ჯანდაცვის პოლიტიკა, ეკონომიკა და სოციოლოგია
Health Policy, Economics & Sociology PRINT ISSN 2960-9992
ONLINE ISSN 2960-9984

An aggregated hospital quality index based on traditional available activity data, a metric exposing change

საავადმყოფოს ხარისხის აგრეგირებული ინდექსი ხელმისაწვდომობისა და აქტივობის ტრადიციულ მონაცემებზე დაყრდნობით: დინამიკის ამსახველი მიდგომა

https://doi.org/10.52340/healthecosoc.2025.09.01.07

Ilir Akshija[1a]

ილირ აკშიია[1a]

[1] University Hospital Center "Mother Teresa", Tirana, Albania

[1] საუნივერსიტეტო საავადმყოფოს ცენტრი „დედა ტერეზა", ტირანა, ალბანეთი

Abstract

Introduction: Considering two of the major pillars of performance comparison, theoretically (principles and feasibility) and practically (standardized and comparative indicators, and what our reporting possibilities are), a pyramid can be conceived. The apex is reserved for the few best hospitals, while the base is shared by other hospitals, which can serve as a common ground of comparison for all hospitals. We use three hospital metrics from Tirana University Hospital Center: ALOS (Average Length of Stay), BOR (Bed Occupancy Rate), and CM (Crude Mortality). The final dataset resulted in 730 observations over 51 clinics, ranging from January 2005 to December 2019. **Method:** All data were represented as the rate of the present year to the mean of all previous years in the database. ALOS rate, BOR rate, and CMR rate were the new standardized metrics used for comparison of clinics to each other through evaluation of each clinic to its historical self. The sum of the three metrics creates the Aggregated Rate, a unique value for each clinic comparable with others. The highest value is associated with lower performance. **Results:** Aggregated Rate, year 2019 as reference, classifies clinics in a quality scale, ranging from 1.54 to 5.9. The same calculation is performed for important ICD-9 three-digit diagnoses, ranging from 0.48 for 'Other forms of chronic ischemic heart disease' to 1.38 for 'Acute appendicitis'. **Conclusions:** We recommend the construction of an Aggregated Rate interactive app as a hospital metrics quality indicator tool.

Keywords: Aggregated Rate (AR), hospital metrics, performance, interactive tool

Quote: Ilir Akshija. An aggregated hospital quality index based on traditional available activity data, a metric exposing change. Health Policy, Economics and Sociology, 2025; 9 (1). https://doi.org/10.52340/healthecosoc.2025.09.01.07

აბსტრაქტი

შესავალი: საავადმყოფოების საქმიანობის შედარების ორ ძირითად საყრდენს – თეორიულს (პრინციპები და განხორციელებადობა) და პრაქტიკულს (სტანდარტიზებული და შედარებადი ინდიკატორები, ასევე ანგარიშგების შესაძლებლობები) – თუ გავითვალისწინებთ, შესაძლებელია წარმოვიდგინოთ პირამიდა. მისი მწვერვალი რჩეული, მაღალი ხარისხის საავადმყოფოებისთვის არის დაცული, მაშინ როცა საფუძველს სხვა კლინიკები ქმნიან,

[a] iakshija@yahoo.com https://orcid.org/0000-0002-2891-271X

რომლებიც ყველა საავადმყოფოსთვის შეიძლება საერთო შედარების ბაზად იქცეს. ჩვენ გამოვიყენეთ სამი საავადმყოფოს მაჩვენებელი ტირანას საუნივერსიტეტო საავადმყოფოს ცენტრის მონაცემებიდან: ALOS (პაციენტის საშუალო ხანგრძლივობა სტაციონარში), BOR (საწოლების დატვირთვის მაჩვენებელი) და CM (მთლიანი სიკვდილიანობა). საბოლოო მონაცემთა ბაზა მოიცავდა 730 დაკვირვებას 51 კლინიკის ფარგლებში, 2005 წლის იანვრიდან 2019 წლის დეკემბრამდე. **მეთოდი:** ყველა მონაცემი წარმოდგენილი იყო როგორც მიმდინარე წლის მაჩვენებლის შეფარდება მონაცემთა ბაზაში არსებული წინა წლების საშუალო მნიშვნელობასთან. ALOS-ის მაჩვენებლის შეფარდება, BOR-ის მაჩვენებლის შეფარდება და CM-ის მაჩვენებლის შეფარდება წარმოადგენდა ახალ სტანდარტიზებულ მეტრიკებს, რომლებიც შესაძლებელს ხდიდა კლინიკების შედარებას ერთმანეთთან, თითოეული კლინიკის ისტორიულ მონაცემებთან შედარებით. ამ სამი მეტრიკის ჯამი ქმნის აგრეგირებულ მაჩვენებელს (Aggregated Rate) — უნიკალურ მნიშვნელობას თითოეული კლინიკისთვის, რომელიც შეიძლება გამოყენებულ იქნეს სხვებთან შედარებისთვის. რაც უფრო მაღალია ეს მაჩვენებელი, მით უფრო დაბალია კლინიკის ხარისხი. **შედეგები:** აგრეგირებული მაჩვენებელი, 2019 წლის მონაცემების გამოყენებით, კლასიფიცირებს კლინიკებს ხარისხის სკალაზე, რომელიც მერყეობს 1.54-დან 5.9-მდე. ანალოგიური მეთოდით შეფასდა მნიშვნელოვანი ICD-9-ის სამნიშნა დიაგნოზებიც — მაჩვენებლები მერყეობს 0.48-დან (ქრონიკული იშემიური გულსისხლძარღვთა დაავადების სხვა ფორმები) 1.38-მდე (მწვავე აპენდიციტი). **დასკვნები:** რეკომენდირებულია აგრეგირებული მაჩვენებლის (Aggregated Rate) ინტერაქტიული აპლიკაციის შექმნა, როგორც საავადმყოფოს ხარისხის მაჩვენებელზე დაფუძნებულ შეფასების ინსტრუმენტზე.

საკვანძო სიტყვები: აგრეგირებული მაჩვენებელი (AR), საავადმყოფოს მეტრიკა, ინტერაქტიული ინსტრუმენტი.

ციტატა: ილირ აკშიია. საავადმყოფოს ხარისხის აგრეგირებული ინდექსი ხელმისაწვდომობისა და აქტივობის ტრადიციულ მონაცემებზე დაყრდნობით: დინამიკის ამსახველი მიდგომა. ჯანდაცვის პოლიტიკა, ეკონომიკა და სოციოლოგია. ჯანდაცვის პოლიტიკა, ეკონომიკა და სოციოლოგია, 2025; 9 (1). https://doi.org/10.52340/healthecosoc.2025.09.01.04.

Introduction

Migration from past methods of hospital management, especially for countries transitioning from the historical eastern bloc, includes the hospital beds policy. Albania, at the beginning of political regime change, inherited 301.7 beds/100,000, and the health care system was functioning as a continuum of the former Semashko model (Dokumenta Statistikor Për Shëndetësinë, 2025). The country is a typical environment of internal and external migration. Population number changes are somewhat predictable but difficult to handle in practical, political, technical, and financial terms where the expected changes need to conform to population changes. The internal population flow is directed towards the capital, while the external emigration process generally aims at the EU countries. Its proper study is often blurred by political agendas. Traditional hospital activity indicators are influenced by each other and also interact with the external social environment. For example, length of stay positively influences bed occupancy rate, but length of stay is affected by the capacity of home care services. The population growth is the other external factor defining the number of patients. (Najibi et al., 2022) Locally, the Albanian health care system is facing important challenges. From 2006 to 2016, the number of TUHC tertiary care hospital patients rose from 55,528 to 78,130, and is still rising due especially to patient flow from other districts with poorer quantity and quality of services. We found, it impacted the length of hospital stay as is the case of open appendectomy length of hospital of 3.8 and 4.6 days, in two clinics (laparoscopic procedures were very rare at that time), nearing the 4.01 days of laparoscopic appendectomy found in literature, which is an abnormality due to pressure on bed utilization caused by the increasing patient flow (Akshija, & Dibra, 2022). Historically, the number of hospital beds shows extreme variability even inside closed systems. For example, the number of psychiatric hospital beds in the Northeast United States ranged from 40 to 142 beds/100,000 (Davis et al., 1998)

Time, GINI Coefficient, and Human Development Index (HDI) are found to be predictors of at least mental hospital beds per 100,000 population (Metcalfe, & Drake, 2020). When making comparisons between countries, it would be appropriate to standardize predictors effect. We believe that standardization loses its value when comparison descends from countries to analysis of departments activity over time and between them, and especially the activity of one department compared to its historical self. This is because the GINI Coefficient and HDI are expected to be the same between the affected populations of different hospital departments.

Patient centered care focuses on individual diversity and preferences while in the hospital. The unifying string for all patients is the word hospital and what it represents. However specific to individual needs, health care has to be efficient, besides being effective. The hospital unit (department, clinic, etc.) stands between specialized care for a certain group of conditions and the hospital as a whole. The ever-changing performance indicators weigh the unit against its historical self and other units. Is it possible to create a single indicator to reflect all the above aspects of a unit as a sole value comparable with other units? Our study attempts to approach this question. We understand that a satisfactory solution remains an objective of multidisciplinary teams from many health care organizations and levels.

Considering two of the major pillars of performance comparison, theoretically (principles and feasibility) and practically (standardized and comparative indicators, and what our reporting possibilities are), a pyramid can be conceived. The apex is reserved for the few hospitals with the best human resources, capabilities, financing, and outcomes, while the base is shared by all other hospitals, which can serve as a common ground of comparison for all hospitals. It is for the base hospitals that we aim to develop our proposal. First, the elements of the comparison have to be universally produced. This means all hospitals need to provide the indicator, and looking at actual possible hospital indicators that can be found at every hospital, activity, and morbidity statistics are available, but not always public. This claim is beyond basic for modern hospitals and systems.

Realizing what different departments have in common is crucial when comparing them. A specific procedure can be of utmost importance for a certain condition, but it is unique for the specific department covering it. Of less importance is the same principle when the same department is compared to its historical self, but when time analysis covers decades, it is possible that the adoption of new technological approaches and management models can make the same clinic unrecognizable to its former self.

Several hospital beds can’t be static. A good example of a hospital bed strategy is tuberculosis beds. While countries with initially high numbers of beds were lowering their number, other countries with a small tuberculosis bed number were increasing it (Bulla et al., 1977). Comparison between countries becomes hazardous in terms of patterns of care and financing in those fluctuating situations. The infectious diseases departments require a different approach, and the results must be handled with caution. In case of no outbursts of infectious diseases, the infectious disease clinic's performance can be measured and compared to other clinics. But, if outbreaks happen, as is the case with the COVID-19 outbreak results deserve clarification. $R0 > 1$ creates increased patient flow, which means at the same time, more severe cases are coming. Susceptible, infected, and hospitalized cases give a picture at time t, but change over time (Misra et al., 2022). The situation is beyond hospital activity and performance, as it depends on the response of the whole system towards the disease. Similar to it is the situation of psychiatric hospital beds. For example, the comparison of just hospital psychiatric beds in Italy with the rest of the EU countries becomes difficult because of early systemic intervention on deinstitutionalization in Italian mental health care policies (Brunn et al., 2023a). Conformity to the bed reduction policy sometimes becomes inappropriate. Regionalization and bed reduction, acting together to increase financial efficiency in some cases, create gaps in the provision of care ("Hospital Beds for Children: A Shrinking Number and Poorly Distributed," 2023). Altogether, the situation of methodological frameworks in hospital management in Albania is not satisfactory. Policy Watch confirms naïveté of methodologies or an absolute lack regarding the relationship between service tariffs to capital investments. [10] (Rechel, 2009, p. 254) The main tertiary hospital in Albania suffered from February 2024 to June 2024 the impossibility of emergency care because of a fire in the department (Prokuroria Tiranë, 2024). Did it come as an accident or as a push over the emergency department due to the grounds of bed reduction for acute care policy? Hospitals remain central to health care, especially in countries like Albania. There are countries, specifically India, where the hospital industry gets 80% of the overall healthcare market (Bhatia, & al, 2023, p. 121)

We use three hospital metrics: ALOS (Average Length of Stay), BOR (Bed Occupancy Rate), and CM (Crude Mortality). The final dataset resulted in 730 observations over 51 clinics, ranging from January 2005 to December 2019. Year 2019 was used in other studies as a cut-off because of hospital utilization substantial change and used LOS data as part of severity indexes (Brunn et al., 2023b). The number of discharges totaled 990,491 patients. The total of 730 observations (100%) consist respectively; Hospital I (Adult internal medicine) – 210 observations (28.8%), Hospital II (Surgery) – 117 observations (16.0%), Hospital III (Paediatric) – 185 observations (25.3%), Hospital IV (Infectious disease) – 60 observations (8.2%), Hospital V (Neurosciences) – 158 observations (21.6%). A total of 12 important/frequent diagnoses coded second ICD-9 three-digit code were selected to analyze their ALOS (Average Length of Stay) progression by year.

Other studies use the mean hospital length of stay as an interdisciplinary indicator measurement (Okayama et al., 2020). Risk-adjusted mortality permits fair comparison to peer healthcare structures. It is important to evaluate whether our second method of risk-adjusted mortality is required. Because the method is based on data representing the historical-self of the health care structure, change shows progress on the same population, and the goal of the method is to measure progress. On the other hand, for many hospitals is not possible to calculate risk-adjusted mortality; crude mortality remains the indicator to be evaluated (Schubert, & Kemmerly, 2022a, p. 32).

All data were represented as the rate of the present year to the mean of all previous years in the database. Thus, ALOS rate, BOR rate, and CMR rate were the new standardized metrics used for comparison of clinics to each other through evaluation of each clinic to its historical self. The sum of the three metrics creates the Aggregated Rate, a unique value for each clinic to compare with others. The higher the value, the lower the performance. We built a quality measurement indicator using the minimum activity and morbidity data that all hospitals produce, combined with another goal, which was to offer a tool that produces a unitless indicator. [15] (Lee et al., 2022) Complex professional raters offer the above ratings, we suggest a continuous indicator for comparison (Schubert, & Kemmerly, 2022b, p. 85)

What to do when we encounter death values of 0? To create 'the period average number of deaths', we took into consideration the existing year the calculations for comparison are performed, in case there is only one death in the period and it happened this exact year. For example, the ten-year average, when only a death occurred in the last year, is calculated as 1/ 'average' (0+1) =1. When mortality equals 0 every year, it is not an issue, thus, it is a constant not adding or attracting value. it is calculated as 1 when summing indicators, making the aggregated quality indicator, but there was just one clinic with 0 deaths during the study period. In this case, it is a 0. When cases of death happen other than in the last year, it can't serve as a denominator. It can be a casual happening with no practical value, or it can be a serious mistake happening in a clinic with no usual mortality.

Most recent studies criticize the indicator bed/1,000 people because it doesn't take into consideration patients' age structure, and especially the effect of the nearness-to-death indicator, suggesting the involvement of deaths/1,000 population in hospital utilization calculation. The comparisons are rates. Although mathematical simulation shows that allotting hospital beds the wrong way has a direct impact on increasing the number of infected individuals (Braga et al., 2021).

The 85% bed occupancy approach as an alarm indicator of usage has supporters and foes, but allows calculations on long-run averages, which queuing models make difficult because of complex computational operations (Proudlove, 2020). There is a compromise created from the intersection of what is best and what is possible. The computational complexity offers the best standard of evaluation, while practical, economic, technological, and human resources stand at a possibly not be equal to the best standard. Standardization of possibility means bringing the best standard to what is possible. All Microsoft Excel 2016 spreadsheets are the same, but not all healthcare managers are the same. Administrative sources can reflect quality, but are not specific and are not suited to forward improvement. An important question to reevaluate is: does our three-indicators evaluation system cover the triad of accessibility, quality of services, and efficiency as a triad of health care services performance? (Schubert, & Kemmerly, 2022).

Results

Tirana University Hospital Center is a tertiary care hospital, and its historical activity data were used to test the model. Admission data from January 2005 to December 2019 (December 2022 for the diagnoses test) were used to test whether the model conforms to a retrospective observational study.

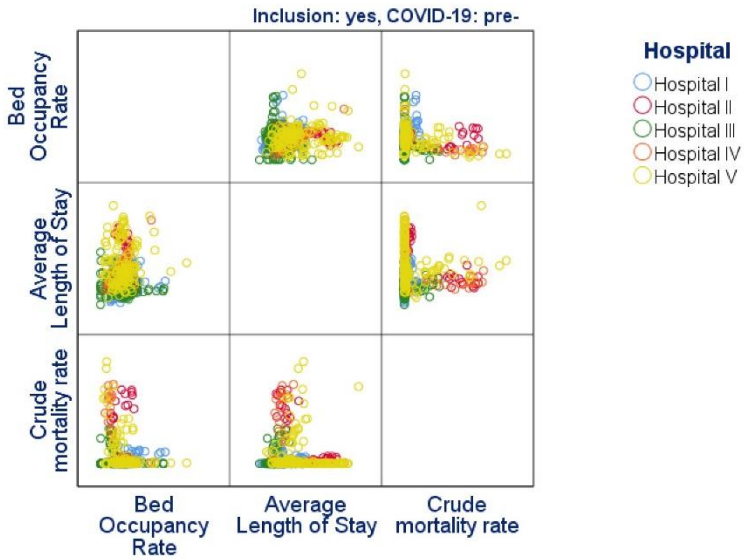

Chart 1. Correlations between basic activity indicators, all data.

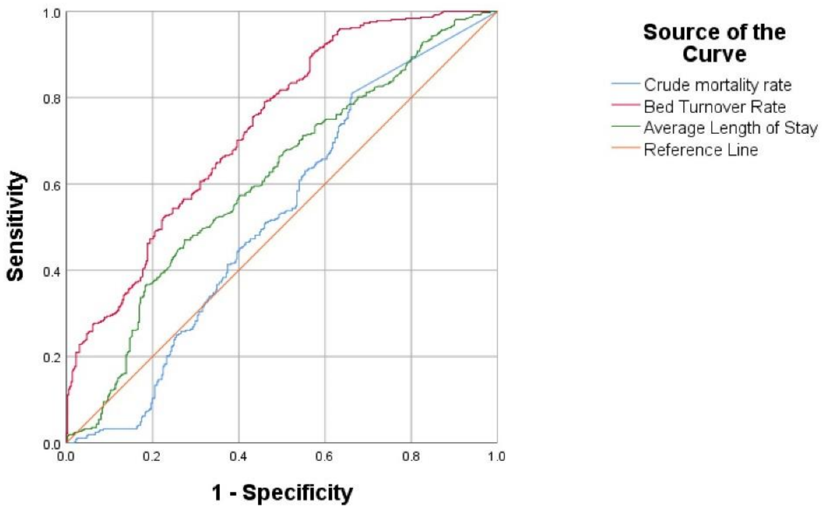

Chart 2. ROC over 85% utilization rate cut-off.

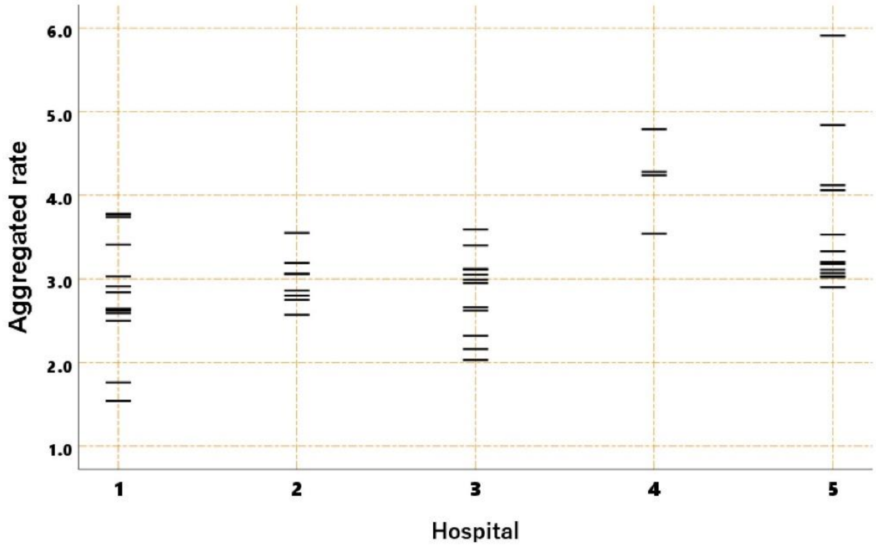

Chart 3. Aggregated Rate, year 2019 as reference.

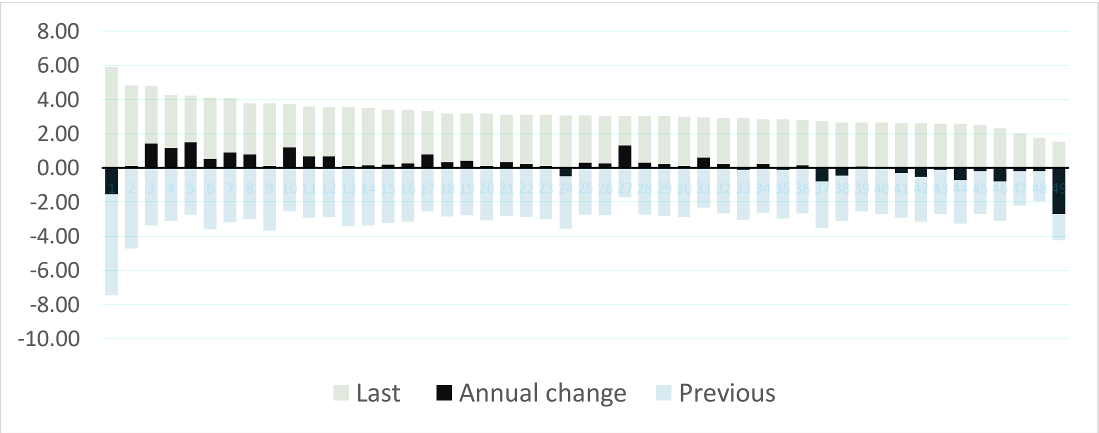

Chart 4. Change from previous year, aggregated rate.

Table 1. Aggregated Rate (AR), year 2019 as reference.

	Clinic	Years	ALOS rate	BOR rate	CMR rate	Aggregated rate		Clinic	Years	ALOS rate	BOR rate	CMR rate	Aggregated rate
Hospital I	Cardiology 2	15	0.45	0.78	0.31	1.54	**Hospital III**	General Clinic 7	14	1.02	0.01	1.00	2.03
	Cardiology 1	15	0.69	0.98	0.10	1.76		Cardio. - Rheumato.	15	1.15	0.01	1.00	2.16
	Nephrology	15	0.89	1.09	0.53	2.50		Surgery	15	1.09	1.04	0.19	2.32
	Dentistry	15	0.82	0.77	1.00	2.59		Endocrinology	15	0.74	0.88	1.00	2.62
	Dermatology	15	0.80	0.82	1.00	2.62		CU	13	0.93	0.94	0.79	2.66
	Endocrinology	15	1.03	1.29	0.33	2.64		Gastroenterology	15	0.83	1.11	1.00	2.95
	Cardiology ICU	15	0.73	1.01	0.90	2.64		Neurology	15	1.02	1.54	0.43	2.99
	Rheumatology	15	0.86	0.98	1.00	2.84		Hematology	15	1.00	0.49	1.56	3.05
	Hematology	15	1.05	0.96	0.90	2.91		Infectious diseases	15	1.08	1.04	1.00	3.11
	Ophthalmology	15	0.91	1.12	1.00	3.03		Nephrology	15	1.01	1.11	1.00	3.12
	Allergology	15	0.99	1.28	1.14	3.41		General Clinic 10	15	1.00	1.40	1.00	3.40
	Hypertension	15	0.92	1.60	1.22	3.74		Allergology	15	0.97	0.95	1.68	3.59
	Otorhinolaryngology	15	1.26	1.28	1.24	3.77	**Hospital V**	Psych. Urgent Female	10	0.93	0.98	1.00	2.90
	Gastrohepatology	15	0.91	0.97	1.90	3.78		Toxicology	9	1.08	0.93	1.00	3.02
Hospital II	Burn-Plastic surgery 1	15	0.74	1.05	0.77	2.57		Psych. Urgent Male	10	1.05	0.98	1.00	3.03
	Cardiac surgery	15	0.88	1.21	0.66	2.75		Psych. Children	10	1.19	0.88	1.00	3.07
	General Surgery 3	15	0.84	1.03	0.93	2.80		Psych. Female	10	1.03	1.09	1.00	3.11
	General Surgery 2	15	0.80	0.96	1.09	2.86		Psych. Male	10	1.09	1.09	1.00	3.18
	Orthopedics	12	1.08	1.20	0.78	3.06		Neurology 3rd floor	15	1.03	1.65	0.51	3.20
	Angiology 1	15	0.94	1.17	0.95	3.06		Neurology 4th floor	15	1.04	1.23	1.05	3.33
	General Surgery 1	15	1.05	1.14	1.01	3.19		Alcohology	9	1.17	1.36	1.00	3.53
	Hospital 2 ICU	15	0.80	1.54	1.22	3.55		Neurosurgery 3rd floor	15	1.28	1.36	1.43	4.06
Hosp. IV	ICU	15	1.18	1.14	1.23	3.54		Neurology ICU	15	1.24	1.33	1.56	4.12
	3rd floor	15	1.08	1.09	2.07	4.24		Neurosurgery_4th floor	15	1.63	1.37	1.84	4.84
	2nd floor	15	0.87	1.09	2.32	4.28		Neurosurgery ICU	15	2.80	1.39	1.72	5.91
	1st floor	15	1.01	0.99	2.79	4.79							

Hospital I - Adult internal medicine; Hospital II – Surgery; Hospital III – Paediatric; Hospital IV - Infectious disease; Hospital V – Neurosciences.

Table 2. ALOS and ALOS rate, reference years respectively 2019 and 2022.

ICD-9 code	Diagnosis	2019	2022	2019 rate	2022 rate
414	Other forms of chronic ischemic heart disease	8.7	6.4	0.59	0.48
574	Cholelithiasis	3.8	3.0	0.74	0.63
550	Inguinal hernia	2.3	2.1	0.77	0.72
296	Episodic mood disorders	14.3	12.5	0.78	0.72
428	Heart failure	9.9	8.8	0.83	0.77
295	Schizophrenic disorders	23.6	21.6	0.85	0.80
558	Other and unspecified noninfectious gastroenteritis and colitis	5.0	4.1	0.94	0.80
434	Occlusion of cerebral arteries	9.7	8.3	0.94	0.83
540	Acute appendicitis	4.3	6.3	0.98	1.38
466	Acute bronchitis and bronchiolitis	6.0	5.5	1.01	0.94
485	Bronchopneumonia, organism unspecified	7.5	7.1	1.04	0.99
250	Diabetes mellitus	9.2	7.2	1.04	0.85

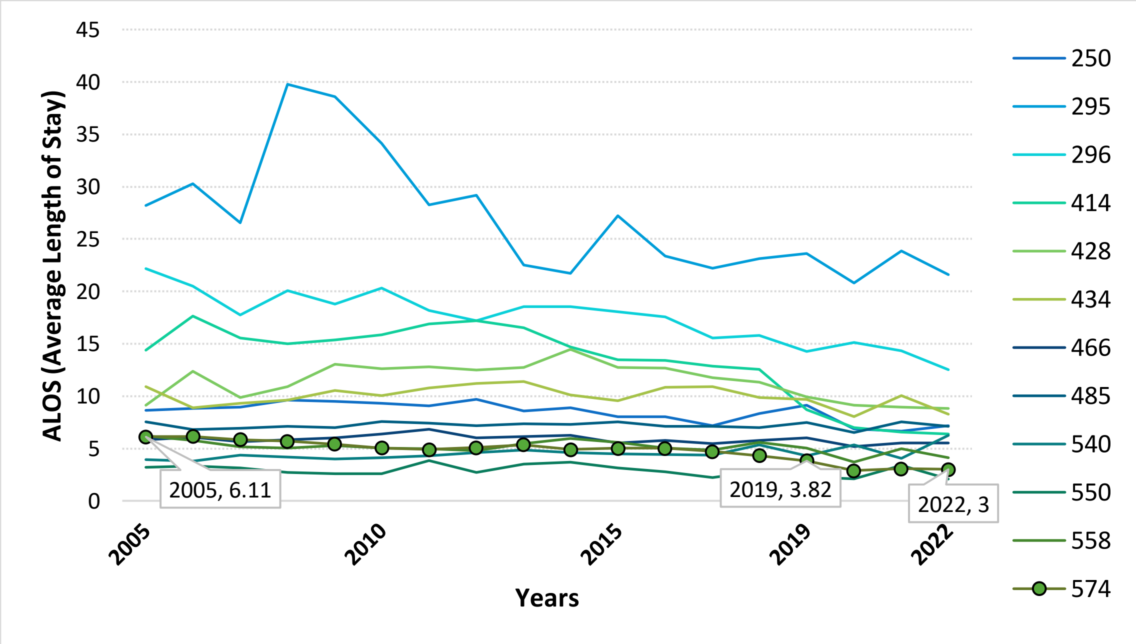

Chart 5. ALOS and ALOS rate, reference years respectively 2019 and 2022

Two clinics comparison

In our example, we analyze two general surgery clinics (Clinic 1 and Clinic 3) with the same statutory responsibilities, covering the same range of procedures and a similar structure of human resources. The only major difference we found is the number of beds, 34 vs. 50. Appendectomy, cholecystectomy, subtotal thyroidectomy, and herniotomy make up, respectively, 63.8% and 62.0% of the total surgical procedures of Clinic 1 and Clinic 3. For the whole period under scrutiny, 2005-2022, respectively, utilization data were ALOS (4.83 vs. 5.47) and BOR (102.4 vs. 92.2). CMR rate (2019 to historical self) deteriorated for Clinic 1 (1.01), and it improved for Clinic 3 (0.93). The 'aggregated rate' indicator, Clinic 1 (3.19) vs. Clinic 3 (2.80), classifies Clinic 3 in a better ranking position than its counterpart, Clinic 1. One important activity procedure of cholecystectomy was further scrutinized to show similarities and differences between clinics. Cholecystectomy as a percent of surgical procedures, ALOS, mortality rate, age at admission, and female to male ratio were as follows: Clinic 1 (17.2%, 4.15, 0.17%, 56.2±15.0 and 2.2) vs. Clinic 3 (28.1%, 4.66, 0.19%, 53.6±15.6 and 2.5). Differences in age at admission and sex were statistically significant, respectively $p<0.001$

and p=0.001. Data differ for all hospital Cholelithiasis ALOS because it considers admissions in other clinics as Gastrohepatology, and here it is calculated only when the surgical procedure is realized.

Discussion

At first impression, looking at the utilization data, Clinic 1 fares better than Clinic 3. Bed utilization in an overburdened system is associated with lower ALOSs. But this comes with a mortality price. Despite the utilization data, the 'Aggregated Rate' rates Clinic 3 better. The Cholecystectomy procedure, an important activity for both clinics, profiles patients on Clinic 3 as significantly younger, significantly female sex, staying longer at the hospital, and having almost the same mortality rate. When a hospital ward breaches the 100% BOR edge, the doctor is pressured to make room for new patients coming from the emergency department and pushing out patients still in need of hospital care. The increase in laparoscopic procedures decreases ALOS, but flow from other counties is still increasing. We note that the 'Aggregated Rate' shows a more truthful evaluation of the overall situation than disjoint indicators. Clinic 3 fares better because it can permit longer stays for its patients, can even choose "the best cases", younger ones or females, which generally show fewer complications, all because it has generally more available beds than Clinic 1. Decreasing the number of beds is good, is not an axiom, especially when the number of patients keeps increasing because of a peripheral lack of services and competition from university hospital doctors to district hospitals.

Can BOR rate, CMR rate, and ALOS rate be considered a representative surrogate evaluation of accessibility, quality, and efficiency? Independent health technology assessments have to prove that accessibility relates to BOR rate, quality relates to CMR rate, and efficiency relates to ALOS rate. Empirically, this reasoning can be acceptable, at least accepting positive correlational relationships between pairs of elements. Their summation producing the Aggregated Rate is meaningful if the three indicators are mostly independent of each other. (Schubert, & Kemmerly, 2022d, p. 187).

We propose the construction of an application. The user inserts ALOS, BOR, the number of discharges, and mortality. In exchange for all inserted clinics, he/she receives the four indicators: ALOS rate, BOR rate, CMR rate, and the Aggregated Rate. The period can be at least two years, comparing the last year with the two last years' mean, and automatically summing the three indicators, creating a rating between clinics and a visual representation. Graphical presentation shows clustering except for clinics that make a trend as cardiology and neurosurgery. (Chart 3)

Some results look paradoxical when other factors are not considered. For example, the private hospitals attract patients, which is quite a new phenomenon. They attract rich citizens and tend to get 'the best patient, which means the younger ones with fewer expected complications. We have to accept the phenomenon of doctors who transfer patients to private practices, most of the time breaching the equity, and in some cases, it is quite illegal. In this case, although the activity data show the position of a certain clinic to another as deteriorating, they are working with more difficult patients, which means the patients' profile, for example, the severity of the same diagnosis, differs from historical data. The length of stay doesn't depend just on the gravity of disease and effective management, but it is also subject to government policies and treatment protocols, which, after approval, become formally inflexible, especially in developing countries where opinion leaders exercise their authority in environments other than their usual working and teaching environment. A case of protocol authority is the use of clozapine in Japan, which began in 2009, and in 2018, only 0.1% of schizophrenic patients were prescribed it, which surely does not represent all doctors' opinions (Reid et al., 2023).

The number of hospitalizations for chemo/radiotherapy positively correlates with the number of regional hospital beds, which was supposed to be pushed by the provider (Matsumoto et al., 2020). The combinations of inappropriate hospital psychiatric admissions as it is the case of patient simulating medical situations to get out trouble from drug dealers whom they own money or just to get shelter on bad weather with paradoxical situations like South Korea's highest world psychiatric hospital use because of their ownership from doctors, makes bed utilization a questionable quality indicator. A hospital bed can also serve for other non-supposed purposes as informally bypassing the referral system, formally being admitted to bypass queuing for costly examinations or other interventions, especially in a fertile under-the-table payments parallel system (Drake, & Wallach, 2019). In hospital patient treatment starts at the emergency department. Emergency department length of stay (EDLOS) when prolonged, ≥ 6 h, is associated with increased mortality. The hospital staffed bed category was associated with in-hospital mortality. Hospitals with more than 1,000 beds and EDLOS < 6h had the lowest mortality. (Barjoan et al., 2022) Thus, additional data from the emergency department would be of interest to be added to the model if possible, to gather and to attach to the electronic patient file. The relationship between market share and quality of care is not widely studied. In a study, the quality of care influenced a marked share, especially for elective surgery. **[22]** (Oddleifson et al., 2021) This is logical as it is the case when the patient has the necessary time to evaluate and choose. The case and structure of the large number of hospital beds in Germany brings an insightful facet to actual trends on hospital bed policy. First, an aging population conditions it, then involving the ambulatory care, physician preferences, political decision, and health care market as the main drivers (Jones, 2023). Acute care hospital levels of care are important in discerning the cost of hospital beds (Bay et al., 1989)

In our case, two sets of clinics can be considered as outliers, Cardiology and Neurosurgery (Table 1). Aggregated Rate (AR) as an in-hospital quality index doesn't show the true success or failure of a specific clinic. For example, the success of percutaneous coronary intervention [PCI] must be evaluated concomitantly with a continuum of care and struggling with less but severe cases raises the question of health care beyond local context, making it necessary the include the indicators like patient's quality of life and survival. If rates of hospital bed occupancy continuously rise, the situation can become clinically unsafe. It was found that a rise of 1% in bed occupancy was associated with a 0.11% increase in risk of admission for patients with four comorbidities. (Friebel et al., 2019).

A good recommendation is to use traditional bed turnover rate (BTR) and bed occupancy rate (BOR), as well as patients' average length of stay (ALS), as independent hospital performance indicators in middle and low-income countries. Lack of investments in data management can't be justified, but surrogate indicators can still be valuable. The Pabon Lasso Model, still in use, places units of comparison in a correlative matrix of BTR and BOR. **[26]** (Aloh et al., 2020) In our study, BTR and BOR are highly correlated (r=0.647, p<0.001), which presupposes they are both affected by the same variables. In this case, adding their results to create a single indicator means also adding common effects. On this ground, BTR was abandoned in an attempt to create somewhat mutually exclusive components for the new indicator. ROC over 85% utilization rate (Chart 2) gives a quick glimpse at their independence.

Research shows hospital occupancy rates larger than 85% to be associated with ED boarding (Janke et al., 2022). ED boarding is typical of the Albanian situation, even though a hybrid solution was in place for some time, called an intermediary ward. These findings correlate well with increased mortality associated with ED waiting time. ICU stay and LOS correlations produce important patterns of patient transition to a certain hospital (Lagoe, 1998). Indicators as 30-day risk standardized mortality rates (RSMRs), risk-standardized readmission rates are key indicators for measurement of US hospital performance, which in itself is considered a central feature of health care policy. **[29]** (Vaughan Sarrazin, & Girotra, 2019) Performance metrics are always evolving, and some of them, although they are gathered, are of doubtful as is the example of socioeconomic status for risk adjustment. Traditionally length of stay was considered an efficiency indicator. Various diversifications as mean stay and median stay were used for comparisons (Murphy, & Noetscher, 1999) Aggregate performance for large hospitals, TUHC is considered a large hospital (>1,000 beds), was higher bur less likely to be identified as top hospitals (O'Brien et al., 2008) This has to be taken in consideration when comparing TUHC hospital with other county hospitals or private clinics. This study defines hospital beds in accordance to the World Health Organisation (WHO) definition, which describes a hospital bed as "a bed that is regularly maintained and staffed for the accommodation and full-time care of a succession of inpatients and is situated in wards or a part of the hospital where continuous medical care for inpatients is provided" (Hawsawi, & Abouammoh, 2022a). We encountered the option many times when the bed is placed as an emergency bed and does not meet the above criteria, but the fact is that one or more stretcher beds were used. One study analyzed the change in the health care service by calculating the rate of change in the total population and the rate of change in the total number of hospital beds in. (Increasing of the number of beds happen to be considered good, as is the case when instead of using the word 'increase' the used expression was 'positive', concluding the overall increase of the number of beds is beneficiary towards health care services. However, this is easily understood, especially in regions like Saudi Arabia, where the correlation coefficient between the number of hospital beds and population changed from r=0.989 to r=0.312.) (Hawsawi, & Abouammoh, 2022b) It is recommended to downsize only after considering prospective patient flow changes. Results of 2010/11–2017/18 on the English system find lower quality with increased bed occupancy, especially regarding health gains and overall mortality (Bosque-Mercader, & Siciliani, 2022). The changing linearity of the number of admissions is susceptible. We found a decrease on mean annual incidence (first admissions) per 100,000 population of schizophrenic psychoses from 11.17, period (2007-2011) to 8.07, period (2017-2021), with a 17-years prevalence of 2.248 per 1000, for Tirana county catchment area, which we can consider a low admission rate (Akshija, 2023) Readmission rates (For example readmission rates are from difficult to impossible to register for many hospitals) (Johnson, 2023a, p. 57).

Mortality rates are among, just in-hospital mortality, because health insurance doesn't get data on the 30-day mortality rate, which is a top measure utilized in healthcare for benchmarking and comparing. **[35]** (Johnson, 2023b, p. 167) Use of Artificial Neural Networks (ANN) is a prospective forecasting technique that will help measure hospital bed demand. Although forecasts work for short-term in the future the increasing power of calculations can expand their usage (Misra & Maurya, 2023). Independent of the method, the main goal remains hospital performance measurement and improvement. Simple methods set goals, permit nationwide appliances and comparisons, while ANN sophistication is still rudimentary in practical terms. For example, in Albania, it would be practically impossible to use ANN techniques in other districts than the capital, and it would be impossible regarding the actual national databases to adjust for patient age and sex for the analytics team in the capital. A tool that automatically generates an indicator based on data input would be appropriate. If a bed becomes empty, it is therefore the "variable" cost that is avoided; the "fixed" cost remains and is incurred as long as the beds are present. Consequently, the fixed cost per bed can be thought of as the cost associated with having that bed available but unused. **[37]** (Pauly & Wilson, 1986) This contradicts our central policy approach. Traditionally, for hospitals with different lengths of stay, even when case mix is considered, adjustments were needed for comparisons. Our recommendation is to compare the health care unit with its historical self and standardize it, making it comparable with other dissimilar units. Communities' income and education positively correlate with risk-averse choices, but negatively correlate with teaching hospitals' preferences on safety (Hornbrook & Goldfarb, 1983). This is a classic example of how scholastic principles remain stable over time, but patients' preferences and protocols change over decades long time. The example of childhood age definition ranges from 11 years to 26 years between European region countries, paradoxically difficult to understand and comply with from our policymakers (McKee, & al, 2020, p. 23).

Long-term good hospital performance indicators tended to measure facets of efficacy, efficiency, timeliness, patient-centeredness, safety, and equity (Binger et al., 2022). Further investigation is required to evaluate the CMR rate for these objectives. New quality metrics need careful evaluation. It was found that some quality metrics were surgical procedure specific, necessitating adequate modification (Graham et al., 2019). Key Performance Indicators of the Learning and Growth Perspective (adding a learning and growth indicator to the three suggested indicators requires a model, too). Key performance indicators in this subject from BSC (Balanced Scorecard) are an excellent reference (Weimann, E., & Weimann, 2018, p. 42). In case the new indicator is accepted, we expect to design a quality measurement tool for common usage, referring also to previous models but with different goals (Magazine et al., 2021)

Conclusions

A new indicator, Aggregated Rate, was suggested as the meeting point between the specifics of a clinic's intrinsic indicators with general nonspecific hospital indicators, showing the progress to historical self and benchmarking with other clinics (hospitals) expressed all as a sole indicator.

References

Akshija, I., & Dibra, A. (2018). Hospital doors under pressure: policies and trends in the major tertiary care hospital in Albania. Il Giornale di chirurgia, 34(5), 265–271.

Akshija, I. (2023). Incidence and prevalence of psychotic disorders, a county population study of Tirana Hospital Admissions. Journal of Health Policy & Outcomes Research, (1), 48–56. https://doi.org/10.7365/jhpor.2023.1.7

Aloh, H. E., Onwujekwe, O. E., Aloh, O. G., & Nweke, C. J. (2020). Is the bed turnover rate a good metric for hospital-scale efficiency? A measure of resource utilization rate for hospitals in Southeast Nigeria. Cost effectiveness and resource allocation: C/E, 18, 21. https://doi.org/10.1186/s12962-020-00216-w

Barjoan, E. M., Allouche, J., Legueult, K., Géloen, C., Prouvost-Keller, B., & Pradier, C. (2022). Hospitalisation avec ou pour COVID-19: quel indicateur de surveillance choisir? Sante publique (Vandoeuvre-les-Nancy, France), 33(5), 725–728. https://doi.org/10.3917/spub.215.0725

Bay, K. S., Toll, K. A., & Kerr, J. R. (1989). Utilisation of acute care hospital beds by levels of care. Health services management research, 2(2), 133–145. https://doi.org/10.1177/095148488900200205

Bhatia, D., Chaudhari, P. K., Chaudhary, B., Sharma, S., & Dhingra, K. (2023). A Guide to Hospital Administration and Planning. Springer Nature.

Bosque-Mercader, L., & Siciliani, L. (2022). The association between bed occupancy rates and hospital quality in the English National Health Service. The European Journal of Health Economics, 24(2), 209–236. https://doi.org/10.1007/s10198-022-01464-8

Braga, M. B., Fernandes, R. D. S., Souza, G. N., Jr, Rocha, J. E. C. D., Dolácio, C. J. F., Tavares, I. D. S., Jr, Pinheiro, R. R., Noronha, F. N., Rodrigues, L. L. S., Ramos, R. T. J., Carneiro, A. R., Brito, S. R., Diniz, H. A. C., Botelho, M. D. N., & Vallinoto, A. C. R. (2021). Artificial neural networks for short-term forecasting of cases, deaths, and hospital beds occupancy in the COVID-19 pandemic at the Brazilian Amazon. PloS one, 16(3), e0248161. https://doi.org/10.1371/journal.pone.0248161

Binger, T., Chen, H., & Harder, B. (2022). Hospital Rankings and Health Equity. JAMA, 328(18), 1805–1806. https://doi.org/10.1001/jama.2022.19001

Brunn, M., Kratz, T., Padget, M., Clément, M. C., & Smyrl, M. (2023). Why are there so many hospital beds in Germany? Health services management research, 36(1), 75–81. https://doi.org/10.1177/09514848221080691

Bulla A. (1977). Trends in tuberculosis hospital and sanatorium beds throughout the world (1960-1975). Evolution du nombre des lits des hôpitaux pour tuberculeux et des sanatoria dans le monde (1960-1975). World Health Statistics Report. Rapport de statistiques sanitaires mondiales, 30(1), 39–56.

Davis, G. E., Lowell, W. E., & Davis, G. L. (1998). Determining the number of state psychiatric hospital beds by measuring quality of care with artificial neural networks. American journal of medical quality: the official journal of the American College of Medical Quality, 13(1), 13–24. https://doi.org/10.1177/106286069801300103

Dokumenta statistikor për shëndetësinë. (2025). Shendetesia.gov.al. Retrieved April 23, 2025, from https://shendetesia.gov.al/dokumenta-statistikor-per-shendetesine/

Drake, R. E., & Wallach, M. A. (2019). Assessing the Optimal Number of Psychiatric Beds for a Region. Administration and policy in mental health, 46(6), 696–700. https://doi.org/10.1007/s10488-019-00954-x

Friebel, R., Fisher, R., Deeny, S. R., Gardner, T., Molloy, A., & Steventon, A. (2019). The implications of high bed occupancy rates on readmission rates in England: A longitudinal study. Health policy (Amsterdam, Netherlands), 123(8), 765–772. https://doi.org/10.1016/j.healthpol.2019.06.006

Graham, L. A., Mull, H. J., Wagner, T. H., Morris, M. S., Rosen, A. K., Richman, J. S., Whittle, J., Burns, E., Copeland, L. A., Itani, K. M. F., & Hawn, M. T. (2019). Comparison of a Potential Hospital Quality Metric With Existing Metrics for Surgical Quality-Associated Readmission. JAMA Network Open, 2(4), e191313. https://doi.org/10.1001/jamanetworkopen.2019.1313

Janke, A. T., Melnick, E. R., & Venkatesh, A. K. (2022). Hospital Occupancy and Emergency Department Boarding During the COVID-19 Pandemic. JAMA Network Open, 5(9), e2233964. https://doi.org/10.1001/jamanetworkopen.2022.33964

Johnson, D. (2023). Hospital quality: Implementing, managing, and sustaining an effective Quality Management System. Productivity Press.

Jones, R. P. (2023). Addressing the Knowledge Deficit in Hospital Bed Planning and Defining an Optimum Region for the Number of Different Types of Hospital Beds in an Effective Health Care System. International journal of environmental research and public health, 20(24), 7171. https://doi.org/10.3390/ijerph20247171

Hospital Beds for Children: A Shrinking Number and Poorly Distributed. (2023). The American journal of nursing, 123(2), 14. https://doi.org/10.1097/01.NAJ.0000919664.85184.ae

Hawsawi, T., & Abouammoh, N. (2022). Distribution of hospital beds across Saudi Arabia from 2015 to 2019: a cross-sectional study. Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit, 28(1), 23–30. https://doi.org/10.26719/emhj.22.003

Lagoe, R. J. (1998). Basic statistics for clinical pathway evaluation. Nursing economics, 16(3), 125–131.

Lee, K. S., Min, H. S., Moon, J. Y., Lim, D., Kim, Y., Ko, E., Kim, Y. S., Kim, J., Lee, J., & Sung, H. K. (2022). Patient and hospital characteristics predict prolonged emergency department length of stay and in-hospital mortality: a nationwide analysis in Korea. BMC Emergency Medicine, 22(1), 183. https://doi.org/10.1186/s12873-022-00745-y

Magazine, M., Murphy, M., Schauer, D. P., & Wiggermann, N. (2021). Determining the Number of Bariatric Beds Needed in a U.S. Acute Care Hospital. HERD, 14(3), 14–26. https://doi.org/10.1177/19375867211012488

Matsumoto, H. H., Ogiya, R., & Matsuda, S. (2020). Association between variations in the number of hospital beds and inpatient chemo/radiotherapy for breast cancer: a study using a large claim database. Acta oncologica (Stockholm, Sweden), 59(9), 1072–1078. https://doi.org/10.1080/0284186X.2020.1787506

McKee, M., Merkur, S., Edwards, N., & Nolte, E. (2020). The changing role of the hospital in European Health Systems. Cambridge University Press.

Metcalfe, J., & Drake, R. (2020). National levels of human development and several mental hospital beds. Epidemiology and psychiatric sciences, 29, e167. https://doi.org/10.1017/S2045796020000761

Misra, A. K., & Maurya, J. (2023). Allocation of hospital beds on the emergence of a new infectious disease: A mathematical model. Chaos (Woodbury, N.Y.), 33(4), 043125. https://doi.org/10.1063/5.0133703

Misra, A. K., Maurya, J., & Sajid, M. (2022). Modeling the effect of time delay in the increment of a number of hospital beds to control an infectious disease. Mathematical biosciences and engineering: MBE, 19(11), 11628–11656. https://doi.org/10.3934/mbe.2022541

Murphy, M. E., & Noetscher, C. M. (1999). Reducing hospital inpatient lengths of stay. Journal of nursing care quality, Spec No, 40–54. https://doi.org/10.1097/00001786-199911000-00006

Najibi, S. M., Seyedi, S. H., Farhadi, P., Kharazmi, E., Shojaei, P., Delavari, S., Lotfi, F., & Kavosi, Z. (2022). Development of a model for predicting hospital bed shortages and optimal policies using a system dynamics approach. *BMC Health Services Research*, *22*(1). https://doi.org/10.1186/s12913-022-08936-w

O'Brien, S. M., Delong, E. R., & Peterson, E. D. (2008). Impact of case volume on hospital performance assessment. Archives of internal medicine, 168(12), 1277–1284. https://doi.org/10.1001/archinte.168.12.1277

Oddleifson, A., Xu, X., Liu, P., Du, C., Spatz, E., & Desai, N. (2021). Association Between Hospital Performance Metrics and Market Share. JAMA Network Open, 4(10), e2130353. https://doi.org/10.1001/jamanetworkopen.2021.30353

Okayama, T., Usuda, K., Okazaki, E., & Yamanouchi, Y. (2020). Number of long-term inpatients in Japanese psychiatric care beds: trend analysis from the patient survey and the 630 survey. BMC psychiatry, 20(1), 522. https://doi.org/10.1186/s12888-020-02927-z

Pauly, M. V., & Wilson, P. (1986). Hospital output forecasts and the cost of empty hospital beds. Health services research, 21(3), 403–428.

Proudlove N. C. (2020). The 85% bed occupancy fallacy: The use, misuse, and insights of queuing theory. Health services management research, 33(3), 110–121. https://doi.org/10.1177/0951484819870936

Rechel, B. (2009). Investing in hospitals of the future. World Health Organization.

Reid, N., Gamage, T., Duckett, S. J., & Gray, L. C. (2023). Hospital utilisation in Australia, 1993-2020, with a focus on use by people over 75 years of age: a review of AIHW data. The Medical Journal of Australia, 219(3), 113–119. https://doi.org/10.5694/mja2.52026

Schubert, A., & Kemmerly, S. A. (2022). Optimizing widely reported hospital quality and safety grades: An Ochsner quality and value playbook. Springer.

Zjarri në Urgjencën e Qendrën Spitalore 'Nënë Tereza', Prokuroria Tiranë regjistron procedimin penal për veprën penale "Shkatërrimi pronës me zjarr." (2024). Swiss Chiropractic Academy. Retrieved April 23, 2025, from https://www.pp.gov.al/Media/Njoftime_per_Shtyp/Zjarri_ne_Urgjencen_e_Qendren_Spitalore_Nene_Tereza_Prokuroria_Tirane_regjistron_procedimin_penal_per_vepren_penale_Shkaterrimi_prones_me_zjarr_19557.html

Vaughan Sarrazin, M.S., & Girotra, S. (2019). Exact Science and the Art of Approximating Quality in Hospital Performance Metrics. JAMA Network Open, 2(7), e197321. https://doi.org/10.1001/jamanetworkopen.2019.7321

Hornbrook, M. C., & Goldfarb, M. G. (1983). A partial test of a hospital behavioral model. Social science & medicine (1982), 17(10), 667–680. https://doi.org/10.1016/0277-9536(83)90373-8

Weimann, E., & Weimann, P. (2018). High performance in hospital management: A guideline for developing and developed countries. Springer Berlin.