

Projection of Inpatient Bed Needs at Andalas University Hospital Until 2030: A Retrospective Analysis of Elderly Utilization and Hospital Capacity

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ABSTRACT

The increasing proportion of the elderly population has raised the demand for inpatient services, requiring hospitals to implement evidence-based bed capacity planning. Andalas University Hospital has not yet developed a projection of inpatient bed requirements through 2030 based on trends in elderly service utilization. This study aimed to project inpatient bed requirements through 2030. A quantitative study with a retrospective longitudinal design was conducted using secondary data from medical records and daily inpatient census reports from 2020–2025 at Andalas University Hospital, Padang. The unit of analysis comprised hospitalized patients aged ≥ 60 years, totaling 5,482 observations (total sampling). Data were collected through document review and reconciliation of medical records, daily census, and management reports. Bed requirements were calculated using the formula: $\text{Bed} = \text{treatment days} / (365 \times \text{target BOR})$, with a target BOR of 75–85%. Data analysis included descriptive statistics, linear trend analysis, and simple linear regression. The average BOR was 71.8%, ALOS 5.6 days, BTO 47.2 times/year, and TOI 2.3 days. The proportion of elderly patients increased by 6.8% annually ($p < 0.001$). Regression analysis demonstrated a significant relationship between increasing elderly admissions and bed requirements ($\beta = 0.81$; 95% CI: 0.65–0.97; $R^2 = 0.76$; $p < 0.001$). Based on the model, bed requirements are projected to increase from 220 beds in 2025 to 287 beds in 2030 (95% prediction interval: 276–298 beds). These projections can support phased bed expansion, optimization of human resources, budgeting, supporting facilities, strategic planning, inpatient capacity evaluation, and geriatric service development. Bed capacity should be gradually increased to maintain service efficiency and support hospital resource planning. These findings are projective and indicate associative rather than causal relationships.

Keywords: Hospital Bed Demand, Population Aging, Capacity Planning, Inpatient Utilization, Health Facility Investment, Forecasting

INTRODUCTION

The increase in the number of elderly people represents one of the biggest demographic changes facing the global health system in recent decades. Improvements in socioeconomic conditions, advances in medical technology, and increases in life expectancy have led to a consistent increase in the proportion of people over 60 years of age in many countries. The World Health Organization estimates that the number of people over 60 years of age will increase from about 1 billion in 2019 to 1.4 billion in 2030 and reach 2.1 billion by 2050. This change in age structure is not only a demographic issue, but also a health care challenge because older age groups have more complex service needs than younger age groups. (World Health Organization, 2021; United Nations Department of Economic and Social Affairs, 2023).

The increase in the population of patients over 60 years of age is associated with an increasing burden of chronic diseases and health conditions requiring ongoing care. This age group has a higher prevalence of non-communicable diseases such as cardiovascular disease, diabetes, cancer, chronic lung disease, as well as impaired physical function that can increase the need for hospitalization. In addition to the number of diseases, 60-year-old patients also experience multimorbidity more often, which leads to the complexity of clinical decision-making, the need for additional examinations, and a longer duration of treatment. These conditions cause hospitals to make adjustments to service capacity in order to meet the changing pattern of patient needs. (Barnett et al., 2021; World Health Organization, 2022). The impact of population aging on health services is not only related to the increase in the number of visits, but also to changes in the intensity of use of hospital resources. Patients 60 years of age are more likely to need multidisciplinary coordination of care, more rigorous clinical monitoring, and rehabilitation support that can extend the use of inpatient facilities. In the perspective of Health Care Management, the need for hospital beds is determined by the interaction between the number of patients admitted, the length of stay (average length of stay/ALOS), and the level of bed utilization. Therefore, an increase in the population of patients over 60 years of age has the potential to increase the pressure on hospitalization capacity if not accompanied by data-based planning. (Clegg et al., 2021; Organisation for Economic Co-operation and Development, 2023).

Hospital bed capacity planning is an important component in maintaining a balance between service demand and resource availability. Insufficient capacity can lead to increased waiting times, delayed patient admissions, and decreased efficiency of Service flow, while excessive capacity can lead to suboptimal use of resources. Therefore, modern approaches in hospital planning are beginning to shift from static capacity calculations towards predictive models that use historical data of services. Models based on the number of admissions, length of stay, and indicators of bed utilization are considered more capable of describing actual needs than population-based approaches alone. (McCarthy et al., 2022; Ahmadi-Javid et al., 2020).

Various studies have shown that predictive models of bed needs can help hospitals determine capacity building strategies more rationally. A service trend-based projection approach allows hospitals to forecast future changes in demand by considering historical demand patterns and patient characteristics. However, most of the models developed still use aggregated data across age groups or focus on specific conditions such as pandemics, so they do not fully explain the contribution of certain patient groups who have high service needs. These conditions indicate the need for the development of a model that takes into account the characteristics of patients over 60 years of age as a group with the potential for a large contribution to the burden of hospitalization. (Overton et al., 2021; McCarthy et al., 2022).

Indonesia is currently experiencing a demographic transition characterized by an increasing proportion of the elderly population as a consequence of increasing life expectancy and decreasing birth rates. Data from the Central Statistics Agency shows that the proportion of the population over 60 years of age continues to increase and Indonesia has entered a phase towards a society with an aging population structure. This change has implications for the health care system as an increase in the number of patients over 60 years of age will



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be followed by an increase in the need for services for chronic diseases, rehabilitation, and inpatient services. These conditions require health facilities to carry out capacity planning based on the needs of the population to be served in the future. (Central Bureau Of Statistics, 2023; Ministry Of Health Of The Republic Of Indonesia, 2023).

The increase in the number of people aged 60 in Indonesia occurred simultaneously with the change in disease patterns from the dominance of infectious diseases to the increase in non-communicable diseases and chronic conditions. Diseases such as hypertension, diabetes mellitus, heart disease, stroke, and degenerative disorders are the main causes of increased utilization of health services in the elderly. Patients 60 years of age with chronic conditions often require longer treatment, greater use of medical technology, and multidisciplinary services during hospitalization. This change in epidemiological patterns causes hospitals to consider age characteristics in planning service resources, including the need for inpatient beds. (Ministry Of Health Of The Republic Of Indonesia, 2022; World Health Organization, 2022).

West Sumatra province is one of the regions in Indonesia that has experienced an increase in the proportion of the population of 60 years and faces challenges in the provision of health services for the elderly. As a region with geographical characteristics serving urban areas and surrounding regions, the need for referral services is becoming increasingly important especially for cases of higher clinical complexity. Referral hospitals in West Sumatra have a role not only serving the community in the Padang City area, but also receiving patients from other districts and cities that need advanced services. The situation causes that inpatient capacity planning needs to consider referral patterns and regional demographic changes.

Andalas University Hospital is a teaching and Referral Hospital in Padang city that has a strategic role in supporting advanced health services in West Sumatra. As a type B Hospital with a capacity of about 202 beds, this hospital continues to develop service functions and receive referrals from various regions in central Sumatra. The improvement in the function of the service has the potential to increase the number of hospitalized patients, including 60-year-old patients who need services with a higher level of complexity. Therefore, the development of inpatient facilities needs to be supported by Needs Analysis based on actual data so that capacity addition can be done appropriately.

In the context of Andalas University Hospital, the change in the number of patients who are 60 years old is one of the important indicators in estimating the need for beds in the future. Data on hospital services during the period 2020-2025 shows the utilization of inpatients by 60-year-old patients that can be used to describe the pattern of service demand. However, information on how these trends in patients over 60 years of age relate to bed capacity requirements through 2030 is not yet available. This condition indicates the need for hospital data-based research to produce projections of bed needs in accordance with the characteristics of local services. (Central Bureau Of Statistics, 2023; Ministry Of Health Of The Republic Of Indonesia, 2023; World Health Organization, 2022).

The increase in the need for inpatient services due to the increase in the number of patients over 60 years of age has a direct consequence on the management of hospital capacity. Inpatient beds are one of the main resources that determine a hospital's ability to receive patients, maintain service quality, and manage patient flow efficiently. Mismatch between the need and availability of beds can lead to a variety of operational problems, such as increased waiting time for admission, delays in the transfer of patients from the emergency department, as well as pressure on health workers. Therefore, decisions regarding the number of beds should be based on a needs analysis that takes into account the pattern of service utilization and the characteristics of the patients served. (McCarthy et al., 2022; Organisation for Economic Co-operation and Development, 2023).

The need for hospital beds is not only determined by the number of patients admitted, but is also influenced by the length of the inpatient day and the level of use of available beds. Indicators such as Bed Occupancy Rate (BOR), Average Length of Stay (ALOS), Bed Turn Over (BTO), and Turn over Interval

(TOI) are important parameters in assessing the efficiency of inpatient capacity utilization. In patients 60 years of age, the ALOS value tends to be an important component due to a more complex recovery process due to multimorbidity and a decrease in physiological reserves. Thus, an increase in the number of patients over 60 years of age can increase the burden of care days even if the increase in the number of admissions is relatively small. (Clegg et al., 2021; Barnett et al., 2021).

From the perspective of hospital management, the addition of beds must be done carefully because it is related to the needs of physical space, health workers, medical equipment, as well as ongoing operational costs. Increasing capacity without taking into account demand patterns can lead to low utilization of facilities, while less capacity can hinder patient access to services. Therefore, a projection approach based on historical data is important to determine whether an increase in the number of beds is a realistic operational need or only a response to a temporary increase in demand. Predictive models that integrate patient counts, ALOS, and BOR targets can help hospital management make more informed investment decisions. (Ahmadi-Javid et al., 2020; McCarthy et al., 2022).

Several studies show that the use of capacity prediction models based on service data can improve hospital readiness to face changes in demand. Time series-based approaches, regression, and simulation models have been used to estimate bed needs based on admission patterns and patient length of stay. However, the application of the model needs to be adapted to the local context because the characteristics of patients, referral patterns, and service capacity of each hospital are different. In teaching and referral hospitals such as Andalas University Hospital, a model that takes into account the contribution of 60-year-old patients is important because this group has the potential to provide a greater burden of inpatient services than other age groups. (Overton et al., 2021; McCarthy et al., 2022).

In addition to the aspect of the number of beds, changes in patient composition (case mix) also need to be considered in hospital capacity planning. Patients 60 years of age often have a combination of several chronic diseases that require longer treatment and more intensive use of resources. These conditions can affect the need for beds in certain service units, especially units of Internal Medicine, heart, nerve, and services that deal with degenerative diseases. Therefore, the projection of the need for beds based only on the number of patients without considering the characteristics of age and length of stay at risk of generating capacity estimates that are less in accordance with operational needs. (World Health Organization, 2022; Clegg et al., 2021; Organisation for Economic Co-operation and Development, 2023).

Research into hospital bed capacity planning has progressed using a variety of analytical approaches, ranging from simple statistical methods to data-driven predictive modeling. Most studies show that the number of admissions, length of stay, and bed occupancy rate are the main factors in estimating hospitalization capacity needs. However, many studies still use aggregated data across patients without stratifying by age group or clinical characteristics of patients. This approach can reduce the ability of the model to describe the contribution of certain groups of patients who have higher service needs, including 60-year-old patients. (McCarthy et al., 2022; Ahmadi-Javid et al., 2020).

Previous research also still has limitations in integrating demographic changes with hospital utilization data simultaneously. Some models use only trends in the number of patients or population data as the basis for projections, but have not linked such changes to operational indicators such as ALOS, BOR, BTO, and TOI. In fact, an increase in the number of patients over 60 years of age does not always result in an increase in the need for beds of the same magnitude because it is influenced by the length of treatment, the degree of complexity of the case, and the efficiency of the flow of patients. Therefore, a projection model that combines demographic factors and indicators of hospital services is needed so that capacity estimates are closer to actual operational conditions. (Organisation for Economic Co-operation and Development, 2023; World Health Organization, 2022).



In addition, most of the research related to hospital capacity projection is carried out on developed country health systems that have different financing patterns, service access, and referral characteristics with developing countries. The results of the study may not necessarily be directly applied to hospitals in Indonesia because there are differences in the distribution of health facilities, regional referral patterns, and patient characteristics. Type B hospitals in Indonesia have a dual function as a referral service provider as well as an education center, so the pattern of bed utilization can be different than other public hospitals. This condition shows the importance of local data-based research to produce more relevant estimates of capacity needs.

Studies of patients over 60 years of age generally focus more on disease burden, quality of life, or geriatric care needs, but have not examined the impact on hospital bed capacity planning. In fact, the increase in the number of patients over 60 years of age may be one of the factors driving the increase in hospitalization needs through an increase in the number of admissions and days of treatment. The lack of information on the relationship between trends of 60-year-old patients and bed needs has led to hospital management not having a strong quantitative basis in planning capacity development. (Barnett et al., 2021; Clegg et al., 2021).

In the context of Andalas University Hospital, there is no research available that specifically projects the need for inpatient beds until 2030 using actual data of 60-year-old patients, bed utilization indicators, and hospital historical service trends. Previous studies have not addressed how the increase in the number of patients aged ≥ 60 years over a certain period is related to the change in bed requirements in teaching hospitals and Type B referrals in the West Sumatra region. These specific gaps are the basis for the need for an analysis that integrates medical record data, daily inpatient census, and hospital capacity indicators to generate projected bed needs that can be used in operational planning. (McCarthy et al., 2022; Ahmadi-Javid et al., 2020; Barnett et al., 2021).

Based on the limitations of previous studies, there is still a gap in the provision of bed demand prediction models that specifically correlate changes in the number of patients aged ≥ 60 years with hospitalization capacity at the hospital level. Most of the available models have not taken into account simultaneously the trends of service utilization of certain age groups, length of stay, target Bed occupancy rate, and changes in service needs based on historical hospital data. In regional referral hospitals such as Andalas University Hospital, such information is important because changes in the number of patients aged ≥ 60 years can affect the burden of service through an increase in the number of admissions and days of treatment. Therefore, local data-based analysis is needed that is able to provide estimates of bed needs in a more operational manner and in accordance with the characteristics of hospital services.

Conceptually, this study uses the framework of analysis that the increase in the patient population of ③ 60 years of age can increase the need for beds through the mechanism of increasing demand for hospitalization. The increase in the number of patients over 60 years of age is expected to increase the number of visits or admissions, and then increase the number of patient days due to the characteristics of the elderly group who tend to have longer hospitalizations due to multimorbidity and complexity of cases. The increase in the burden of day care will further increase the need for beds if not balanced with service efficiency and adequate capacity building. Based on the framework, this study assumes that there is an association relationship between the increase in the number of patients aged ≥ 60 years with an increase in the need for inpatient beds, but the relationship is not interpreted as a causal relationship because the study used a retrospective observational design.

The analysis Model in this study uses the actual data of Andalas University Hospital in the form of medical records and daily census of inpatient patients aged ≥ 60 years for the period 2020-2025. Estimated bed needs are calculated based on the service load by considering the number of projected admissions, average length of stay, and target occupancy rate of beds using the equation: Required beds= (Projected admissions $\times$ Expected ALOS) / (365 $\times$ target drill). This approach allows hospitals to estimate bed needs based on actual

service usage patterns, rather than just based on the ratio of population to health facilities. In addition, trend analysis and linear regression were used to evaluate the pattern of the relationship between the increase in patients aged ≥ 60 years and the change in bed requirements until 2030.

Based on these gaps, this study aims to estimate the need for inpatient beds at Andalas University Hospital in the period 2025-2030 by integrating inpatient utilization of 60-year-old patients, average length of stay, bed utilization indicators, bed occupancy targets, and projected changes in service needs based on hospital historical data in 2020-2025. The results of the study are expected to provide a basis for decision-making for hospital management in determining inpatient capacity development strategies, including planning for additional beds, readiness of affected service units, and gradual and evidence-based allocation of resources.

Thus, this study has an important value because it not only produces an estimate of the number of beds needed, but also provides a picture of the relationship between changes in the characteristics of patients 60 years of age with the capacity needs of hospital services. A local data-based approach is expected to fill the information gap in inpatient capacity planning at teaching and referral hospitals in Indonesia, especially in the West Sumatra region. The findings of this study can be an operational reference for hospital managers in the face of increasing service needs due to changes in the age structure of the population. (World Health Organization, 2022; McCarthy et al., 2022; Organisation for Economic Co-operation and Development, 2023).

Demographic changes towards an increase in the number of patients over 60 years old as well as the demands of increasingly complex referral services are the main reasons for this study conducted at Andalas University Hospital. As a type B teaching and Referral Hospital, this hospital requires capacity planning that is able to adjust between the growth of service needs and the availability of resources. Inpatient utilization Data for the period 2020-2025 provides an opportunity to build predictive models based on the actual condition of hospitals, especially in estimating the need for beds until 2030. Therefore, this study was conducted to produce a more specific estimate of inpatient bed needs based on the service patterns of patients aged ≥ 60 years, so as to support managerial decision-making in the development of service capacity on an ongoing basis.

This study aims to estimate the need for inpatient beds at Andalas University Hospital for 2025-2030 by integrating inpatient utilization of 60-year-old patients, average length of stay (ALOS), target Bed occupancy rate (BOR), bed utilization indicators, and projected changes in service needs based on historical hospital trends in 2020-2025. Using a longitudinal retrospective approach, this study is expected to provide quantitative evidence of the need for inpatient capacity in accordance with the characteristics of patients and hospital service patterns. The results of the study were not intended to prove a causal relationship, but to illustrate the pattern of association between increased utilization of patient services of 60-year-olds and the need for beds as a basis for hospital operational planning. (World Health Organization, 2021; McCarthy et al., 2022; Ministry Of Health Of The Republic Of Indonesia, 2023).

METHODS

This study used a quantitative retrospective longitudinal design to project the need for inpatient beds at Andalas University Hospital, Padang, West Sumatra, until 2030. The study population consisted of all inpatient records of 60-year-old patients and hospital utilization data for the period 2020-2025. The total sampling technique was applied, covering all records of hospitalization of the elderly who meet the inclusion criteria: patients over 60 years old, inpatients, recorded in the hospital information system and daily hospitalization census, with complete information about age, length of hospitalization, and inpatient service units. Records with incomplete data, duplicated entries, or unrelated inpatient service records are issued. Data was collected through document review and retrieval from medical records, daily inpatient census reports, and hospital management reports, followed by data verification through reconciliation between sources. The extracted variables include the number of elderly inpatient visits, length of Stay, days of stay, bed occupancy



rate (BOR), average length of stay (ALOS), bed turnover (BTO), turnover interval (TOI), and available bed capacity.

The need for beds is calculated by the formula: need for beds = Total days of hospitalization/(365 target drill targets), with a drill target of 75-85%. Data analysis included descriptive statistics, linear trend analysis to assess changes in elderly inpatient utilization over time, and simple linear regression to evaluate the relationship between elderly inpatient visits and projected bed needs. The analysis framework assumes that an increase in the elderly population contributes to higher utilization of hospitalizations through an increase in hospital stays and cumulative hospitalization days, which further increases the demand for beds. The hypothesis tested is that the trend of increasing utilization of elderly hospitalization is associated with an increase in the need for inpatient beds at Andalas University Hospital.

Data analysis is done in stages through univariate, bivariate Analysis, Regression Analysis, and projection analysis. Univariate analysis was used to describe the characteristics of patients, the proportion of elderly patients, the number of beds available, as well as indicators of hospital bed utilization which include Bed Occupancy Rate (BOR), Average Length of Stay (ALOS), Bed Turn Over (BTO), and Turn over Interval (TOI) using frequency distribution, percentage, mean, and standard deviation. Bivariate analysis was performed using the Pearson correlation test to assess the relationship between the increase in the number of elderly patients and the need for inpatient beds. Furthermore, linear regression was used to build a predictive model of bed needs until 2030 based on the trend of increasing elderly patient visits.

Before regression modeling is performed, testing of model assumptions is performed to ensure the validity of the estimated results. The linearity test was conducted using the Test for Linearity to assess the suitability of the linear relationship between the number of elderly patients and the need for beds. Residual normality was evaluated using the Shapiro-Wilk test and examination of the Q-Q plot graph. Homoscedasticity is tested by examining the residual pattern (residual plot) and the Breusch-Pagan test to ensure that the residual variance remains constant. Residual independence was assessed by order of observation time, while residual autocorrelation was tested using Durbin-Watson statistics. Observation points that have the potential to exert excessive influence on the model (influential points) were identified using Cook's distance, leverage, and standardized residual values. Regression models are considered feasible if they meet the assumptions of linearity, normal distribution residuals, no heteroscedasticity problems, no autocorrelation, and no influential observations are found that significantly change the model estimates.

The projection of the need for beds was carried out using an age-graded demand model based on historical trends in inpatient services for the elderly in 2020-2025. The number of patients admitted was projected using the linear trend equation $Y = \textcircled{3} + \beta t$, with Y as the number of elderly hospitalized patients in the t-th period, $\textcircled{3}$ as a constant, $\textcircled{3}$ as the change in the average visit per period, and t as the observation time. Projections are based on age groups of 60-69 years, 70-79 years, and 80 years. Estimation of patient days is calculated using the equation Patient days = $\textcircled{3}$ (Projected admissions, age $\times$ Expected ALOS, age), then the need for beds is calculated using the formula Required beds = Patient day (365 $\times$ drill Target) with a drill target of 75-85%. Validation of the model is done through a back-testing approach by comparing the prediction results against historical actual data and calculating the prediction error rate. Projection results were presented with 95% prediction interval, while sensitivity analysis was conducted using 75%, 80%, and 85% drill target scenarios to assess changes in bed capacity requirements. All analyses were conducted with statistical significance level $p < 0.05$.

RESULTS

1. Analisis Univariat

Table 1. Characteristics of Utilization of Elderly Hospitalization and Indicators of Bed Capacity of Andalas University Hospital in 2020-2025

Variable	Value
Number of elderly inpatients (n)	5.482
Observation period	2020–2025
Proportion of elderly patients increase per year	6,8%
Drill average (%)	71,8
Average ALOS (day)	5,6
Average BTO (times/year)	47,2
Art average (day)	2,3
Bed requirement in 2025 (units)	220
Projected bed needs by 2030 (units)	287
Prediction Interval of 95% of bed needs by 2030 (units)	276–298

The results of the univariate analysis showed that during the period 2020-2025, 5,482 elderly inpatients were analyzed. The utilization of beds showed an average drill of 71.8%, with ALOS of 5.6 days, BTO of 47.2 times/year, and TOI of 2.3 days. The proportion of elderly patients has increased by 6.8% every year. Based on the bed demand projection model by considering the utilization trend of elderly services and BOR targets, bed demand is expected to increase from 220 units in 2025 to 287 units in 2030 with an uncertainty range (95% prediction interval) of 276-298 units.

2. Analisis Bivariat

Table 2. Bivariate Analysis of the Relationship of Increased Elderly Visits with Inpatient Bed Needs

Analysis	coefisien (β)	95 % CI	R ²	p- value	Description
Trend of increasing the proportion of elderly patients per year	6,8%	-	-	<0,001	Significant increase in the proportion of elderly patients
Linear regression of elderly visits to bed needs	0,81	0,65– 0,97	0,76	<0,001	Positive and significant relationships

The results of bivariate analysis showed a significant increase in the proportion of elderly patients by 6.8% per year ($p < 0.001$). Linear regression analysis showed a positive and meaningful relationship between the increase in the number of visits of elderly patients with the need for inpatient beds ($\beta = 0.81$; 95% CI 0.65–0.97; $p < 0.001$). The R² value of 0.76 indicates that 76% of the variation in bed requirements in the model can be explained by changes in the number of visits of elderly patients. These results suggest an association between increased utilization of elderly inpatient services and increased bed capacity requirements, but cannot be interpreted as a cause-and-effect relationship because the study design is retrospective observational.

DISCUSSION

This study shows that the need for inpatient capacity at Andalas University Hospital has increased in line with changes in the pattern of utilization of services for patients of 60 years. The main findings of the study show that the service trend-based projection model is able to describe the increase in bed needs until 2030 by considering the number of patients admitted, length of stay, patient days, and target Bed occupancy



rate. The relationship between the increase in visits of patients aged ≥ 60 years and the need for beds suggests that changes in the demographic characteristics of patients are becoming one of the important factors in hospital capacity planning. These findings suggest that hospital bed needs need to be planned based on actual service load, not just based on currently available physical capacity.

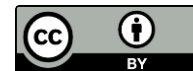
The increase in the need for beds in this study should be understood as a change in service needs due to the increase in the proportion of patients 60 who have different clinical characteristics compared to younger age groups. Theoretically, the need for hospital beds is influenced by three main components, namely the number of patients in need of care, the length of care, and the level of bed utilization. In the context of this study, the use of ALOS as a component of the calculation showed that the capacity requirement is influenced not only by the number of visits, but also by the duration of bed use by patients of 60 years of age. However, these results cannot yet explain the influence of specific clinical factors such as the severity of the disease, the primary diagnosis, and the degree of dependence of the patient because such variables have not been included in the model.

The pattern of increasing demand for services for patients of 60 years of age is in line with global demographic changes that show that the elderly population is increasing and putting pressure on the health care system. Older age groups have a higher tendency to experience chronic disease, multimorbidity, and long-term care needs, contributing to increased use of inpatient services. Research on the impact of population aging on health systems suggests that hospitals need to adjust service capacity by considering changes in the age structure of the population, not just the number of residents as a whole. The age-based planning approach is becoming increasingly important because the group of patients aged 60 has a different pattern of service needs than other age groups. (World Health Organization, 2021; United Nations, 2023).

The results of this study are consistent with previous studies that have shown that the increase in the number of patients over 60 years of age is related to the increase in inpatient use and resource needs of hospitals. Modern hospital capacity planning studies show that predictive models that combine data on admissions, ALOS, and patient characteristics provide more accurate estimates of bed needs than simple approaches based on bed-to-population ratios. This approach is consistent with this study, which uses actual hospital service data as the basis for projected capacity needs until 2030. However, most of the previous studies used aggregated population data, while this study provides a specific context based on the utilization of services for patients of 60 years of age in regional referral hospitals. (Barasa et al., 2021; OECD, 2023).

The different characteristics of patients aged 60 years compared to other age groups also explain the importance of considering the case mix in hospital bed planning. Patients 60 years of age often have more than one chronic disease that requires coordination of multidisciplinary services, more supporting examinations, and longer recovery times. Previous research has shown that an increase in the proportion of patients with high clinical complexity can increase length of stay and decrease bed turnover if not matched by appropriate capacity management strategies. Therefore, the estimation of the need for beds in this study should be understood as a need based on the pattern of care of patients 60 years of age, not just as a result of an increase in the number of patients quantitatively. (WHO, 2022; OECD, 2021).

The mechanism of increased need for beds in this study can be explained by the relationship between the number of patients 60 years of age, length of stay, and the resulting service burden. Patients 60 years of age generally have more complex treatment needs due to the high incidence of non-communicable diseases, impaired organ function, and the need for more intensive clinical monitoring. In the theory of health care utilization, the need for beds is determined not only by the number of sick individuals, but also by the intensity of service use, which is reflected in the number of patient days. Therefore, the increase in the demand for beds in this study is likely a combination of the increase in the number of patients over 60 years of age and the characteristics of services that require longer treatment times. (WHO, 2021; Barnett et al., 2022).



ALOS is an important component in explaining capacity needs because any increase in length of stay will increase the number of days of care that hospitals must provide. In patients over 60 years of age, length of stay may be affected by multimorbidity, risk of complications, need for rehabilitation, and slower recovery than younger patients. Although this study used aggregate alos of services and did not calculate specific ALOS based on diagnosis or age group, the use of these indicators still provides an initial picture of the capacity pressure derived from the characteristics of the service of 60-year-old patients. Further research needs to develop a model by including ALOS based on age group and diagnosis so that the estimation of bed needs becomes more precise. (Clegg et al., 2021; OECD, 2023).

Case mix is an important factor to consider in the interpretation of the results of this study. An increase in the number of patients over 60 years of age does not always result in the same bed requirement because the degree of complexity of the disease differs between individuals. Service units such as internal medicine, cardiology, neurology, and Chronic Care Units are expected to be the most affected units as they have a larger proportion of patients over 60 years of age and more complex care needs. Based on the assumptions of the researchers, if the trend of increasing number of 60-year-old patients continues, capacity pressures are likely to occur not only on the number of beds, but also on the needs of health workers, diagnostic facilities, and coordination of services between units.

The findings of this study have the implication that the decision to add hospital beds needs to be made through a comprehensive capacity approach. The addition of physical beds needs to consider operational feasibility, including the availability of specialist doctors, nursing personnel, treatment rooms, supporting facilities, bed management systems, and hospital financing capabilities. Health service operations management theory explains that capacity building without the readiness of supporting resources can cause an imbalance between physical capacity and service capability, potentially reducing efficiency. Therefore, the projected results of this study are more appropriate to be used as a basis for gradual planning than as a basis for adding capacity directly. (Harrison et al., 2021; OECD, 2023).

In the context of Andalas University Hospital as a teaching and Referral Hospital, the results of this study provide important information for the development of medium to long-term capacity strategies. The increase in the need for beds should be followed by the strengthening of the patient flow management system, including the acceleration of the admission process, optimization of patient discharge, strengthening outpatient services, and the development of services based on the needs of 60-year-old patients. Previous studies have shown that the efficiency of hospital beds depends not only on the number of beds available, but also on the ability of hospitals to manage the flow of patients from entry to exit. Thus, the most rational capacity building strategy is a combination of optimization of existing beds and selective expansion of capacity based on the needs of Service units. (Mardiah et al., 2021; WHO, 2023).

The managerial implication of this study is the need for Andalas University Hospital to use the projected results of bed needs as the basis for the preparation of data-based capacity plans for services. The increase in the need for beds does not have to be directly translated as the construction of new inpatient rooms, but it needs to be preceded by an evaluation of the efficiency of using available beds. The evaluation included an analysis of the distribution of 60-year-old patients by Service unit, patient entry and exit patterns, variations in length of stay, and obstacles to the discharge process. This approach is consistent with the principle of evidence-based health development that emphasizes the use of actual service information to determine health facility investment priorities.

The operational feasibility of adding beds needs to consider the balance between capacity needs and the ability of hospitals to provide safe and quality services. Based on the results of the study, the projected increase in capacity requirements is related to the increase in the utilization of patient services of 60 years, so that the addition of beds needs to be accompanied by the strengthening of Service units that handle patients



with high complexity. Hospitals need to analyze the readiness of human resources, including the ratio of nursing staff, the availability of specialist doctors, rehabilitation personnel, and other supporting services before expanding capacity. Studies on hospital capacity management show that an increase in the number of beds without an increase in supporting capacity can lead to an increase in workload and decrease the efficiency of services. (Harrison et al., 2021; OECD, 2023).

In addition to the addition of physical capacity, alternative strategies such as optimizing the flow of services can be a more efficient approach in dealing with the increasing needs of 60-year-old patients. Interventions such as strengthening outpatient services, developing a chronic disease clinic, planning patient discharge from the start of treatment, and coordinating referrals can reduce the pressure on hospital beds. This approach is in line with the concept of integrated care that places hospitals as part of a sustainable health care system, not just as inpatient service providers. Thus, the results of this study can be used to support management decision making that considers aspects of capacity, efficiency, and sustainability of services. (WHO, 2021; OECD, 2022).

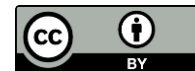
This study has some limitations that need to be considered in interpreting the results. First, the study used a retrospective design based on hospital service data so that the projected results are highly dependent on service patterns during the observation period and have not fully considered external changes such as referral policies, changes in health financing, or medical technology developments. Second, the model has not included clinical variables such as primary diagnosis, disease severity, case mix index, and patient dependence level that can affect the length of care of patients aged ≥ 60 years. Third, this study showed an association between the increased utilization of services of 60-year-old patients and the need for beds, but could not prove a causal relationship because the study design was observational.

Future studies will need to develop more comprehensive projection models using monthly time series data and incorporating patient characteristics in greater detail. Models based on age group, diagnosis, disease severity, and service unit can provide more specific estimates of bed needs than aggregate models. In addition, the use of scenario analysis can help hospitals assess various possible changes in capacity needs based on variations in patient growth, drill targets, and changes in service patterns. The development of the model is expected to support the planning of hospital beds that are more adaptive and in accordance with the needs of patients aged ≥ 60 years in the future. (WHO, 2023; Barasa et al., 2021).

CONCLUSIONS

This study shows that there is an increase in the need for inpatient capacity at Andalas University Hospital related to the increase in the utilization of services by patients aged ≥ 60 years. Based on a linear regression analysis, the increase in patient visits of 60 years had a significant relationship with the need for inpatient beds, maintaining the values of statistical significance, regression coefficients, confidence intervals, and the proportion of variation described by the model. Projections based on service trends and bed requirement components that consider the number of patients admitted, length of stay, patient days, and BOR targets show an increase in bed demand until 2030. These results support the use of 60-year-old inpatient service data as one of the bases for hospital bed capacity planning, although the relationship found is associative and cannot be interpreted as a causal relationship.

The implication of this study is the need for Andalas University Hospital to carry out capacity planning in stages by considering changes in the case mix, the characteristics of the length of care for patients aged ≥ 60 years, the readiness of the affected service units, and operational feasibility before adding hospital beds. This study has limitations because it uses retrospective design based on historical Service data so that the projected results depend on service patterns during the observation period and has not fully considered external changes such as referral policies, health financing, medical technology developments, and epidemiological changes. In



addition, the model has not included clinical variables such as primary diagnosis, disease severity, case mix index, and degree of patient dependence that can affect length of stay and capacity needs. Therefore, further research is needed to develop a predictive model based on more detailed time series data by including clinical characteristics and variations in needs between service units in order to estimate the need for hospital beds to be more accurate.

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REFERENCES

- Adriani, Mila Sari, & Samuel Hadjo. (2026). The Relationship Between Health Misinformation Exposure and Adherence to Disease Prevention Programs: A Cross-Sectional Study in Indonesia. *Miracle Get Journal*, 3(2), 102–112. <https://doi.org/10.69855/mgj.v3i2.607>
- Ahmadi-Javid A, Jalali Z, Klassen KJ. Outpatient appointment systems in healthcare: a review of optimization studies. *European Journal of Operational Research*. 2020;258(1):3–34. doi:10.1016/j.ejor.2016.06.054.
- Badan Pusat Statistik. *2023 Elderly Population Statistics*. Jakarta: Badan Pusat Statistik Republik Indonesia; 2023.
- Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *The Lancet*. 2021;398(10292):E21. doi:10.1016/S0140-6736(21)01786-2.
- Christina, T.Y., Maria, D., Sampouw, N., Manoppo, M.W., Diannita, C.G., Mustar, M., Hadjo, S., Evawaty, E., Yuliani, E., & Indrawati, I. (2025) *Public Health Nursing*. Jakarta: Yayasan Kita Menulis.
- Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. *The Lancet*. 2021;397(10284):1718–1728. doi:10.1016/S0140-6736(21)00514-1.
- De Belvis AG, Ferre F, Specchia ML, Valerio L, Fattore G, Ricciardi W. The financial burden of hospital care for older people with chronic conditions. *Health Policy*. 2020;124(7):735–742. doi:10.1016/j.healthpol.2020.05.003.
- Hadjo, S., Dalimunthe, D.Y., Tasnim, T., Manalu, J.S., Sumiyati, I., Kasenda, T., Djuwadi, G., Sagala, N.S., Simamora, J.P., & Zainab, Z. (2025) *Theory and Practice of Health Promotion*. Jakarta: Yayasan Kita Menulis.
- Hadjo, S., Kasenda, T., & Hadjo, N. (2025). Development of a Self-Determination Model Questionnaire Instrument on the Breakfast Habits of Adolescents in Junior High Schools. *Jurnal Sosial Teknologi*, 5(6), 1911-1917.

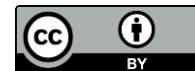


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- Harrison R, Fischer S, Walpola RL, Chauhan A, Babalola T, Mears S, et al. Where do models for change management, improvement and implementation meet? A systematic review of the health service literature. *BMC Health Services Research*. 2021;21:1–13. doi:10.1186/s12913-021-06292-1.
- Kementerian Kesehatan Republik Indonesia. *Indonesia Health Profile 2022*. Jakarta: Kementerian Kesehatan Republik Indonesia; 2023.
- Kementerian Kesehatan Republik Indonesia. *National Action Plan for Elderly Health 2020–2024*. Jakarta: Kementerian Kesehatan Republik Indonesia; 2020.
- McCarthy SE, Moore L, Jones S, Howe C, Wilson E. Hospital capacity planning using predictive modelling approaches: a systematic review. *BMC Health Services Research*. 2022;22:1–12. doi:10.1186/s12913-022-07554-2.
- Nainggolan, K., Ansya, Y.A., Hamdayani, H., Sihombing, Y.A., Geneo, M., Hadjo, S., Rois, I., Siburian, U.D., Shidiq, A., & NNPS, R.I.N. (2025) *Introduction to Public Health in the Global Era*. Jakarta: Yayasan Kita Menulis.
- Nainggolan, K., Panduwiya, H., Hasibuan, A., Ansya, Y.A., Fauziyyah, N., Sianturi, E., Dalimunthe, D.Y., Hadjo, S., Manoppo, I.J., & Sampouw, N. (2025) *Health Promotion and Behavioral Science: Concepts and Strategies*. Jakarta: Yayasan Kita Menulis.
- Najibi SM, Seyedi SH, Farhadi P, et al. Development of a model for predicting hospital beds shortage and optimal policies using system dynamics approach. *BMC Health Services Research*. 2022;22:1525. doi:10.1186/s12913-022-08936-w.
- Organisation for Economic Co-operation and Development. *Health at a Glance 2021: OECD Indicators*. Paris: OECD Publishing; 2021. doi:10.1787/ae3016b9-en.
- Organisation for Economic Co-operation and Development. *Health at a Glance 2023: OECD Indicators*. Paris: OECD Publishing; 2023. doi:10.1787/7a7afb35-en.
- Organisation for Economic Co-operation and Development. *Ready for the Next Crisis? Investing in Health System Resilience*. Paris: OECD Publishing; 2023.
- Overton CE, Pellis L, Stage HB, Scarabel F, Burton J, Fraser C, et al. EpiBeds: data-informed modelling of the hospital burden during infectious disease outbreaks. *Epidemics*. 2021;37:100520. doi:10.1016/j.epidem.2021.100520.
- Rahmawati Shoufiah, Inez Vravty Lestari, & Samuel Hadjo. (2026). Community-Based Health Promotion Model for Diabetes Mellitus Prevention in Urban Areas. *Miracle Get Journal*, 3(2), 113–126. <https://doi.org/10.69855/mgj.v3i2.608>
- Rudin C, Chen C, Chen Z, Huang H, Semenova L, Zhong C. Interpretable machine learning: fundamental principles and 10 grand challenges. *Statistics Surveys*. 2022;16:1–85. doi:10.1214/21-SS133.
- United Nations Department of Economic and Social Affairs. *World Population Ageing 2020 Highlights*. New York: United Nations; 2021.
- United Nations Department of Economic and Social Affairs. *World Social Report 2023: Leaving No One Behind in an Ageing World*. New York: United Nations; 2023.
- World Health Organization. *Ageing and Health*. Geneva: World Health Organization; 2022.
- World Health Organization. *Decade of Healthy Ageing: Baseline Report*. Geneva: World Health Organization; 2021.
- World Health Organization. *Global Report on Ageism*. Geneva: World Health Organization; 2021.
- World Health Organization. *Global Status Report on the Decade of Healthy Ageing 2021–2030*. Geneva: World Health Organization; 2022.
- World Health Organization. *Integrated Care for Older People (ICOPE): Guidance for Person-Centred Assessment and Pathways in Primary Care*. Geneva: World Health Organization; 2021.



Zhang X, Meltzer D, Zhang Y. The effect of increasing age on health care utilization and hospital demand among older adults. *Health Economics Review*. 2021;11:1–12. doi:10.1186/s13561-021-00330-8.