Characteristics and Percentage of 30 Days All Cause Hospital Readmissions in Mongolia

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Objective: This study aimed to estimate the 30 days readmissions and predictors of readmission at selected referral hospitals in Mongolia.

Methods: We studied the electronic medical recording database of patients admitted to The State First Central Hospital of Mongolia, The State Second Central Hospital of Mongolia, and The State Third Central Hospital of Mongolia, from January 01, 2023, to June 30, 2023. The Institute for Healthcare Improvement's Whole system measures white paper adopted the measurement methods for hospital readmission percentages. A descriptive analysis was conducted to calculate the percentage of hospital readmissions. We examined principal diagnoses, length of stay and age and gender are variables.

Results: 31,675 hospital discharged data were recorded in hospitals over the 6-month study period. The average readmission percentage across the three hospitals were 1988 (6.3%). Most of the principal diagnosis leading to readmissions were cancer and chronic diseases.

Conclusion: The highest hospital readmission rates were observed in patients with cancer and chronic diseases, particularly among individuals aged 46-64 years in the referral hospitals.

Keywords: 30 day readmission, Rehospitalization, Performance, Quality indicators, Health Care

Introduction

Mongolia is a lower middle-income country with a population of 3.3 million [1]. Mongolia has a two-tier national healthcare system: Primary care and referral care. In alignment with Sustainable Development Goals, the World Health Organization encourages countries to adopt a people-centered healthcare approach that is free from financial burdens, aiming to achieve high-quality healthcare globally. Despite the goal, the reality is marked by significant challenges in thehealth sector [2].

Based on the needs and requirements of increasing Universal Health Coverage, to health care services, the Ministry of Finance of Mongolia, with the assistance of the Asian Development Bank, implemented healthcare financing reform in Mongoliaduring 2019-2022 [3,4]. Therefore, all levels of management and stakeholders have recently been striving to improve hospital performance. By evaluating performance measures at the level of organizational managers, we can determine which parts of the organization need improvement and performing better as what motivates improvement [5].

Hence, there admissionrate is an important indicators of hospital performance and quality measures [6-8]. Readmission to the hospital is a measure of both the care received in the hospital and thecoordination of care back to the outpatient setting. The hospital readmission percentage is defined as the percent of hospital episodes after which the patient was admitted again to referral hospital within 30 days of discharge. Readmission is the number of times a discharged patient is re-hospitalized within 30 days.

Furthermore, hospital readmission measures outpatient and inpatient careassociated with additional health care costsand the quality measure of inefficiency in care and services [9-11]. The cost of unplanned readmissions is 15 to 20 billion dollars annually [12,13] and hospital costs for preventable readmissions during six months was about 730 million US dollars in US [14]. For instance, the healthcare system in the USA incurs enormous costs related to readmissions. In 2018, 3.8 million adults were hospitalized; 14 percent of them were 30-daysall-cause readmissions, costing an average of 15,200 dollars [8]. Therefore, readmissions are a leading measure of quality of care and impact on care-related costs [6,8] in the healthcare system.

Authors use various time frames to identify hospital readmissions: 7 days (early readmission), 15 days, 30 days, 60 days and 90 days after discharge, and countries commonly use the 30 days readmissions [10,11,15,16]. Planned readmission care and services, including some readmissions, such as cancer chemotherapy, are necessary for patients, but the majority of readmissions is unplanned. Early discharge, lack of patient counseling, or patients needing to follow the treatment regimens at home are the reasons to increased unplanned readmissions [17].

Unplanned readmission is an essential indicator of the quality of care and services [10,11,18, 19]. Moreover, readmission indicates hospital performance measures such as adverse events and patient satisfaction [5,17]. Authors believe that one out of four patients readmitted within 30 days after discharge from the hospital is preventable [20,21]. In the literature, significant causes leading to readmissions, such as heart failure [7,22], stroke, pneumonia, asthma, chronic obstructive pulmonary disease (COPD), diabetes, and comorbidity [23] diagnoses with surgical procedures [24,25] have been reported.

Reducing readmissions should be a priority for hospitals and clinicians to improve the health care system's quality and attractpolicymakers' attention [18]. The US Medicare and Medicaid Services (CMS) initiated the Hospital Readmissions Reduction Program (HRRP) on October 1, 2012, to impose financial penalties on hospitals with high readmission rates. Before the first penalty was imposed, readmission rates were calculated taking into account age, gender, and co-morbid conditions (diabetes and hypertension) among people hospitalized for acute stroke, heart failure, and pneumonia from 2008 to 2011. Then, the adjusted readmission rate was compared with the actual (observed) readmission rate of the hospital, and then a penalty was imposed on hospitals that exceeded the estimated rate. HRRP implements many measures to reduce readmissions and evaluates their effectiveness [26].

In Mongolia, among the quality indicators, the percentage of repeated operations and the percentage of readmissions are included to evaluate the operation of a referral hospital [27]. However, the integrated statistics of the health sector report only on repeated operations, needing more data on readmissions [28]. Therefore, the adequacy of the hospital's performance evaluation is questionable. Presently, limited legal documents govern the recording and calculation of readmissions. To address this gap and facilitate necessary changes, the study aims to ascertain the 30 days all cause hospital readmission percentage at selected referral hospitals.

Materials and methods

We studied the electronic medical recording database of patients admitted to the referral hospitals in Mongolia, which are The State First Central Hospital of Mongolia (SFCHM), The State Second Central Hospital of Mongolia (SSCHM) and The State Third Central Hospital of Mongolia (STCHM) from January

01, 2023, to June 30, 2023.We determined whether they were readmitted and identified 30 days readmission rates by medical history and patient registration numbers through the electronic database. We analyzed principal diagnoses, length of stay, and age and gender are variables, which are clinically related variables.
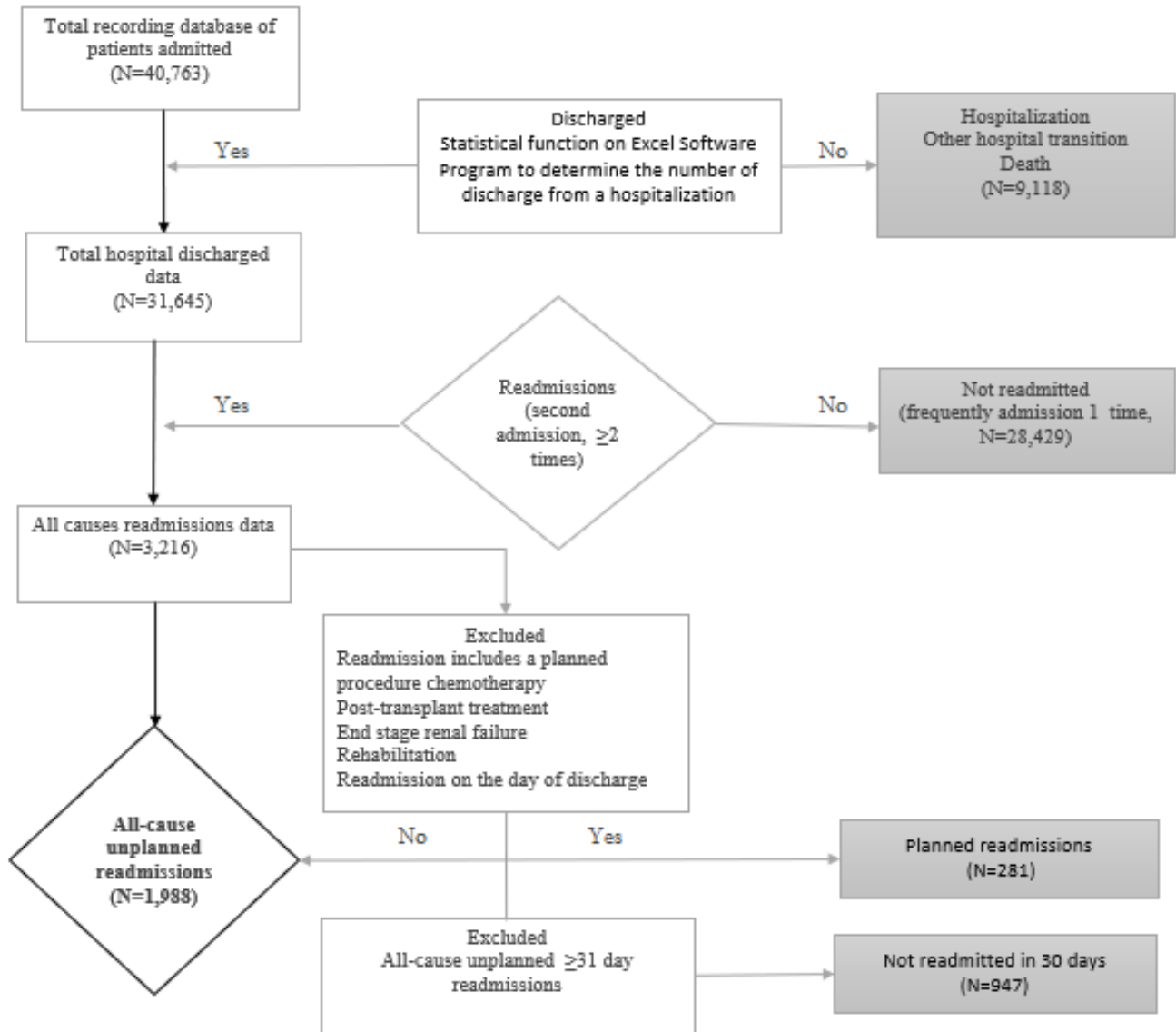

Figure 1. Sample selection flow chart

Ethical Statement

Before starting the study, we obtained written approval from the hospital's management and ethics committee. The study protocol was evaluated and approved by the Ethics Committee of the Mongolian National University of Medical Sciences (No: 2022/3-02).

Data sources and calculating

The Institute for healthcare improvement's whole system measures white paper adopted by the measurement methods for hospital readmission percentages. These whole system measures aim to measure health system's overall quality and align improvement work across a hospital, group practice, or

extensive healthcare system. Properly constructed, the whole system measures should complement existing measures that organizations use to evaluate the performance of their healthcare systems [5]. Each month, admission information databases were used to identify patients who had been discharged that month and had a second admission within 30 days of the initial discharge date. In order to collect research data, three researcherssearched the registration database of the current month and the following month using statistical function on excel software program to determine the number of patients registered for readmission to the hospital within 30 days from the discharge. After the initial search, two researchers performed the same search and double-checked it. The study was conducted for 6months at each hospital, recording of 30 day all cause readmissions of the initial hospital admission. This information was obtained from each hospital's inpatient and discharge records. We identified 30 days readmissions from the discharge date every month by cross referencing medical history and patient registration numbers through the electronic medical recording system. Planned readmissions were excluded from the study. The exclusion criteria encompassed cases related to cancer chemotherapy, post-transplant treatment, end stage renal failure, rehabilitation, and readmission on the day of discharge. Notably, there is a one-month delay in acquiring the required data, attributed to waiting for 30 days post-discharge to ensure comprehensive and accurate data collection.

Statistical Analysis

Data were extracted into a microsoft excel (*Microsoft, Redmond, Washington, USA*) software. Hospital readmission rate characteristic were calculated using descriptive analysis. We calculated the monthly readmission percentage for each of the three hospitals using the following formula. The whole system measure is

Hospital Readmission Percentage = *(Number of discharged patients readmitted to the hospital within 30 days of their discharge / Number of patients discharged) * 100 [5]*

Results

In the patient information system of the three state referral hospitals of the study, monthly calculations were performed using electronic medical recording data registered for inpatient treatment in each hospital from January 1st to June 30th, 2023. A total of 40,763 hospitalizations were registered across the participating hospitals for six months. During the study, 2,316 cases of planned and unplanned readmissions were identified. Following the exclusion criteria, which excluded planned readmissions for chemotherapy, end stages renal failure and rehabilitation, and rehabilitation, 1988 (6.3%), records were analyzed for unplanned 30 days all cause readmissions.

Table 1. A summary of patient admission

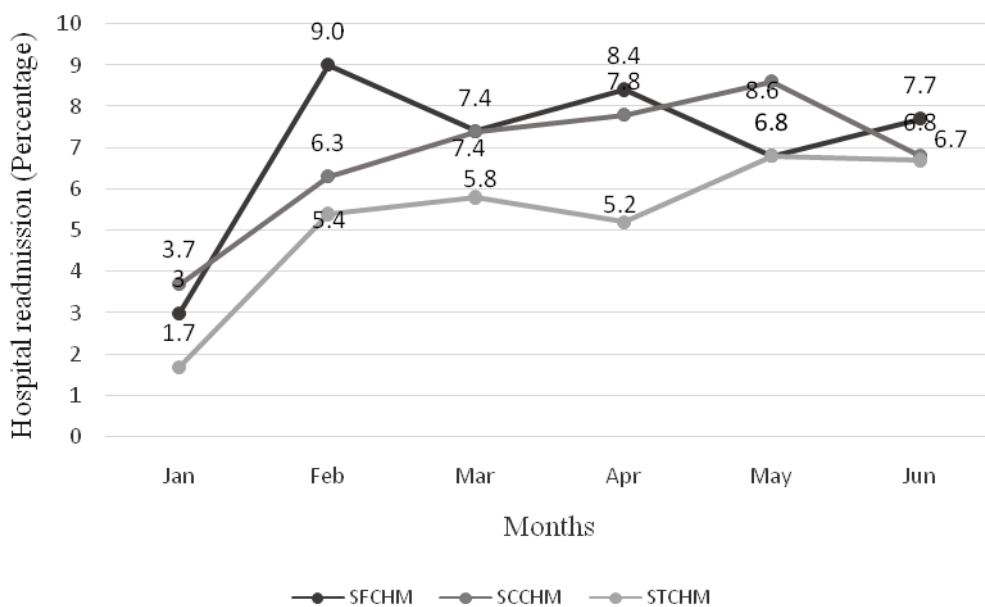| Categories	Number (n)/ Percentage (%)
Total number of discharges	31,645
Total number of all cause readmissions	2316/7.5%
Unplanned readmission	1,988/6.3%
Total number of patients	1628
Average length of stay	6.1
Mean age (year) n=1628	50;5 SD 1.14
Male	1,178
Female	1,138

Figure 2. Hospital readmission percentage at three referral hospitals

We calculated hospital readmission percentages as percentages of unplanned 30 days readmissions and the number of hospital discharges in that month. We observed rate variations by analyzing the dynamics of monthly readmissions over 6 months for each hospital. The highest rate of readmissions was observed in February at the SFCHM, reaching 144 (9.0%) while the lowest rate was 34 (1.7%) in January at the STCHM. The percentages of readmissions were similar in March: SFCHM was 156 (7.4%), SSCHM was 101 (7.4%), and in June, SSCHM was 81 (6.8%), and STCHM was 140 (6.7%). The overall average percentage of readmissions across the three hospitals was 6.3%, totally 1988 cases. The percentage of readmissions in each hospital is relatively similar, and a stable pattern was observed. The percentage of readmissions is shown for each hospital. SFCHM minimum 58 (3%) in January, 144 (9.0%) in February, 153 (6.8%) – 173 (8.4%) from March to June. The dynamics of readmissions at SSCHM is between 54 (3.7%) and 99 (8.6%), or relatively stable. STCHM readmission percentage was the lowest at 34 (1.7%) in January, the highest at 162 (7%) in May, and varied between 105 (5.2%) and 140 (6.7%) in other months.

Table 2. Common readmission diagnoses in all three hospitals and mean age of patient

Diagnoses	Readmission rate (n)
Heart failure	67
Chronic ischemic heart disease	61
Non-insulin-dependent diabetes mellitus	53

Heart failure (67 cases), chronic ischemic heart disease (61 cases), and diabetes mellitus (53 cases) were the most common readmission diagnoses across all three hospitals.
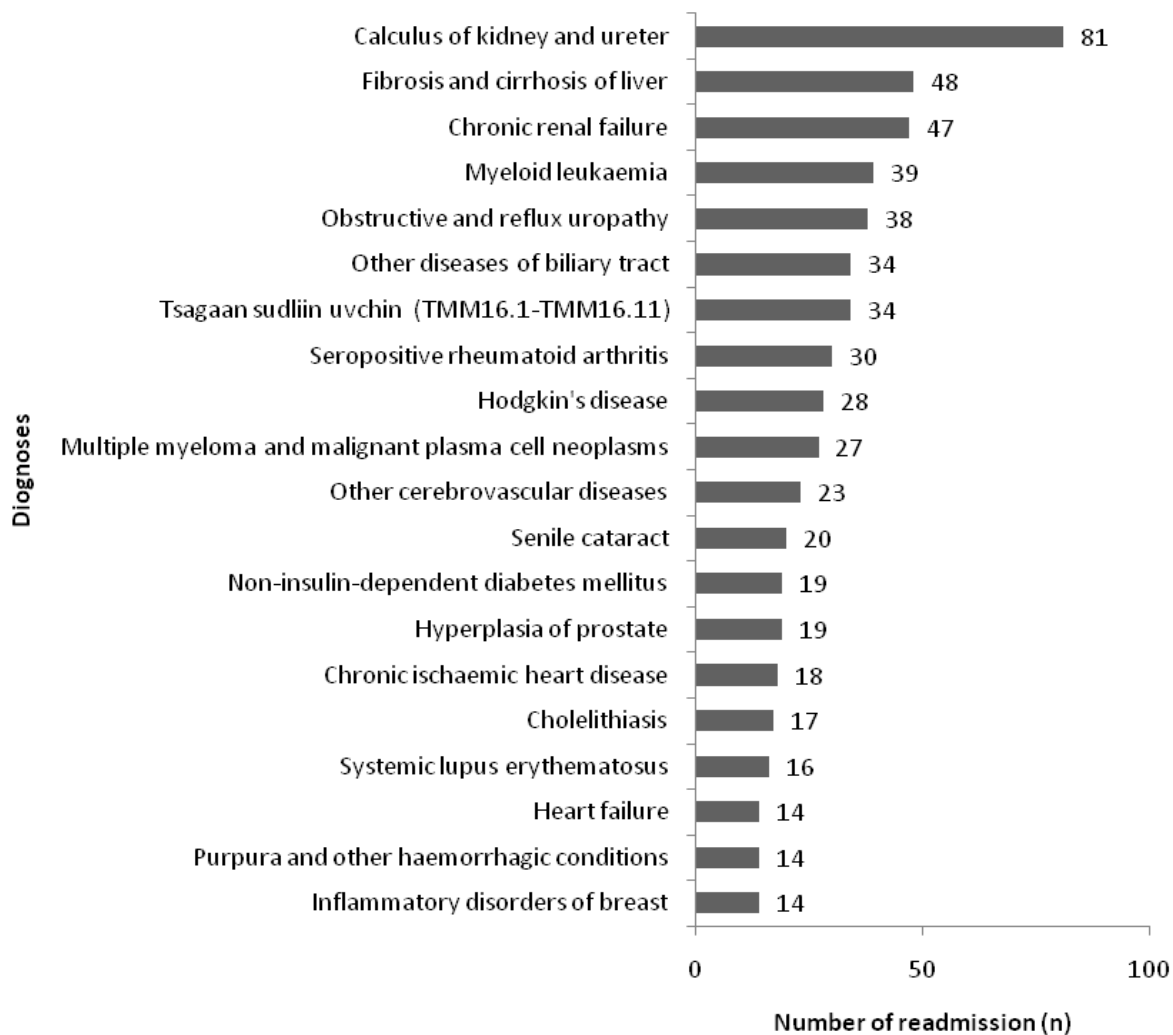
Figure 3. Top 20 diagnoses the highest number of 30 days all cause SFCHM readmission

Figure 3 shows the diagnosis of the 20 diseases with the most frequent readmissions in SFCHM. This comprises 118 individuals diagnosed with calculus of the kidney and ureter, myeloid leukemia, along with individuals diagnosed with Mongolian traditional medicine who are frequently hospitalized.
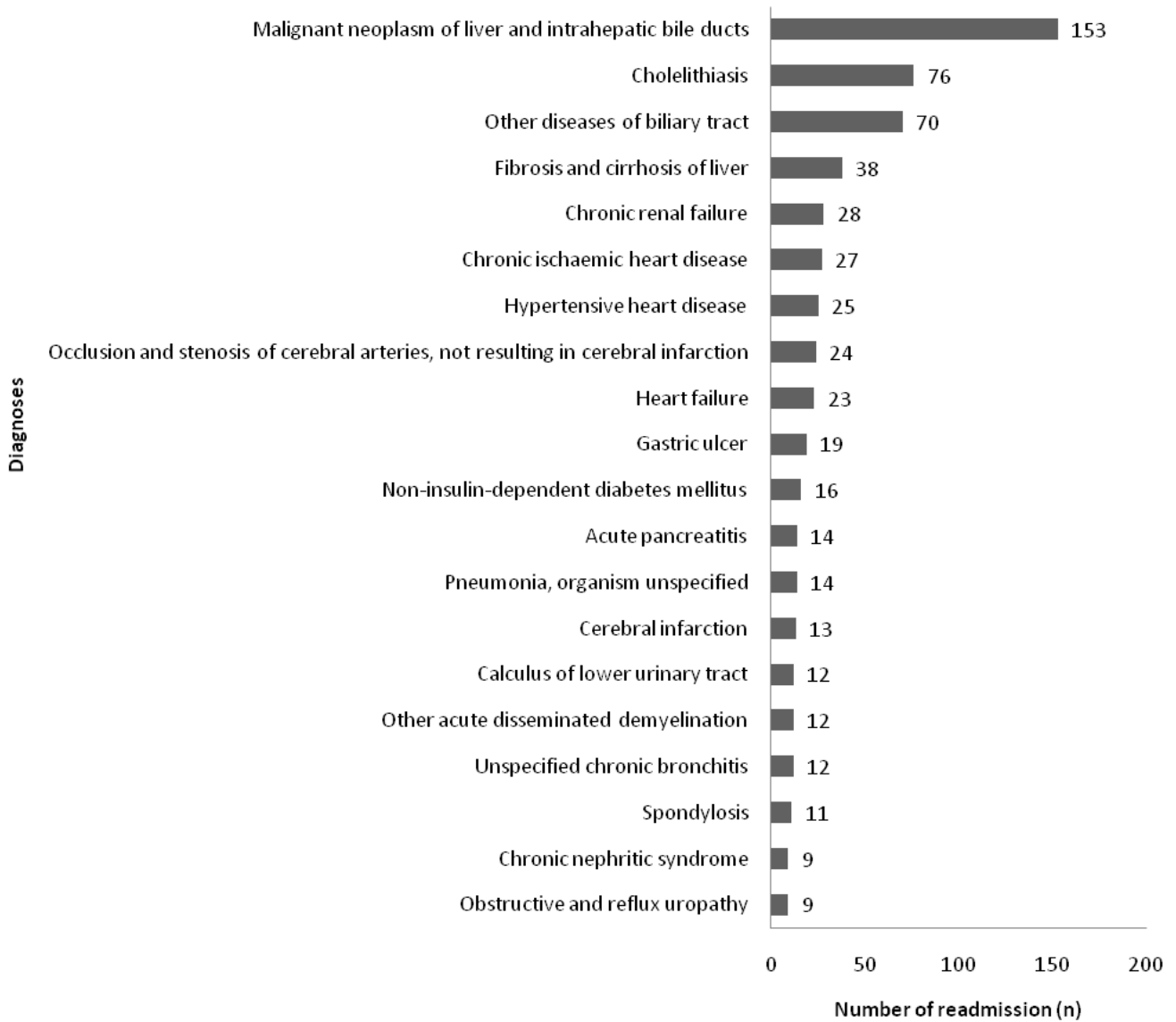
Figure 4. Top 20 diagnoses the highest number of 30 days all cause SSCHM readmission

Figure 4 shows the diagnosis of the 20 diseases with the most frequent readmissions in SSCHM, which are 166 patients diagnosed with malignant neoplasm of liver and intrahepatic bile ducts and 86 patients with fibrosis and cirrhosis of liver, followed by hypertensive heart disease, which accounts for a significant percentage of hospitalizations.
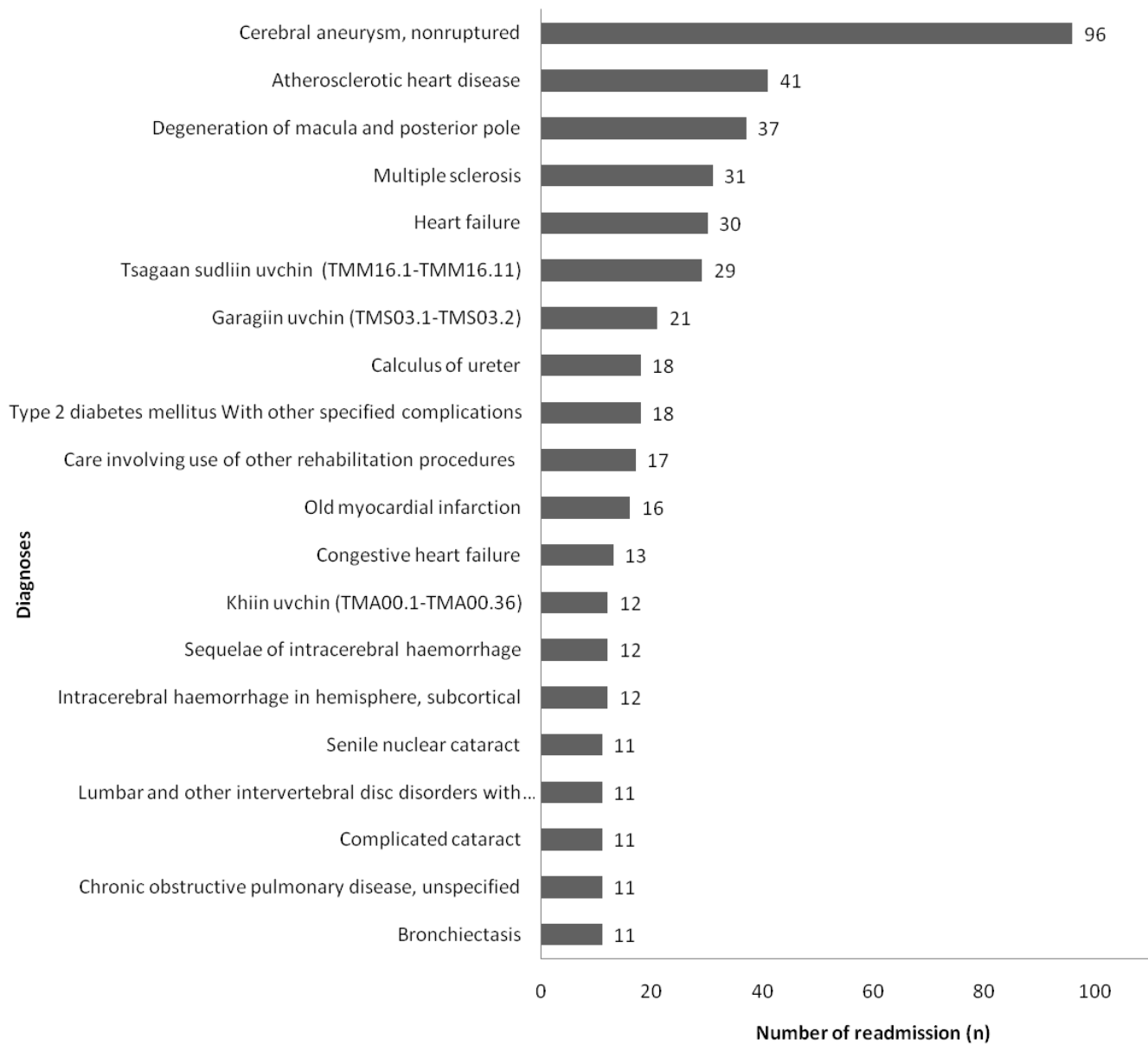
Figure 5. Top 20 diagnoses the highest number of 30 days all cause STCHM readmission

Figure 5 shows the diagnosis of the 20 diseases with the most frequent readmissions in STCHM. This includes 96 patients diagnosed with cerebral aneurysm, non-ruptured, and 31 patients with multiple sclerosis, which were the most frequent readmissions, followed by Mongolian traditional medicine diagnostic disease and rehabilitation care, which accounts for a significant rate of readmission.

Figure 6. Top 10 principal diagnoses with the highest number of 30 days all cause three hospital readmissions
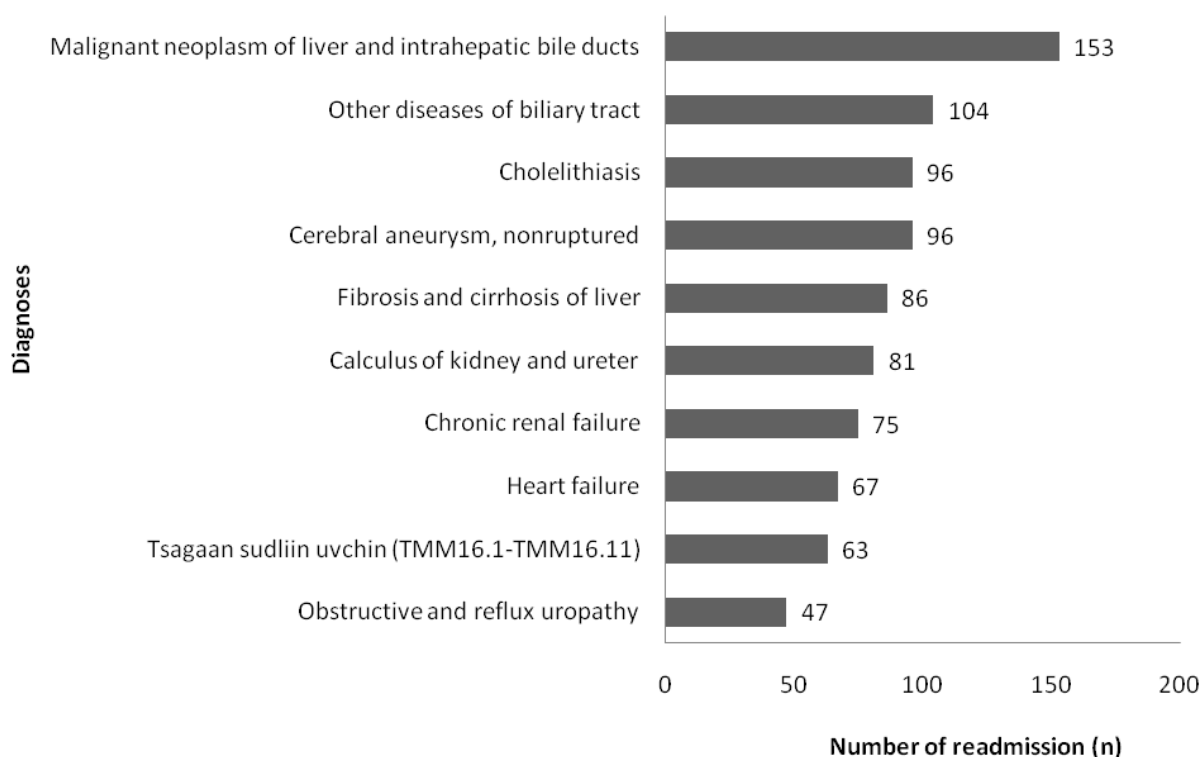
The above ten diagnoses shown in Figure 5 are the principal diagnoses most frequently hospitalized in the 3 hospitals involved in the study. They are listed using the ICD-X international diagnosis code, and the following list is provided: First, Malignant neoplasm of liver intrahepatic bile ducts, 2nd cerebral aneurysm non-ruptured, 3rd cholelithiasis, etc.

1178 (male) and 1138 (female) people age between 1-101 were recorded in the medical records, and the 45-64 age group had the highest frequency, followed by >65-year-olds, but no gender difference was observed, as shown in Figure 7.
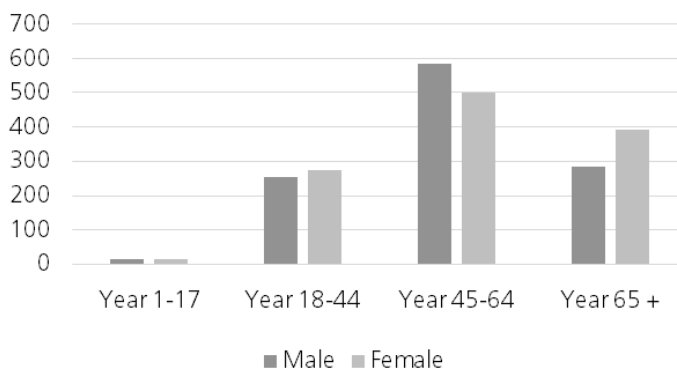

Figure 7. 30 days all cause readmission percentages by age and gender

Table 3. 30 days all cause readmissions by organs system the most frequently treated condition in hospitals

№	Principal diagnoses	Number of readmissions (n)
	Certain infectious and parasitic diseases	
1	Sepsis	19
2	Echinococcosis	5
	Malignant neoplasms	
3	Malignant neoplasm of liver and intrahepatic bile ducts	166
4	Myeloid leukemia	39
5	Hodgkin's disease	28
6	Multiple myeloma and malignant plasma cell neoplasms	27
7	Lymphoid leukemia	13
8	Acute myeloid leukemia	10
9	Large cell (diffuse) lymphoma	9
10	Malignant neoplasm of kidney, except renal pelvis	8
11	Acute lymphoblastic leukemia	6
12	Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue	6
	Diseases of the blood and blood forming organs and certain disorders involving the immune	
13	Purpura and other hemorrhagic conditions	14
14	Benign neoplasm of thyroid gland	9
	Endocrine, nutritional and metabolic diseases	
15	Non-insulin-dependent diabetes mellitus	35
16	Type 2 diabetes mellitus with other specified complications	18
	Diseases of the nervous system	
17	Multiple sclerosis	31
18	Other acute disseminated demyelination	12
19	Mononeuropathies of upper limb	5
	Diseases of the eye and adnexa	
20	Degeneration of macula and posterior pole	37
21	Senile cataract	20
22	Senile nuclear cataract	11
23	Complicated cataract	11
	Diseases of the circulatory system	
24	Cerebral aneurysm, nonruptured	96
25	Heart failure	67
26	Chronic ischemic heart disease	45
27	Atherosclerotic heart disease	41
28	Hypertensive heart disease	25
29	Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction	24
30	Other cerebrovascular diseases	23
31	Cerebral infarction	19
32	Old myocardial infarction	16
33	Pneumonia, organism unspecified	14
34	Congestive heart failure	13

35	Sequelae of intracerebral hemorrhage	12
36	Intracerebral hemorrhage in hemisphere, subcortical	12
37	Unspecified chronic bronchitis	12
38	Hemorrhoids	9
39	External hemorrhoids with other complications	5
Diseases of the respiratory system		
40	Chronic obstructive pulmonary disease, unspecified	11
41	Bronchiectasis	11
42	Other interstitial pulmonary diseases	8
43	Abscess of lung and mediastinum	6
44	Other disorders of nose and nasal sinuses	5
Diseases of the digestive system		
45	Other diseases of biliary tract	104
46	Cholelithiasis	93
47	Fibrosis and cirrhosis of liver	86
48	Gastric ulcer	19
49	Other diseases of intestine	18
50	Acute pancreatitis	14
51	Peritonitis	8
52	Gastric ulcer	7
53	Abscess of anal and rectal regions	6
54	Other diseases of jaws	5
55	Inguinal hernia	5
56	Ulcerative colitis	5
57	Paralytic ileus and intestinal obstruction without hernia	5
Diseases of the musculoskeletal system and connective tissue		
58	Seropositive rheumatoid arthritis	30
59	Systemic lupus erythematosus	16
60	Spondylosis	11
61	Lumbar and other intervertebral disc disorders with radiculopathy	11
62	Gon arthrosis [arthrosis of knee]	9
63	Cellulitis	7
64	Cutaneous abscess, furuncle and carbuncle	6
Diseases of the genitourinary system		
65	Calculus of kidney and ureter	124
66	Obstructive and reflux uropathy	118
67	Other disorders of urinary system	81
68	Chronic tubulo-interstitial nephritis	75
69	Acute tubulo-interstitial nephritis	47
70	Other renal tubulo-interstitial diseases	19
71	Chronic nephritic syndrome	18
72	Chronic renal failure	18
73	Inflammatory disorders of breast	18

74	Hyperplasia of prostate	7
75	Other chronic renal failure	6
Traditional medicine		
76	Tsagaan sudliin uvchin (TMM16.1-TMM16.11)	63
77	Garagiin uvchin (TMS03.1-TMS03.2)	21
78	Khiin uvchin (TMA00.1-TMA00.36)	12
Factors influencing health status and contact with health services		
79	Care involving use of other rehabilitation procedures	17
80	Other postprocedural states	6
81	Streptococcal infection, unspecified	6
Injury, poisoning and certain other consequences of external causes		
82	Injury of eye and orbit	8
83	Dislocation, sprain and strain of joints and ligaments of knee	8
84	Shoulder lesions	7

According to the results of our study, diagnoses of more than 5 all cause 30 days readmissions are grouped by organ system using ICD-X code, calculus of the kidney and ureter, lower urinary tract (124), there are 84 diagnoses and conditions across 14 groups that result in readmissions. Among them, cancer diseases such as malignant neoplasm of the liver and intrahepatic bile ducts (166) are leading, followed by obstructive and reflux uropathy (118), and chronic diseases such as other diseases of the biliary tract (104), non-ruptured cerebral aneurysm (96), cholelithiasis (93), fibrosis and cirrhosis of the liver (86), and heart failure (67). Additionally, Table 2 highlights that sepsis, heart failure, and pneumonia account for a significant percentage of diagnoses.

Discussion

Internationally, measuring and reducing early readmissions is widely recognized, especially within 30 days after initial discharge, and can enhance the quality of medical care and services [16, 29].

In this study, among 31645 hospital discharged data, 30 days readmission percentage was 1,988 (6.3%). Comparative studies in low-middle-income countries, including a national data-based study in India by Nijat Aliyev et al, reported an average unique readmission percentage of 8.1% [30]. Similarly, in Brazil, the percentage was not ably higher at 13.7% [31], possibly influenced by factors such as hospitalization volume and research method. However, according to the whole system measures

method issued by the institute for healthcare improvement, the readmission percentage in U.S. hospitals was determined to be 4.49%. If this percentage is higher, it necessitates the planning of measures to reduce it [5].

Chronic lung disease, coronary artery by pass graft surgery, heart attacks, hip and knee replacements, heart failure, and pneumonia [8,22] are reported high-risk conditions for readmission within 30 days [32]. According to the statistical data from the national database of readmissions issued by The Agency for Healthcare Research and Quality in the US, the 20 most frequently readmitted diseases includes epticemia, heart failure, diabetes mellitus with complication, chronic obstructive pulmonary disease and bronchiectasis, pneumonia, acute and unspecified renal failure, schizophrenia spectrum and other psychotic disorders, cardiac dysrhythmias, respiratory failure, acute myocardial infarction, urinary tract infections, fluid and electrolyte disorders, skin and subcutaneous tissue infections, depressive disorders, complication of selected surgical or medical care, injury, initial encounter (including complications such as infection for surgical or medical care other than those from cardiovascular, genitourinary, or internal orthopedic devices or from organ/tissue transplants), alcohol-related disorders, gastrointestinal hemorrhage, cerebral infarction, chronic kidney disease, pancreatic disorders [8].

Wolters Kluwer's study result showed that specific clinical conditions as factors influencing readmissions, which is chronic obstructive pulmonary disease, diabetes, heart failure, stroke, cancer, weight loss, depression, and sepsis [33]. Based on the

results of our study, the recorded diagnoses in readmissions included malignant neoplasm of the liver and intrahepatic bile ducts (153 cases), heart failure (97 cases), chronic renal failure (75 cases), diabetes mellitus (53 cases), sepsis (19 cases), pneumonia (14 cases), and chronic obstructive pulmonary disease (11 cases).

In this study, the age group of 45-64 years exhibited a higher incidence of re-hospitalization. This finding aligns with data from the Medicaid Nationwide Readmissions Database (NRD) in the U.S. in 2016-2020, indicating that individuals aged 45-64 had the highest percentages of readmissions (21.4 and 19.7 per 100 index admissions) [34]. A study involving approximately 12,000 people across various departments, including surgery, trauma, and internal medicine, reported an average age of 63.6 among those readmitted within 30 days [35], which closely mirrors our study results. However, a study by Jing Cao et al. in China in 2021 revealed that the majority of people readmitted due to pulmonary tuberculosis were over 65 years old. Additionally, according to Leppin et al.'s meta-analysis, the readmission rate tends to be higher in individuals older than 65 [24,25]. These variations are believed to be influenced by differences in the average age of populations across countries.

According to Linda Calvillo et al systemic review of 72 study related to hospital readmissions, there was a mixed relationship between men and women in readmissions [22]. A 2021 study by Filipa Pereira et al. on risk factors associated with readmissions within 30 days in Europe revealed that readmission rate for females was 7.3%, while 8.2% for males [36]. However, our study found no significant differences between genders.

The insights derived from these studies provide a foundation for addressing issues related to hospital readmissions in Mongolia. Customizing predictive models, understanding patterns specific to diseases, and implementing meaningful metrics can aid the country in improving healthcare outcomes and lowering readmission rates. Learning from global experiences can also guide the development of evidence based policies to optimize Mongolia's healthcare system.

In the context of health insurance, there is a provision that funds will not be provided in case of repeated hospitalization within 30 days due to medical malpractice or inadequate medical care and services [37]. Therefore, hospitals can prevent future financial accurately recording repeat admissions.

Limitations

The study has some limitations. This study focused on three specific referral hospitals in Mongolia rather than including all. However, these three hospitals vital in providing most care services nationwide, treating 40.8% of all inpatients by 2022. They stand out as the largest hospitals offering diverse specialized care and services. As such, the data collected from these hospitals is expected to provide valuable and representative insights into general readmission trends.

Conclusion

In conclusion, our study analyzed 1,988 data, resulting a 6.3% rate of 30 days unplanned all cause readmissions rate. The highest hospital readmission rates were evident among patients with cancer and chronic diseases, particularly within the age group of 46-64 years in referral hospitals. Recognizing the impact of avoidable readmissions on both patient well-being and the financial efficiency of the health system underscores the importance of preventive measures.

Looking ahead, we advocate for further studies to delve into various aspects of readmissions. Hospital-based and home-based investigations and exploration of other causes and correlations will contribute to a comprehensive understanding of the factors influencing readmission rates. These endeavors are crucial for the developing of targeted interventions and evidence based strategies to reduce unplanned readmissions, ultimately improving patient outcomes and healthcare system efficiency.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgement

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