	
05	Marital status	1 Single 2 Married 3 Divorced 4 Widowed	
06	Occupation	1 Student 2 Farmer 3 Employed 4 Merchants 5 Day laborer 6 Others	
07	Insurance	1 Insured	

		2 Not insured	
08	Family care	1 Yes 2 No	At admission
Part II b; ward patients			
	Variables		
09	Admission time	1 Office hour 2 Off hour	
10	Admitted from	1. Emergency 2. OPD 3. ICU	
11	Specialty	1 General surgery 2 Orthopedics 3 Internal medicine 4 Obyi &gyni 5 Pediatrics	
12	Diagnosis	Primary diagnosis
13	Disease burden group	1 CDs 2 NCDs 3 injuries 4 others (maternal perinatal, nutritional conditions)	
14	Comorbidity	1 Yes 2 No	Presence of more than one dx
15	Nurse to		

	Patients ratio		
16	physician to patients ratio		
17	Readmission with in on month	1 Yes 2 NO	
Update variables			
18	Lab results arrival	1 In first day 2 In second day 3 In third day 4 No request	
19	radiological results arrival	1 In first day 2 In second day 3 In third day 4 No request	
20	Nosocomial infections	1 Yes 2 NO	From medical record the presence is recorded
21	Number of medications use in hospital stay	Number.....	Counts from medical records and
22	Medication adherence		Scores 0_4 (yes=0 No=1)
23	Discharge date		d/m/y in Ethiopia calendar
24	Length of stay	Day-----	Length of stay recorded

25	Discharge status	1 Discharged 2 Died 3 Transferred 4 loss to follow up 5 not discharged	
----	------------------	--	--

Questions related to medication adherence

1. Do you ever forget to take your medicine?
2. Are you careless at times about taking your medicine?
3. When you feel better, do you sometimes stop taking your medicine?
4. Sometimes if you feel worse when you take the medicine, do you stop taking it?

Yes=0 and No=1

10.2.2: Study information sheet form in Amharic version

የተኝቶ መታከሚያ ክፍል መጠየቂያ

ማህበራዊና ስነ-ሕዝብ ባህሪዎች			
ተቁ	ጥያቄዎች	መልስ	መለካት
01	የመግቢያ ቀን		ቀ/ወ/አ
02	ዕድሜ		
03	ጾታ	1.ወንድ 2.ሴት	
04	የት/ደረጃ	<ol style="list-style-type: none"> 1. መጻፍ ና ማንበብ የማይችል 2. የመጀመሪያ ደረጃ 3. ሁለተኛ ደረጃ 4. ሶስተኛ ደረጃ 	
05	ትዳር ሁኔታ	<ol style="list-style-type: none"> 1. ያገባ 2. ያላገባ 3. የፈታ 4. ባሉዋ/ሚሰቱን በሞት ያጣ 	
06	የስራ ሁኔታ	<ol style="list-style-type: none"> 1. ተማሪ 2. አርሶአደር 3. የመንግስት ሰራተኛ 	

		<ul style="list-style-type: none"> 4. ነጋዴ 5. የቀንሰራተኛ 	
07	የጤና መድን	<ul style="list-style-type: none"> 1. አለ 2. የለም 	
08	አስታማሚ	<ul style="list-style-type: none"> 1. አለ 2. የለም 	
የሆስፒታል እና የበሽታ ሁኔታ			
09	የተኙበት ሰዓት	<ul style="list-style-type: none"> 1. የስራ ሰዓት 2. ከመንግስት ስራ ሰዓት ውጭ 	
10	የተላከበት ቦታ	<ul style="list-style-type: none"> 1. ከድንገተኛ ክፍል 2. ከተመላላሽ ክፍል 3. ከጽኑ ህመማን ክፍል 	
11	ተኝተዉ የታከሙበት ቦታ	<ul style="list-style-type: none"> 1. አጠቃላይ ቀዶ ጥገና 2. የአጥንት ህክምና 3. የዉስጥ ድወ ህክምና 4. የጽንሰና የማህጽን 5. የህጻናት ህክምና 6. የካንሰር ህክምና 	
12	ምርመራ		
13	የበሽታ ምደባ	<ul style="list-style-type: none"> 1. ተላላፊ በሽታ 	

		2. ተላላፊ ያልሆነ በሽታ 3. ጉዳቶች 4. የእናቶች ፡ የወሊድ ፣ የአመጋገብ ሁኔታዎች	
14	ተያያዥ ህመም	1. አለ 2. የለም	
15	ነርስ ታካሚ ንጽጽች		
16	ሃኪም ታካሚ ንጽጽር		
17	በአንድ ወር ውስጥ ለሁለተኛ ጊዜ መተዋል	1. አዎ 2. አይ	
በክትትል የሚሰበሰቡ መጠየቆችህ			
18	ላብራቶርይ ውጤት	1. በመጀመሪያ ቀን 3. 2> ቀን 2. በሁለተኛ ቀን 4. የለም	
19	ራድይሎግይ ውጤት	1. በመጀመሪያ ቀን 3. 2> ቀን 2. በሁለተኛ ቀን 4. የለም	
20	ሆስፒታል ኢንፈክሽን	1. አለ 2. የለም	
21	የመዳሃኒት ብዛት		
22	የመዳሃኒት ክትትል		0-4(አው=0, አይ=1)
23	የወጡበት ቀን		ቀ/ወ/አ

24	የቆይታ ጊዜ		
25	ሁኔታ	1.ወጣ 2.ሞተ 3.ተላለፍ 4.ጠፋ 5.አልወጣም	

ክፍል 2: ከመዳሃኒት ክትትል ጋር ተያያዥነት ያላቸው ጥያቄዎችህ

1. መዳሃኒትዎን መውሰድ ይረሳሉ?
2. አንዳንድ ጊዜ መዳሃኒትዎን ለመውሰድ ግድየለሽ ነዎት?
3. ጥሩ ስሙት ሲሰማዎት አንዳንድ ጊዜ መዳሃኒት ያቅርጡ?
4. አንዳንድ ጊዜ መዳሃኒቱን በሚወስዱበት ጊዜ መጥፎ ስሙት ከተሰማዎት መውሰድ ያቆማሉ?

አዎ=0 አይ=1