

## HOSPITAL PERFORMANCE EVALUATION IN ROMANIA THROUGH THE "DIAGNOSIS RELATED GROUPS" SYSTEM

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### Abstract

*This study analyses the impact of using the Diagnosis Related Groups (DRG) system in public hospitals in Romania, looking at the main hospital performance indicators: average length of stay, bed occupancy rate, weighted case tariff (WCT) and case complexity index (CCI). The data analysed show a steady decline in the average length of hospital stay, associated with the development of day hospitalisation and outpatient services, as well as investments in infrastructure and modern medical equipment. Bed occupancy rates have varied significantly, but with a general upward trend, reflecting more efficient patient flow management and the adaptation of hospital structures to the real needs of the community. The increase in this indicator indicates both a more rational use of available resources and a better capacity to respond to complex medical demands. The WCR and CCI indicators showed an upward trend, reflecting improvements in the quality of medical care, diversification of services offered and optimisation of resource use. The evolution of these parameters demonstrates that the DRG system can stimulate medical and financial performance when supported by coherent health policies and consistent investment. The results highlight the importance of the DRG system as a management and financing tool capable of aligning the allocation of funds with the complexity and real needs of the patients treated. The study also highlights the need for continuous training of healthcare units to respond effectively to both the current demands of patients and the challenges posed by exceptional situations, such as the COVID-19 pandemic.*

**Keywords:** *Diagnosis Related Groups; average length of stay; utilisation rate; weighted case rate; case complexity index.*

**JEL Classification:** *I18, H51, M11*

### I. INTRODUCTION

The use of healthcare services is a fundamental aspect of maintaining and improving our health. In the modern world, access to quality healthcare can make the difference between a long and healthy life and one full of hardship and suffering. Healthcare services range from prevention and early diagnosis to treatment and ongoing care for chronic diseases. Whether it is regular visits to the family doctor, periodic screenings, or surgical procedures and specialised treatments, every aspect of healthcare plays a vital role in managing personal and community health.

"Diagnosis Related Groups" (DRG) is a classification system used in the healthcare sector to standardise payments for medical services, based on the type of diagnosis and treatments required. The financing of hospitals providing acute care in Romania is based on DRG. It imposes certain principles related to compliance and understanding of concepts and aspects, namely: recording clinical data, coding it, sending patient data in electronic format, the concept and incentives for new financing structures. The DRG system involves classifying patients into groups based on diagnoses, procedures and clinical information, making it possible to correlate the types of situations that the hospital treats, namely CCI or case-mix index (case complexity index) and their associated costs. DRG examines the characteristics of each discharged patient (age, gender, length of hospitalisation, primary and secondary diagnoses, procedures, condition on discharge) and, based on these, patients are ranked into distinct categories. Thus, the DRG system fulfils the main function of management, which is to highlight the hospital's

results and standardise the way in which its performance is presented. The main indicators of the use of DRG-funded medical services are the average length of hospitalisation and the bed utilisation rate.

The main objective of this study is to conduct a detailed analysis of two key indicators in hospital service management: average length of stay and bed occupancy rate. To achieve this goal, the study has the following objectives:

O1: Conduct an exhaustive review of the literature to identify current trends and directions in research on average length of stay and bed occupancy rate;

O2: To analyse the evolution of the average length of hospital stay in a representative hospital in order to understand the dynamics of this indicator and the factors influencing its variations;

O3: To examine in detail the evolution of bed occupancy rates in the same hospital in order to identify trends, challenges and opportunities associated with the efficient management of hospital resources.

By achieving these objectives, the study aims to contribute to a better understanding of the efficiency and effectiveness of hospital medical services, thus providing valuable information for improving hospital management and the quality of care provided to patients.

## II. LITERATURE REVIEW

Diagnosis Related Groups (DRG) are an important element in the structuring and financing of healthcare systems, influencing the way in which healthcare services are planned, financed and provided, and have been analysed in numerous specialist papers (Jian et al., 2011; Zhang & Li-hua, 2021). Goldfield (2010) considers DRGs to be the most important tool implemented by governments and private payers to control costs and improve the quality of healthcare services. DRGs help balance the need for financial efficiency with the need for quality in patient care. This classification is an integral part of prospective payment systems (PPS) (Yujiao & Shuling, 2022), designed to encourage hospitals to use resources efficiently while maintaining or improving the quality of care. The implementation of DRGs also prompts hospitals to adapt their operational strategies, influencing financial health and performance indicators (Wang et al., 2025). Hospitals that successfully manage these changes often engage in robust data analysis to align their service offerings with DRG classifications that generate higher reimbursement rates. This adaptability is evident in studies highlighting hospitals that specialise in certain high-value DRGs to improve their revenue streams (Lin & Hou, 2025). However, we believe that the focus on financial indicators must be balanced with the provision of quality care, as DRG pressures can lead to inadequate treatment if not carefully monitored.

In this context, DRGs have been adopted in many countries as the basis for hospital reimbursement structures, providing a standard by which the provision of medical services can be evaluated and financially supported. Countries such as USA, Australia, China, Germany, the USA, France, Switzerland, the UK, Romania, etc., illustrate the global application of DRGs, with their own versions developed based on in-depth research and health policy frameworks. DRGs in the US were developed in the late 1960s and implemented in 1983 as part of the Medicare payment system, marking the transition from cost-based reimbursement to a prospective payment system (Morone & Dunham, 1984). By classifying patients into clinically and resource-consumption-homogeneous groups, DRGs establish a fixed amount for each admission based on diagnoses, procedures, and other clinical factors. This model has enabled cost control, stimulated resource efficiency, and created a comparable framework for evaluating hospital performance. However, challenges have also emerged, such as the risk of premature discharges, funding differences between hospitals, and the ongoing need to update classifications in line with technological advances and demographic changes. The American experience shows that DRGs can be an effective management and financing tool, but their success depends on the balance between cost control and maintaining the quality of care (Chang et al., 2023). The Australian Refined Diagnosis Related Groups (AR-DRG) system is a classification framework that categorises hospital inpatients based on their diagnoses and procedures (Bučková et al., 2023). It aims to improve the efficiency of hospital funding and resource allocation within the Australian health system. This system refines the original DRG classification, providing a more detailed subdivision of patient groups based on clinical relevance and resource consumption, comprising approximately 700 subdivisions tailored to Australian medical practices (Notaras et al., 2022; Doroshenko et al., 2023). Another example is the German diagnosis-related group (G-DRG) system, introduced in 2004, which was heavily influenced by the Australian model and has been continuously refined to address healthcare costs (Vogl, 2012). A comparative analysis of DRG implementation indicates that countries use these frameworks to streamline hospital management, balance budgets, and formulate payment policies that reflect the complexity of treatment for diverse patient populations (Koné et al., 2019). Liu et al. (2023) noted that although DRG systems are based on the same classification concept, they differ considerably from country to country in terms of purpose, grouping structure, coding methods and payment mechanisms, and their evolution has followed distinct paths depending on each country's income level. In high-income countries, the role of DRG-based hospital payment systems has gradually diminished as the primary remuneration mechanism, while in middle-income countries these systems have seen increased interest and wider use (Liu et al., 2023).

The fundamental purpose of DRGs is to group patients into categories that reflect similar clinical conditions and resource use, thereby providing a basis for equitable payment systems (Grass et al., 2024). With the introduction of DRGs, hospitals are required to improve their efficiency, as payments are made on the basis of diagnosis rather than procedure, which has an impact on the overall service delivery process, including length of stay and treatment protocols (Gartner et al., 2015; Locke et al., 2022). In this regard, the accuracy of clinical coding is essential. The assignment of comorbidities and additional diagnoses with ly influences the financial results of hospitals, as it affects the case mix index (CMI) and the associated reimbursement (Zafirah et al., 2018; Souza et al., 2020). Goldfield, N. (2010) analyses the reasons why DRGs have been so successful both in the hospital sector and, in the last decade, in outpatient and *managed care* systems. DRGs are therefore an important innovation in healthcare payment systems, designed to classify hospital admissions into groups that reflect similar clinical conditions and resource consumption. Designed primarily to promote efficiency and cost control in healthcare systems, DRGs have a number of defining characteristics that determine their functioning and impact on healthcare delivery. In the literature, DRGs are defined as a system for classifying hospitalised patients based on clinical and resource consumption criteria, with several characteristics.

Table 1. Characteristics of DRGs

DRG characteristics	Description
Clinical homogeneity	Cases within a DRG are medically similar (diagnosis, procedures, severity).
Cost homogeneity	Cases in a DRG involve comparable resource consumption.
Additional DRG characteristics	Description
Categorical classification	Each DRG is a distinct category with homogeneous clinical and economic criteria.
Separation of the clinical model from payment weights	The structure of the groups is based on clinical data, and the financial values are determined separately.
Adjustments for non-clinical factors	Payment adjustments based on factors such as region, hospital type or service specifics.
Additional payments for outlier cases	Additional funding for patients with costs significantly above average.
Transparency and comparability	Enables analysis and comparison of hospital performance based on standardised criteria.

Source: Authors' elaboration based on Badea et al. (2006), Liu et al. (2023), Grass et al. (2024), Jakubowski et al. (2024)

Diagnosis groups for patients with acute conditions are divided into medical and surgical categories. Classification depends on whether or not surgery is performed for the condition that led to hospitalisation. The main benefit of the DRG system is the standardisation of hospital outcomes. Discharged patients are classified into homogeneous groups, which facilitates the comparison of hospital performance and the efficient use of resources (Badea et al., 2006). We consider that DRGs are primarily a management and financing tool, with an indirect impact on patients through their influence on the organisation and provision of healthcare services.

### III. DRGs IN ROMANIA

The DRG system was introduced in Romania as a primary mechanism for hospital financing, with the aim of ensuring more efficient resource allocation and increasing transparency in the use of funds. Romania initially adopted version 18 of the US HCFA-DRG system for the reimbursement of hospital expenses at the start of the DRG scheme in 2002-2003. However, the system underwent several revisions due to the need to improve accuracy and align it with the local dynamics of the healthcare system. In 2007, Romania switched to using version 5 of the Australian Refined DRG (AR-DRG) system (Radu et al., 2010), but by 2010 it had developed its own version, known as RO-DRG. This adaptation provided customised definitions of comorbidities and complications, while refining the grouping boundaries for specific cases to better reflect local medical practices and hospital needs (Mincă et al., 2025). Thus, adapted from the international HCFA-DRG and AR-DRG models, the Romanian DRG classifies patients into clinically and resource-homogeneous groups, serving as both a management tool and a hospital performance evaluation tool. The system classifies patients based on clinical diagnoses, procedures performed, and reported complications. This classification allows for better alignment of hospital reimbursements with the intensity of resources used for the care provided, thus ensuring fairness in compensation (Petre et al., 2023). The process of assigning a patient to a diagnosis group involves several main steps:

- Collecting and recording clinical data for discharged patients, with the mandatory completion of seven elements: age, sex, length of hospitalisation, main diagnosis and secondary diagnoses, surgical interventions or other procedures performed, condition on discharge and body weight.

- Coding the diagnosis and procedures for each patient to obtain the complete set of data required.
- Transmission of data in electronic format to the centralised system.
- Automatic classification of each case into the appropriate DRG group.

The DRG system serves both as a method of classifying patients for the purpose of evaluating hospital performance and as a financing tool. By using DRG classification, hospitals can analyse their results, compare them with those of other medical units and identify opportunities for improvement. DRG classification is also useful for increasing efficiency by determining the resources required for each type of patient, for improving service quality by evaluating standards and defining models of practice, and for optimising the structure and activities of the hospital (staff, departments, etc.). In addition, it facilitates the application of results-oriented management rather than resource- or process-oriented management.

In the case-based financing system, hospitals may incur costs higher than the rate set for a particular DRG, leading to resource losses for that patient category, or costs lower than the rate, generating savings. This mechanism encourages keeping costs below the rates for each type of patient, allowing resources to be saved and reallocated for other purposes. According to Badea (2006), the implementation of the DRG system requires the fulfilment of essential conditions:

- a) Accurate data recording – the accuracy of records is crucial, as any error can compromise the entire DRG classification process.
- b) Collection and transmission of the data set – requires efficient management of the information system so that information is transmitted completely and correctly in electronic format and can be used for patient grouping.
- c) Ensuring the confidentiality of information – electronic databases contain personal data and must be managed in accordance with data protection legislation (GDPR).
- d) Autonomy of hospital management – when results reflect the image of the hospital, it is essential that management has the freedom to adjust and improve services in order to increase the efficiency and quality of healthcare.

We therefore consider that the DRG system can only function efficiently and transparently if the essential conditions regarding the accuracy of data recording, collection and transmission in electronic format, confidentiality and autonomy of hospital management are met. These elements form the basis for accurate patient classification, fair funding and continuous improvement in the quality of healthcare services (Siretean et al., 2022).

The overall assessment of hospital activity supports the contracting of services and the formulation of health policies, using patient data for morbidity reports, analysis of service accessibility and adequacy, comparison of average length of stay, and identification of situations of inadequate care provision (Badea, 2006). In these circumstances, a number of special situations may arise that affect the proper and efficient functioning of the DRG system and, implicitly, of the entire hospital sector (Radu et al., 2010): false reporting (modification or exaggeration of codes to artificially increase the DRG, favoured by the lack of control and the activity of some "DRG optimisation" companies), the quality of services provided (the emphasis on maximising revenue, in the absence of monitoring, can lead to premature discharges or the selection of simpler cases), monopoly providers (in areas or specialities with few providers, lack of competition reduces pressure for efficiency and quality) and the resources needed to run the system (lack of specialised staff, IT infrastructure and locally adapted cost weights affect the accuracy and credibility of the system). According to Radu, Chiriac & Vlădescu (2010), Romania adopted DRGs to link hospital payments to the number and complexity of patients actually treated, rather than to other administrative criteria. The aim of the RO-DRG system is to classify patients into clinically and resource-homogeneous groups in order to ensure equitable financing, evaluate and compare hospital performance, support internal management and stimulate the efficient use of resources, while maintaining the quality of medical services. Hospital funding through the DRG system is based on the principle of 'money follows the patient'. In this way, hospitals that treat a large number of patients with complex pathologies will receive more substantial funds, while units with a low patient volume will have more limited resources. Funds are therefore allocated according to the hospital's activity and results, rather than its organisational structure. DRG funding allows hospitals to identify the types of patients treated and the resources obtained for each category. In this way, funds allocated according to the costs associated with each patient contribute to more efficient operation that is better adapted to the real needs of the medical facility. We believe that the DRG system is both a tool for evaluating hospital performance and for financing hospitals, and its implementation must be aligned with health policies, adapted to the objectives of each hospital and accompanied by continuous evaluation to prevent it from becoming an end in itself.

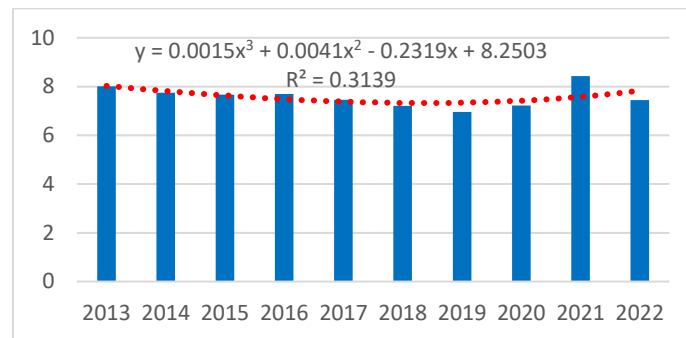
#### IV. EVOLUTION OF DRG FACTORS

The DRG system is not static, but is constantly evolving to respond to changes in medical practice, health policies and economic realities. The main indicators of healthcare service use are the average length of stay, bed occupancy rate, weighted case tariff and case complexity index.

The length of hospital stay refers to the period of time a patient spends in a medical facility for treatment and recovery. The formula for calculating the average length of hospital stay per hospital is:

$$\text{Average length of hospital stay per hospital} = \frac{\text{Person} - \text{days of hospitalization}}{\text{Patients at the beginning of the period} - \text{Patients during the period}}$$

The evolution of the average length of hospitalisation per public hospital during the period analysed is shown in Figure 1:



**Figure 1.** Evolution of the average length of hospital stay per hospital in the period 2013-2022

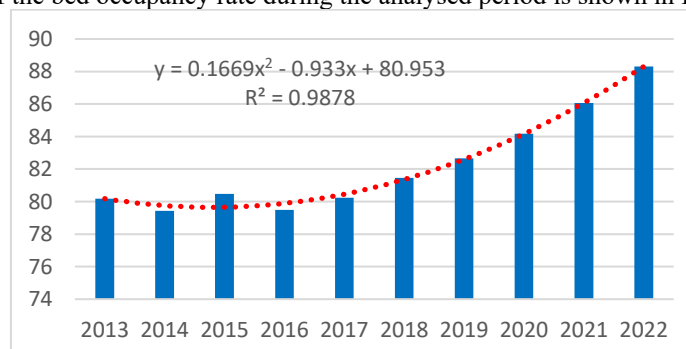
Source: Prepared by the author in Excel using the database <https://www.ms.ro/>

Analysing the data in Figure 1, there is a general downward trend in the average length of hospitalisation between 2013 and 2022, with minor fluctuations in recent years. This decrease is mainly associated with the expansion and streamlining of day hospitalisation, as well as the increased role of hospital outpatient services. Another important factor is the modernisation of infrastructure and the provision of high-performance medical equipment, which enable faster diagnosis and treatment of patients. Furthermore, the diversification of medical specialties, both in day hospitalisation and outpatient care, has contributed to reducing the length of hospital stays without compromising the quality of medical care.

The bed occupancy rate is an essential indicator of the performance and efficiency of a medical facility, reflecting the extent to which available beds are occupied by patients over a given period of time. This indicator provides relevant information for both hospital management and healthcare decision-makers, as an optimal bed utilisation rate indicates good capacity planning and efficient resource allocation. Too high a rate may signal excessive pressure on the healthcare facility, with possible consequences for the quality of care, while too low a rate may indicate underutilisation of available resources. The formula for calculating the bed utilisation rate is:

$$\text{Bed utility rate} = \frac{\text{Bed occupancy rate} \times 100}{365 \text{ days}}$$

The evolution of the bed occupancy rate during the analysed period is shown in Figure 7:



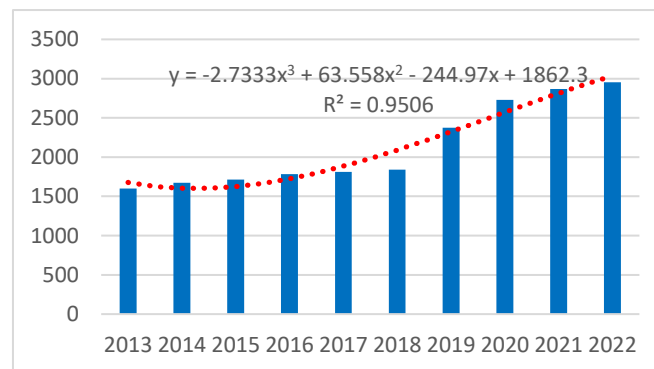
**Figure 2.** Evolution of bed occupancy rates per hospital during the period 2013-2022

Source: Prepared by the author in Excel using the database <https://www.ms.ro/>

Throughout the analysed period (2013–2022), there was a general upward trend in the bed occupancy rate in the public hospital analysed, with occasional fluctuations reflecting changes in the organisation and efficiency of medical services. The lowest rate was recorded in 2014, possibly due to temporary capacity limitations or

internal reorganisation. After 2016, considered a turning point, the trend became predominantly upward, culminating in the maximum value in 2022. This steady increase was supported by several factors: improvement of the legislative framework for financing day hospital services, expansion and diversification of outpatient services, increased revenues through an increase in the number of on-demand medical services, significant investments by the County Council in hospital infrastructure and the purchase of modern medical equipment. In addition, the digitisation of processes through the implementation of high-performance IT software has enabled the collection, analysis and use of data in real time, which has led to optimised bed management.

The weighted case rate (WCR) is the amount set by the health authorities to cover the costs of treating a patient, calculated according to the complexity of the case and the resources used. It is determined on the basis of a weighted assessment of different types of medical cases, so as to reflect actual variations in treatment costs. The evolution of the weighted case rate over the period 2013-2022 is shown in Figure 3:

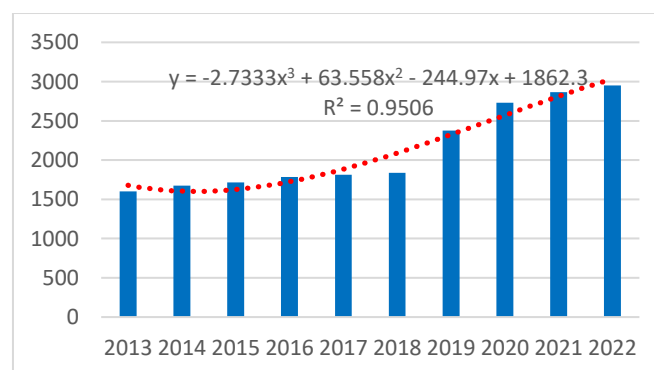


**Figure 3.** Evolution of the weighted case rate over the period 2013-2022

Source: Prepared by the author in Excel using the database <https://www.ms.ro/>

Between 2013 and 2022, the weighted case rate increased, reaching its highest level in 2022. A reference point is 2020, when, against the backdrop of the COVID-19 pandemic, values increased significantly compared to the previous year. This jump was due to additional costs for managing COVID-19 patients, such as the purchase of protective equipment, the implementation of special medical procedures and the provision of additional staff. The overall evolution of the WCR is supported by accreditation processes to European standards, infrastructure modernisation, adaptation of the public hospital structure to the needs of the population, and the continuous development of medical and financial management services.

The case complexity index (CCI) is an indicator used in hospital management to measure the resources required for patient care, taking into account the severity of the diseases, the procedures performed and the length of stay. The CCI highlights the diversity and difficulty of the cases treated, ensuring the most accurate correlation between the resources allocated and the specific needs of patients. The evolution of the case complexity index is shown in Figure 4:



**Figure 4.** Evolution of the case complexity index for the period 2013-2022

Source: Prepared by the author in Excel using the database <https://www.ms.ro/>

Throughout the period analysed, the case complexity index followed an upward trend, reflecting a greater diversification and complexity of the cases treated. In 2020, the CCI value increased significantly, influenced by the large number of patients with severe pathologies, including COVID-19 cases, which required increased resources and complex interventions. The steady increase in this indicator is supported by the hospital's modern and high-performance equipment, continuous training of medical staff and the introduction of more advanced

diagnostic and therapeutic procedures. These changes have made it possible to reduce the average length of hospitalisation and optimise the use of resources.

All these factors have contributed to increased clinical and administrative efficiency, which is directly reflected in the bed utilisation rate and the hospital's ability to respond more promptly and effectively to patient needs. They are of major importance for the DRG system, as the weighted case tariff (WCT), the case complexity index (CCI), the average length of stay and the bed occupancy rate are essential indicators for determining the payment per case resolved. The DRG and CCI allow funding to be linked to the actual complexity of the cases treated, while the average length of stay and bed occupancy rate reflect the efficiency of resource use and the capacity to manage patient flow. The continuous improvement of these indicators supports the correct application of DRG principles, ensuring both financial sustainability and improved quality of medical care.

#### IV. CONCLUSION

The use of healthcare services is an essential aspect of maintaining and improving health. It involves access to a wide range of services, from routine consultations and prevention to specialised treatment and emergency care. The choice and appropriate use of these services can have a significant impact on quality of life, contributing to disease prevention, effective management of chronic conditions and rapid recovery from acute health problems. In the current context, marked by rapid technological advances and the continuous evolution of medical knowledge, it is important to understand how the DRG system works so that patients can receive the care they really need and hospitals can use resources in a balanced and efficient manner. DRGs, as a classification method used in healthcare systems to standardise payments for medical services, are established based on diagnosis, procedures performed and other clinical criteria. Its importance comes from its ability to directly link funding to the complexity and actual resource needs of each patient, which encourages efficiency, transparency, and fairness in how funds are allocated. DRGs have a significant and diverse impact on healthcare services, influencing both the financial performance of hospitals and the quality and accessibility of healthcare.

According to this study, we can conclude that the public hospital plays a central role in improving the health of the county's population, aiming to develop a modern, efficient healthcare system aligned with European Union standards. The unit is permanently focused on the needs of citizens, benefiting from a complex structure of medical and surgical specialties, capable of providing highly specialised care, including for serious cases that cannot be treated in other hospitals in the county. The results of the analysis highlight a number of important trends and changes in the functioning and performance of the public hospital, which, when taken together, provide a clear picture of its evolution in relation to the requirements of the DRG system and the community it serves.

Firstly, the average length of hospitalisation shows a downward trend over the period analysed. This decrease is not accidental, but reflects a complex process of optimising patient flow, made possible by the expansion and diversification of day hospitalisation, the increased capacity of outpatient services to manage cases that previously required hospitalisation, and the introduction of clinical protocols based on international best practices. The modernisation of infrastructure and the acquisition of state-of-the-art equipment have enabled rapid diagnosis and prompt initiation of treatment, which has significantly reduced bed occupancy times.

Secondly, bed occupancy rates have varied significantly, with a minimum in 2014 and a maximum in 2022. These fluctuations reflect both changes in the demand for medical services and the hospital's ability to respond to this demand through effective planning. The turning point identified in 2016 corresponds to a moment of institutional transformation, driven by:

- improvements in the legislative framework for the financing of day hospitalisation and outpatient care,
- increased revenues through the diversification of on-demand medical services,
- substantial investment by local authorities in infrastructure, equipment and digitalisation, including the implementation of IT systems that have facilitated the collection and analysis of data necessary for management.

The WCR has grown steadily, reaching its highest level in the last year of the period under review. The increase in the WCR indicates that the hospital is aligning itself with European accreditation standards and continuously adapting its structure and services to the real needs of patients. This development is a sign of the professionalisation of hospital management, the ability to attract resources and the focus on high-performance medical services. The CCI also showed a positive trend, confirming the improvement in the quality of medical care. The provision of modern, high-performance equipment to the public hospital, the continuous training of medical staff and the application of evidence-based clinical protocols have contributed to the management of more complex cases. The increase in this index shows that the hospital is not only attracting more cases, but also managing more difficult pathologies, which translates into more consistent funding within the DRG system. The experience of 2020, marked by the COVID-19 pandemic, has highlighted the need for hospitals to be permanently and ly prepared to respond quickly and effectively to health crises, whether pandemics, natural disasters or other events with a major impact on public health. This preparedness requires flexibility in the organisation of resources, rapid adaptation of clinical workflows and the maintenance of high standards of safety and quality of care.



We believe that these developments reflect not only an increase in clinical efficiency – through rapid diagnosis, effective treatments and shorter hospital stays – but also an improvement in administrative efficiency through the optimal use of resources, increased revenues and adaptation to the needs of the population. All these factors are directly relevant to performance in a DRG system, where indicators such as WCR, CCI, average length of stay and bed occupancy rate influence both hospital funding and its ability to respond promptly and efficiently to the needs of the community.

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