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Hospital financing: lessons learned from over 25 years of experience with the revision of the case-based payment system in Kyrgyzstan

Kyrgyzstan

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Abstract

The development of the Kyrgyz diagnosis related group (DRG)/case-based payment system has been a crucial component of large-scale health system reforms over the past decades in Kyrgyzstan. The development of the DRG system aimed to support the reform, improve health goals and enhance various health system functions, with a particular focus on service delivery.

Kyrgyzstan started with a very simple DRG version followed by the introduction of complexities into the system, driven by national needs. The path to an effective DRG system entailed careful data management, stakeholder engagement and continuous refinement of the DRG system. Kyrgyzstan's experience suggests that opting for a domestically developed DRG system may offer certain advantages over adopting a DRG system from other countries.

This policy paper provides an overview of the evolution of the Kyrgyz DRG system, with a specific focus on recent revisions, offering valuable insights for other countries embarking on hospital payment reform or the introduction of a DRG system.

Keywords

HEALTHCARE FINANCING
PROSPECTIVE PAYMENT SYSTEM
DIAGNOSIS-RELATED GROUPS
HOSPITALS
KYRGYZSTAN

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Abbreviations

ALOS	average length of stay
CMI	casemix index
CSF	clinical statistical form
CV	coefficient of variation
CW	cost weight
DgCats	diagnosis categories
DRG	diagnosis related group
ICD-10	International Classification of Diseases, tenth revision
ICU	intensive care unit
IS	information system
IT	information technology
MDC	major diagnostic category
MHIF	Mandatory Health Insurance Fund
MoH	Ministry of Health
PHC	primary health care
SGBP	State Guaranteed Benefits Program

Executive summary

Health financing, strategic purchasing and hospital payment reforms were not done in isolation in Kyrgyzstan, they were implemented to support health system reform and improve health system goals (efficiency and equity), and other health systems functions, particularly service delivery. The initial implementation and subsequent evolution of the diagnosis related group (DRG) system occurred concurrently with comprehensive health system reforms.

Over the period from 1997 to around 2010 (the first phase of reforms) the post-Soviet health system of Kyrgyzstan underwent significant infrastructure restructuring and substantial changes in service delivery. Hospital restructuring was particularly necessary to adapt to the disastrous economic situation at the time, by reducing the level of excess capacity in public buildings, beds and staff and obtaining efficiency gains. Health service delivery also required substantial reform including a shift to primary health care (PHC), the development of general or family medicine practitioners, the introduction of evidence-based medicine and new clinical practice guidelines, and the strengthening of priority programmes.

The shift from input-based to output-based payment, including the use of DRGs, established a positive cycle whereby health facility managers and doctors determined the optimal mix of inputs to deliver necessary service outputs, retained savings and reinvested these savings into both direct hospital-based patient care and in strengthening and shifting services to PHC.

The health purchasing reform started only with Mandatory Health Insurance Fund (MHIF) payroll tax funds. But, by the end of the first phase payroll tax funds were pooled with general revenue. In addition, the State Guaranteed Benefits Program (SGBP) was better specified, including embedded population co-payments, national implementation of PHC per capita payments and DRGs with associated information systems (ISs) and realignment of public finance management, and the inclusion of labour costs or civil servant/health professional salaries in the hospital payment system. These reforms in the first phase produced major restructuring results including a reduction of approximately 50% of hospital buildings and beds that enabled an extension of service coverage, as well as substantial changes in service delivery and clinical practice.

The second phase of reform – from around 2010 to present day – has consisted of continuous improvement to increase equity and financial risk protection to maintain the universal health coverage of the Soviet era and to improve service delivery quality and responsiveness to

patients, population and community. The most recent revision of DRGs was in line with the second phase of reform as it refined the Kyrgyz DRG system based on international experience, analyzed available data and strengthened coding and ISs to improve purchaser and provider operation and management.

Several lessons have been learned in the process of upgrading the DRG system, which can be valuable for other – especially low- and middle-income – countries. Kyrgyzstan started with a very simple DRG version that matched the clinical, economical, technological and other capacities of the MHIF and providers at that time, as well as the available data. Over the years, Kyrgyzstan has gradually introduced complexities into the system, driven by local-level needs. Kyrgyzstan's experience suggests that opting for a domestically developed DRG system may offer certain advantages over adopting such a system from other countries.

Furthermore, with 25 years of experience in developing and implementing a DRG system, several other lessons have been learned that can be applied to DRG systems generally.

- The active use of available data, even when it is initially lacking or of poor quality is important. Through analysis and continuous quality monitoring, a country can gain a deeper understanding of system bottlenecks and areas in need of improvement.
- The implementation of a system for monitoring provider performance is necessary. The continuous monitoring and evaluation of the DRG system is essential to identify areas requiring revision or improvement, especially in harmonizing the coding standard and monitoring and enforcing compliance.
- Regular adjustment of the DRG system and financing rules is necessary to ensure its effectiveness in achieving its objectives. Over time, providers adapt to the payment system and learn to exploit its shortcomings.
- The development of the DRG system at least two years after changes in key classification systems for coding the diagnosis and surgical interventions is recommended. This ensures that the development of the DRG system is based on accurate data.
- Continuous effort is needed to analyze the quality of data and to build capacity in clinical coding.
- The involvement of the health-care professional community in the process of developing a new DRG system is vital. The participation of experts from different clinical fields may extend the development time, but it enhances ownership of the DRG system and improves the understanding of its basic principles.
- The establishment of a dedicated unit within the MHIF structure with the primary responsibility of monitoring and evaluating the outcomes of DRG implementation is important.

Kyrgyzstan still has many health system issues to address, including further strengthening PHC, facility autonomy and management, and health revenue increases to ensure the sustainability of purchasing SGBP services. However, DRG-based hospital payments has been a constant throughout the reform process and its revisions will remain at the heart of the reform engine, continuing to drive health system strengthening, service delivery improvement and movement towards universal health coverage.

1. Introduction

This policy paper provides an overview of the development of the Kyrgyz diagnosis related groups (DRG) system[1] over time with a particular focus on the last revision initiated in 2017 and lessons learned for other low and middle-income countries.

The development of the Kyrgyz DRG system was part of the large-scale health system reforms that have taken place in the country over the last decades. One of the landmark reforms was the development and implementation of "Manas" – the national health reform programme – to reorganize Kyrgyzstan's health-care system (1996–2005), which was followed by "Manas Taalimi" (2006–2011) and "Den-sooluk" (2012–2016). The establishment of a mandatory health insurance system in 1996 became the primary source of health-care financing and in 2001, the first-ever State Guaranteed Benefits Program (SGBP) was adopted *(1).*

In Kyrgyzstan, health services are mainly provided by public health-care facilities. Hospital services are largely paid on the basis of DRGs. In addition, starting from 2019, the Mandatory Health Insurance Fund (MHIF) is allocating funds to hospitals for achieving quality targets measured by indicators under the Results-Based Funding programme *(1).*

The Kyrgyz DRG system was introduced for public providers in 1997 and it has since been revised and updated several times. In the early years of its implementation, DRGs were seen as one of the elements of a broader health financing policy aimed at shifting resources to primary health care (PHC), streamlining the oversized hospital sector (particularly in urban areas), using hospital resources more efficiently, increasing the autonomy of hospitals to allocate their own resources, and improving the responsiveness of the health system to patients and the population. The updates that followed after the introduction of the first DRG system had often been "cosmetic" in nature and mainly concerned the update of the cost weights of the DRGs.

In recent years, however, Kyrgyzstan has been gaining an understanding that it is necessary to carry out not just cosmetic updates but substantial improvements of the DRG system to be in line with clinical practice and with a focus on overall strategic purchasing and more equitable and health-needs-driven resource allocation.

Since 2012 several payment models have been developed for new structural subdivisions of hospitals that provide services in day care settings (including day units for children, obstetric patients and emergency departments) and there was a need to integrate fragmented day care payments into a unified system to support the shift of services from inpatient to outpatient and day care, and incentivize the provision of day surgery.

1. The Kyrgyz DRG system refers to a case-based system that groups patient cases, including services received, into standardized groups according to several variables – most commonly diagnosis, treatment or procedure received, and patient characteristics *(2).* In this paper, "DRG system" and "case-based payment system" are used as synonyms.

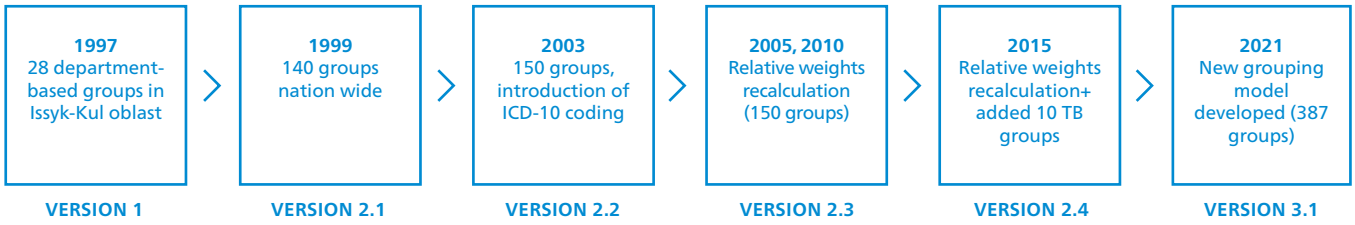
This paper is organized into sections that provide an overview of the evolution of the Kyrgyz DRG system, the main building blocks[2] of the current Kyrgyz DRG system, further steps to be made and lessons learned. The section on the main building blocks is the core of this policy paper describing the main achievements and challenges as well as technical details related to single building blocks. The section on lessons learned aims to inform policy-makers of low- and middle-income countries about the Kyrgyz experience of DRG implementation for consideration while implementing or developing their own DRG system.

2. The main building blocks, such as primary classifications, grouping principles, payment principles, and other enabling factors, are the absolute pre-requisites which are needed to use a DRG system for payment.

2. Brief overview of the evolution of the Kyrgyz DRG system

This section describes the evolution of the Kyrgyz DRG system, the main changes starting from 1997 (Fig. 1), and the rationale behind the upgrade in 2021. Development of the case-based payment system in Kyrgyzstan began in 1997 with the simple hospital department profile-based grouping of hospital cases, and it was later streamlined and revised various times.

Fig. 1. Evolution of Kyrgyz DRG system in Kyrgyzstan



Notes: ICD-10: International Classification of Diseases, tenth revision; TB: tuberculosis.

Source: Authors

In the original version (version 1), which was developed and approved by the MHIF in 1997, there were a total of 28 groups based on the clinical profile of the hospital department from which the patient was discharged. This version was based on the aggregated statistics on treated patients in the Issyk-Kul oblast and the results of the first-ever country costing study in the hospital sector. For calculations of cost weights (CWs), department level cost accounting data and partially disaggregated average length of stay (ALOS) data was used.

Despite its simplicity, the first case-based payment version facilitated the development of ISs; the collection of detailed information about treated cases; MHIF's capacity building, including the implementation of a claims management system; and other positive developments. Furthermore, the simplicity of the original DRG version made its implementation easier, particularly in a limited capacity and resource setting.

In 1999, after consolidating and analyzing the accumulated information from the first years of DRG implementation, the initial version was updated based on the grouping algorithm principles of the All Patient DRG system (version 2.1), with the groups split between medical and surgical partitions. Classification criteria relied on a primary diagnosis code for medical cases and a surgical intervention code for surgical cases. A total of 140 groups were included in version 2.1. CWs of each DRG were calculated on the basis of a costing study using a top-down method of cost allocation. The system of patient classification and the process of developing and implementing this DRG system in practice are described in more detail by Langenbrunner and colleagues *(3)*.

Later on, version 2.1 underwent a series of minor updates (versions 2.2–2.4), primarily of a cosmetic nature. These updates did not involve alterations to the grouping principles or significant changes in the financing rules. However, they did introduce some important improvements to the system. Namely, in 2003, the diagnoses codes of medical cases were converted from International Classification of Diseases, ninth revision *(4)* to the International Classification of Diseases, tenth revision (ICD-10) *(5)*, and a specific re-grouping of diagnoses was done to ensure a greater clinical meaningfulness of the updated version (version 2.2). For example, diseases such as asthma, anemia and hypertension were added as separate groups. As a result, the total number of groups increased to 150. At this point, there were no changes in surgical DRGs.

In 2005 and 2010 DRG CWs were recalculated, while the number of groups remained unchanged (version 2.3).

In 2015 another update took place (version 2.4) adding 10 medical groups for patients treated in specialized tuberculosis (TB) hospitals. These groups were formed by taking into consideration the specific characteristics of a TB case, such as the diagnostic method, anatomical localization and the degree of drug susceptibility.

In addition, the MHIF developed a "temporary" DRG system for hospitals day care units, including a separate base rate, ISs, statistical reporting forms, etc. This has increased the administrative burden on MHIF staff but has not encourage providers to expand the scope of the services provided in day care or shift services (including surgical procedures) from inpatient to outpatient settings – the MHIF are therefore planning to drop this system.

Over time, different challenges of the Kyrgyz DRG system began to emerge that needed to be addressed:

- The classification of *surgical* interventions (based on International Classification of Diseases, ninth revision, clinical modification, developed in the United States of America) had not been updated for more than 20 years. This lack of updates hindered the incorporation of changes in clinical practices for forming surgical DRGs.
- There was a need to review current grouping variables which consisted only of primary diagnosis and surgical codes and add more, to encourage the further development of DRG-related payment incentives or incentivize providers to record other essential parameters in the IS, such as secondary diagnosis codes or intensive care needs.
- The small number of DRGs, initially justified during the system's development, now resulted in grouping cases with different clinical and resource use profiles. This led to unfair payments for providers.
- Several separate payment systems for day units did not incentivize providers and needed to be integrated into the main DRG system.

Toward 2020 it became clear that DRG version 2.4 had become outdated and did not meet the needs of the country. At the same time, new strategic goals emerged, guiding the revision of the existing DRG system. These goals included:

- increasing the clinical and economic efficiency of the inpatient sector;
- stimulating the adoption of effective medical technologies and treatment methods; and
- significantly improving the quality of medical information and its practical use for managerial and clinical decision-making at all levels.

Taking these factors, along with numerous recommendations of international partners, into account, the Government included an activity to "revise diagnosis related groups" in the implementation plan of the "Healthy Person – Prosperous Country" Governmental Programme for 2019–2030 *(6)*. This served as a mandate for the Ministry of Health (MoH) and the MHIF to initiate the process of developing an updated DRG version with technical assistance from WHO.

As a consequence, in 2021 fundamental changes, such as the introduction of selected technical elements from the NordDRG system *(7)* and an updated classification for surgical procedures (more details are provided in following chapters) were implemented in a new DRG version (version 3.1). In addition, a new version of the clinical statistical form (CSF), was approved in 2021, which included additional data that could be used in the new DRG version (e.g. birth-weight).

It should be noted that the development of the new DRG version was carried out under constraints related to the quality of medical information available:

Firstly, a narrow list of ICD-10 codes had been in practical use in Kyrgyzstan. For example, during the period of 2018–2022, only 4 250 diagnosis codes out of a total of 11 260 were used.[3] The main reasons for this were that the DRG system did not include all ICD-10 codes, and, in addition, the MoH had approved a list of outpatient diagnoses that were not eligible for MHIF payment in the inpatient setting. During informal discussions, many providers admitted that these factors drove them to change diagnoses in order to receive payment from the MHIF, which led to a certain distortion in the statistics.

Secondly, providers had not been paying sufficient attention to the quality of coding since it did not substantially impact the level of payment. For instance, the previous DRG versions (2.4 and earlier) accepted "incomplete" ICD-10 codes on a three character level.[4] In addition, during the period of 2018–2022 approximately 19% of cases were coded using "unspecified" or "other" diagnosis codes. However, there were significant regional differences in how ICD-10 codes were used within a single medical specialty.

Thirdly, since the secondary diagnosis codes that were used to indicate co-morbidities or complications were not used in the previous DRG versions and they did not impact payment, providers rarely entered this data into the IS.

3. This information comes from the MHIF database for the period 2018–2022 and includes only those diagnosis codes that were used more than ten times during that period.

4. For example, the ICD-10 code I20 Angina pectoris has various subcodes to describe the form of Angina pectoris more specifically and should be used instead of the three-character code.

Fourthly, as mentioned earlier, the classification of surgical interventions in Kyrgyzstan had not been updated for more than two decades, which led to significant inaccuracies in the practice of coding surgical procedures, particularly in national-level hospitals.

Finally, the MHIF claims management system did not use data auditing to improve the quality of collected information.

These constraints significantly affected the upgrade of the Kyrgyz DRG system.

3. Overview of the recent revision of the Kyrgyz DRG system

This chapter provides an overview of the recent revision – version 3.1 – of the Kyrgyz DRG system by its main building blocks: primary classifications, grouping principles, payment system and other enabling factors. The final section outlines the development process of the new DRG version.

3.1. Primary classifications

Kyrgyzstan has been using the ICD-10 *(5)* since 1997 and since the transition to the International Classification of Diseases 11th Revision *(8)* is scheduled for a later period, it remains the primary classification for the coding of diagnoses in the Kyrgyz DRG system.

As mentioned above, the outdated classification of surgical interventions led to a significant inaccuracy in the practice of coding surgical operations. An analysis of MHIF data (since 2003) revealed that out of more than 2.5 million operations, approximately one-third were coded with unspecified codes (e.g. "other operations of the....organ"), making it nearly impossible to maintain clinically meaningful and economically homogenous surgical DRGs. After discussing the potential way forward, the MoH decided that the best approach would be to develop a new national classification of surgical operations that meets local needs, rather than adapting an international classification (Box 1).

Box 1. Development of a new classification for surgical procedures

To develop a national classification of surgical procedures, the MoH established a working group. The working group consisted of representatives from the MoH, the MHIF and the medical community, including surgeons from various specialties. The responsibilities of the working group included different tasks such as conducting preparatory work, submitting the new classification for approval to the MoH, and defining the standard procedure for its use and updates.

During the first stage, the working group conducted a comparative analysis of international classifications of surgical operations and manipulations,[5] identifying the possible ways of applying them in Kyrgyzstan. The comparative evaluation included the following criteria:

- compliance with clinical practices and terminology adopted in Kyrgyzstan;
- the structure of codes and their convenience for data entry into the IS;
- the level of granularity of the classification; and
- the absence of surgical interventions that were not used in Kyrgyzstan.

The results of the comparative analysis helped the working group to develop the national classification. The new classification was approved by the MoH in June 2020.

5. The following international classifications were evaluated from an applicability point of view in the Kyrgyz context:
- International Classification of Health Interventions (beta version, 2019) *(9)*;
- ICD-10 Procedure Coding System *(10)*;
- Australian Classification of Health Interventions *(11)*;
- NOMESCO Classification of Surgical Procedures *(12)*; and
- Nomenclature of Medical Services (Russian Federation) *(13)*.

3.2. Grouping principles

Following globally accepted practices, the following principles were taken into account while developing the new grouping logic *(3)*:

- ***Clinical homogeneity:*** Cases that are grouped into the same DRG should be anatomically similar and belong to one disease category.

- ***Economic homogeneity:*** Each case assigned to the same DRG should have a similar resource intensity and cost for the range of diagnostic and treatment services needed for diagnostics and treatment of the case.

- ***Statistical representativeness:*** Each DRG should contain a sufficient number of cases to ensure stable aggregate estimates per DRG.

3.2.1. The development of the new DRG version grouping algorithm

The development of the new DRG version algorithm consisted of the following steps *(2)*:

1. preparation of a database of discharged patients/cases;[6]
2. removing all cases with incorrect or incomplete information;
3. eliminating high-cost cases;
4. classifying cases by major diagnostic category (MDC) and diagnosis categories (DgCats) on the basis of the primary diagnosis code;
5. distributing cases into medical and surgical groups; and
6. using additional variables to assign cases to a specific DRG.

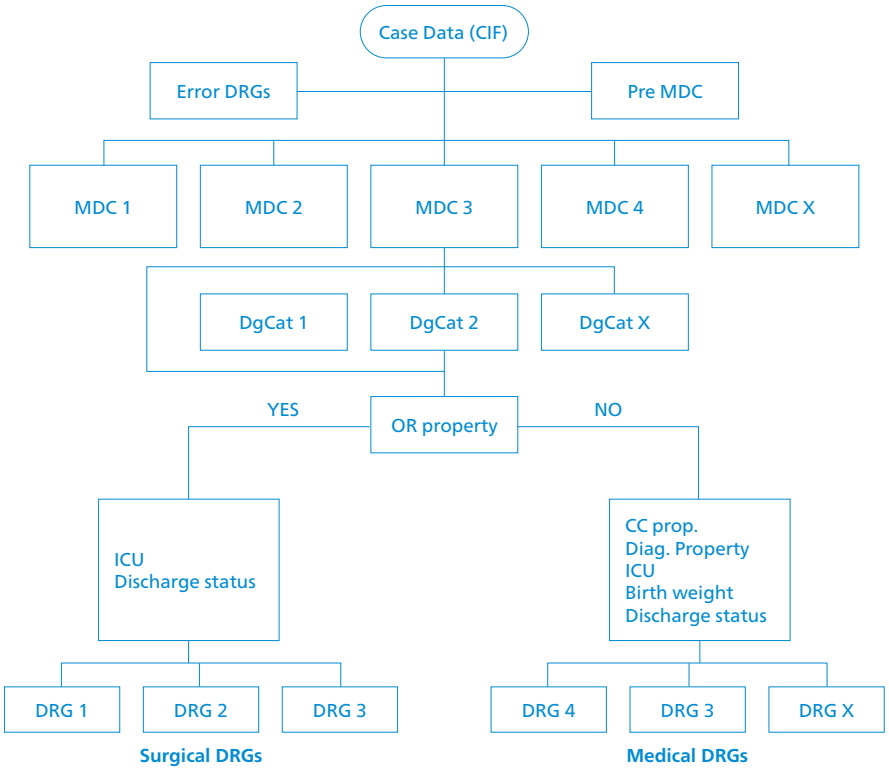
The schematic algorithm for case grouping, based on the abovementioned steps, is shown in Fig. 2 and a short description of each step is provided below.

Step 1. Preparation of a database of discharged patients/cases
The database, generated for analytical purposes, contained non-personalized data from 2015–2018 at the patient level. It included a wide array of data, including both demographic (gender, age, etc.) characteristics of a patient and clinical characteristics (diagnosis and operation codes, discharge status, etc.).

Step 2. Removing all cases with incorrect or incomplete information
Before proceeding with direct data analysis, data records containing incorrect or incomplete information were removed from the database. This process involved eliminating records with diagnosis codes that did not correspond to the patient's gender and age (for specific diagnoses), cases lacking a primary diagnosis code, and instances where a diagnosis code implied a need for a surgical procedure without an accompanying surgical intervention code (e.g. cases like caesarean section or appendectomy).

6. A case refers to a unique hospital stay, starting with admission to a hospital and ending with discharge home, referral to another hospital or death.

Fig. 2. Schematic algorithm of grouping cases into DRGs



Notes: CC: complication/co-morbidity; ICU: intensive care unit; OR: operation room, Diag.Property: Diagnosis Property.

Source: Authors.

Step 3. Eliminating of high-cost cases
ALOS was used as a proxy for the resource intensity in the economic homogeneity analysis. To reduce the impact of non-standard cases (outliers) those of an inpatient stay with an ALOS of more than 100 days were excluded from the database. The decision to use 100 days was made based on the results of expert discussions. In the absence of reliable information on the cost of each treated case, it was decided to use a hospital stay of more than 100 days as a universal criterion for determining a high-cost case.

As a result of activities carried out during steps 2 and 3, about 2.7% of the total number of records in the database were excluded from the analysis. A database for the analysis was formed, which included almost 3 million records of treated patients for the period from June 2015 to June 2018.

Step 4. Classifying cases by MDCs and DgCats on the basis of the primary diagnosis code
The first stage in the development of the DRG algorithm involved the classification of all cases into MDCs using the primary diagnosis codes. In the second stage, these cases were further categorized into more specific DgCats. MDCs, which ensure clinical similarity, are a common feature in all DRG systems. DgCats, unique to NordDRG *(7)*, were used to further

streamline the grouping process. In the initial development phase, each DgCat had the potential to become an independent DRG. Subsequent decisions involved either splitting DgCats into multiple DRGs using additional criteria (see below) or consolidating multiple DgCats into a single DRG. The merging of DgCats occurred when case counts for single DgCat was low, thus preserving the statistical representativeness of the DRG.

A few diagnosis codes within the DgCats were slightly modified compared to the original NordDRG system. These adjustments were made in consultation with the medical community to better align with local clinical practices. These minor changes increased acceptance among medical professionals, positioning it as a "national product".

The code structure for each DgCat was created as follows:

- the first and second characters: MDC code (e.g. 01, 02, 11, 12 etc.)
- the third character: the letter M; and
- the fourth and fifth characters: DgCat's sequence number.

Table 1 provides an example of DgCats included in MDC 03: Diseases and disorders of the ear, nose, mouth and throat.

Table 1. List of DgCats in MDC 03

DgCat code	DgCat text
03M01	Malignancies of the ear, nose, mouth and throat
03M05	Otitis media and upper respiratory infection
03M06	Laryngotracheitis
03M08	Other ear, nose, mouth and throat diagnoses
03M10	Obstructive apnea
03M99	Dental and oral diseases

Source: Authors.

To create clinically and economically homogenous DRGs, further subcategorization within DgCats was based on diagnosis codes. To maintain the original DgCat structure without disruption, an additional grouping feature called Diagnosis property was created. For example, with this approach, three diagnosis groups were created within DgCat 06M99: Other digestive system diagnoses as shown in Table 2.

Table 2. Diagnosis properties within the DgCat 06M99

Diagnosis property code	Diagnosis property text
06T01	Appendicitis
06T02	Hernias of the abdominal wall
06T03	Proctological diagnoses

Source: Authors.

Step 5. Distributing cases into surgical and medical groups
For separating surgical and medical cases in the grouping process, the presence of the primary surgical operation code was taken into account. In case multiple surgical procedures were performed during one hospital stay, an operation that can be classified into a DRG with the highest CW was recommended to be used as the primary code and was used to assign the case into a surgical group.

Step 6. Using additional variables to assign cases to a specific DRG
In addition to the primary diagnosis and surgical intervention codes, it was decided that the following secondary grouping criteria would be used in the new DRG version:
- secondary diagnosis codes (diagnosis codes of comorbidities or complications)
- treatment in an intensive care unit (ICU)
- birth-weight (for neonatal care)
- patient's age
- discharge status
- treatment with thrombolytics.[7]

The secondary grouping criteria were carefully chosen as they could influence providers' economic incentives both positively and negatively. Factors such as the ability to monitor changes in provider behaviour, conduct objective data verification, and strategic health policy goals were considered. For example, diagnoses that can be verified through laboratory tests or are part of special registries, such as diabetes and other similar conditions, were selected as comorbidities or complications for classification into more resource-intensive DRGs. The detailed list of secondary grouping criteria and classification parameters is given in Annex 1.

Given the limitations of the available information, a major role in defining the grouping principles was given to expert opinion, which were made during numerous discussions with the involvement of working group members and invited specialists such as clinicians with various backgrounds, financial experts, medical statisticians, and managers from various levels.

The following sections describe the grouping principles of medical and surgical cases.

3.2.2. The grouping principles for the DRG medical partition

At the start of the case grouping process, as cost information was unavailable, ALOS was used as a proxy to gauge the cost intensity of medical cases. This means that the initial decisions regarding how to group medical cases and when to apply secondary grouping criteria were made by analyzing the homogeneity of the normal distribution of inpatient cases in one DgCat based on their ALOS. The distribution was assessed statistically and visualized graphically. If a bell curve[8] was formed correctly and the distribution could be deemed normal, then, as a rule, a decision was made not to break the DgCats down into several groups. The coefficient of variation (CV) was used as a statistical criterion to determine the homogeneity of the groups.

7. Thrombolytic therapy includes the use of medication to destroy blood clots or prevent new blood clots from forming.
8. A statistically normal distribution is considered to be one that forms a typical bell curve shape, with the majority of cases forming the peak at the mean (statistical average) and steadily declining numbers of cases on either side of the mean.

The CV was calculated using the formula:

$$CV = \frac{\text{Standard deviation of the LOS}}{\text{Mean LOS}} = \frac{\sigma_{LOS\,t}}{X_{LOS\,t}}$$

Where,
LOS = Length of stay
$\sigma_{LOS\,t}$ = Standard deviation of the LOS in $DgCat_t$
$X_{LOS\,t}$ = Mean LOS in $DgCat_t$

This coefficient represents the ratio of the standard deviation to the mean, and it is a useful statistic for comparing the degree of variation from one data series to another, even if the means are drastically different from one another. If the value of this coefficient was greater than 0.9, the group was considered not homogeneous.

Fig. 3 provides an example of a normal distribution in DgCat 01M06 "Transient ischemic attack and occlusions of the anterior cerebral vessels without an infarction". This graph clearly shows a distinct single "peak", indicating that the distribution is normal (CV = 0.40). In other words, the majority of patients were in the hospital for about 9 days, with a slight degree of deviation from the mean value. Eventually, a single therapy group – T010601: Transient ischemic attack and occlusions of the anterior cerebral vessels without an infarction – was created based on this DgCat's analysis.

Fig. 3. Normal distribution of DgCat 01M06

Source: Data provided by MHIF in personal communication.

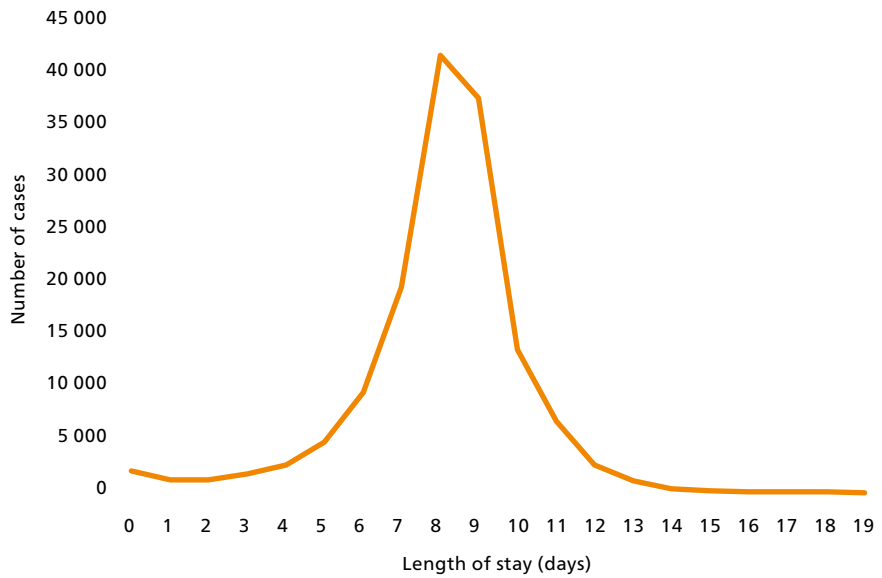
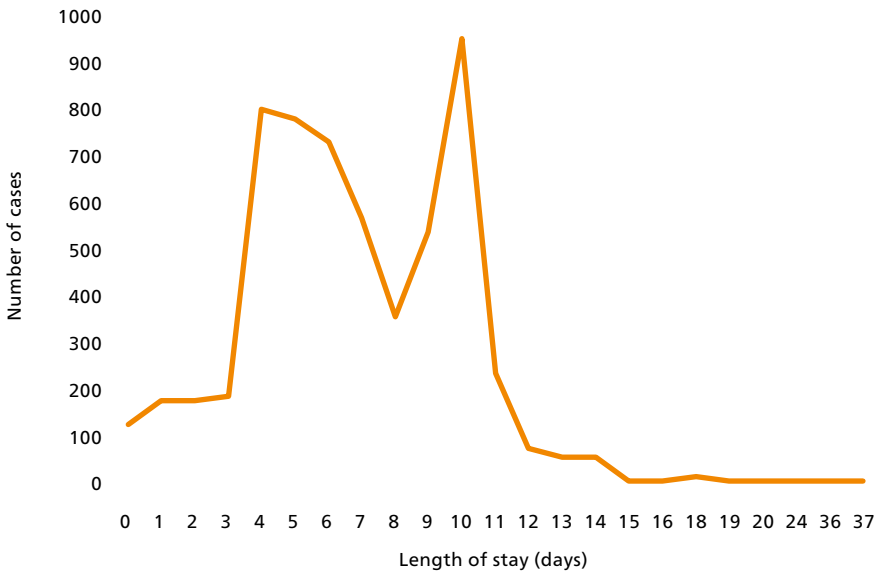


Fig. 4 shows an example of the analysis of the distribution of inpatient cases in DgCat 04M06: Pulmonary edema and respiratory failure. Cases included in this DgCat form two distinctive peaks, thereby the distribution cannot be considered normal (CV = 1.27).

Fig. 4. The distribution of DgCat 04M06

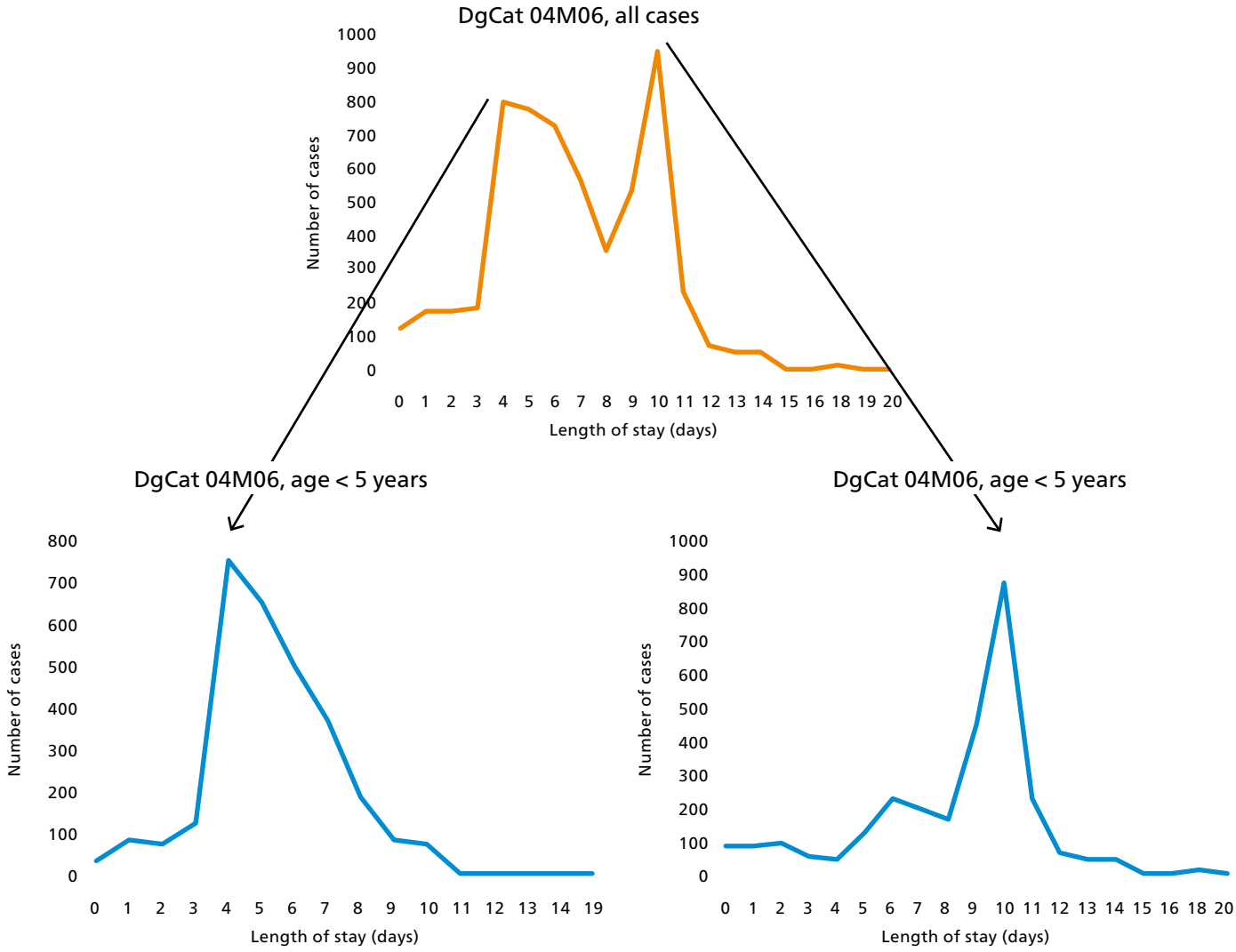
Source: Data provided by MHIF in personal communication.



The primary aim of the discussion with the experts was therefore to determine the reasons behind this "unusual" distribution and to create several DRGs with a more homogeneous distribution by using secondary grouping criteria. Thus, following the discussion, DgCat 04M06 was split into two homogenous DRGs (T040601: Pulmonary edema and respiratory failure, children under 5 years; and T040602: Pulmonary edema and respiratory failure) as shown in Fig. 5.

Fig. 5. Illustration of the results of splitting DgCat 04M06 into two DRGs

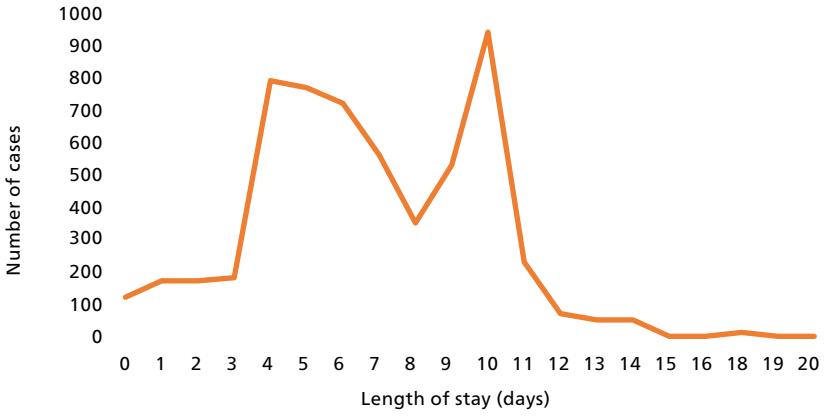
Source: Data provided by MHIF in personal communication.

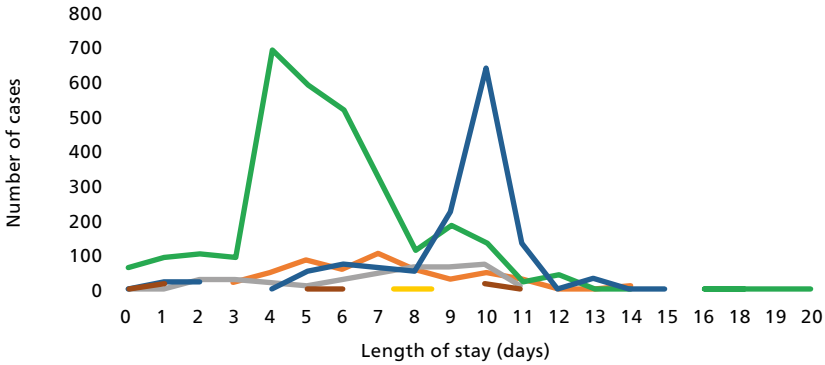


The given example of the analysis for DgCat 04M06 is illustrative since this group has the two distinctive "peaks" and a clear reason for their formation (recovery in children under 5 years is substantially faster than in those over 5 years). In many cases, however, the results were not so clear cut, therefore, decisions were based on expert opinions, taking into account an assessment of the potential impact of the grouping on the behaviour of health-care providers.

In order to make the process of analyzing information easier for the experts, a special user-friendly analytical module was developed by using BI Tableau. The main function of this module was to make it possible for experts to analyze to what degree potential secondary grouping criteria impacts the generation of a normal distribution. An example of a standard analysis of DgCat 04M06 and how different secondary grouping criteria impact normal distribution is provided in Fig. 6.

Fig. 6. Impact of secondary grouping criteria on normal distribution



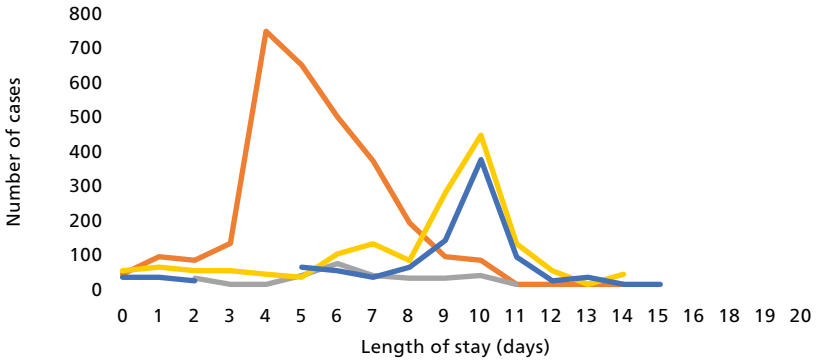


Source: Data provided by MHIF in personal communication.

A. Analysis covers **all cases** included in the DgCat 04M06 without any granulation.

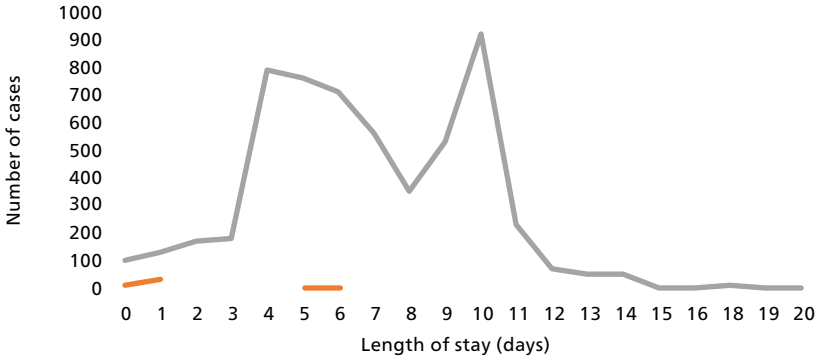
B. The distribution of DgCat 04M06 is shown in more detail **by diagnoses**. The second peak (10 days) is predominantly shaped by the diagnosis code J96.1. However, the code J96.0 (the most common diagnosis code of DgCat 04M06) also has a small peak at 10 days, which diminishes the advisability of splitting this DgCat 04M06 into two DRGs on the basis of primary diagnosis.

J18.2
J80
J81
J95.2
J96.0
J96.1
J96.9



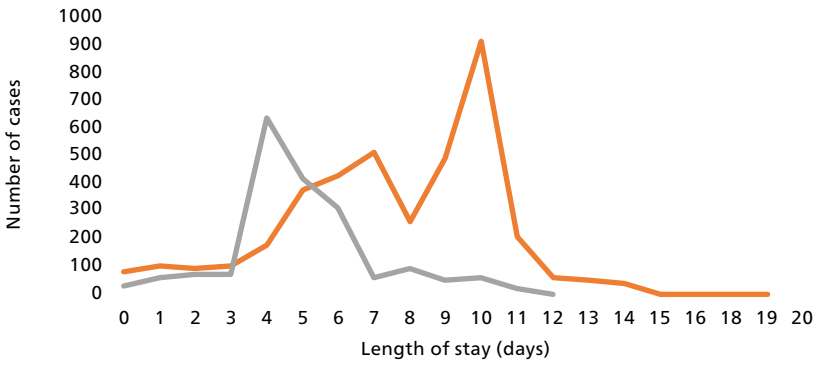
C. The distribution of DgCat 04M06 is granulated by **age groups.** The first peak (4 days) is predominantly shaped by the < 5 years age category. The second peak (10 days) is shaped by patients from other age groups. Due to this, creating a separate DRG within this DgCat, using "children up to 5 years" as a secondary grouping criteria seems to be a logical and justified decision.

- < 5y
- >18y and <70y
- >5y and <18y
- >70y



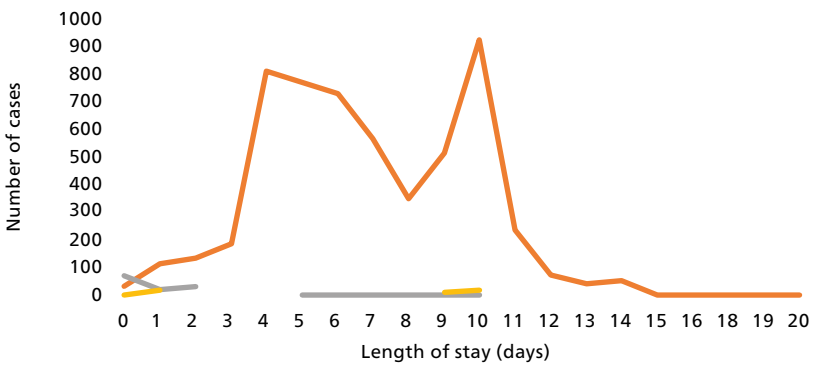
D. The distribution of DgCat 04M06 is granulated by the stay in the **ICU** secondary grouping criteria. There are only a few cases with an ICU stay and the curve showing cases without admission to ICU basically duplicates the main distribution: the two peaks at 4 and 10 days are retained. Due to this, it can be unequivocally concluded that it is not advisable to form a separate DRG for the ICU attribute within this DgCat.

- ICU
- no ICU



E. The distribution of DgCat 04M06 is granulated by the **secondary diagnoses (complications)** secondary grouping criteria. The cases with complications also form two peaks (6 and 10 days). This diminishes the justifiability of using this criterion to create a separate group.

- With complication/co-morbidity
- Without complication/co-morbidity



F. The distribution of DgCat 04M06 is granulated by the **discharged status** secondary grouping criteria. As shown in the left, the 'discharged home' cases duplicate the initial distribution including all DgCat 04M06 cases (two peaks at 4 and 10 days are retained). It is therefore not advisable to form a discharged status secondary grouping criteria within this DgCat.

- Discharged to home
- Died
- Transferred to another hospital

3.2.3. The grouping principles for the DRG surgical partition

During the development of the surgical partition, a greater emphasis was placed on expert opinion – taking into account local conditions and proposals of professional communities – instead of statistical analysis. This approach was chosen because the new classification of surgical procedures has only recently been applied, and there was not enough information available for statistical analysis.

Since the country had already approved a national classification of surgical procedures, it was not possible to use the approaches adopted in NordDRG to create homogeneous surgical DRGs. The main reason was that the structure of the local surgical codes differed significantly from the NOMESCO Classification of Surgical Procedures *(12)* codes. Therefore, the surgical partition was fully developed by the working group, starting from the initial grouping of surgical intervention codes into complexity groups within the surgical specialty. Complexity groups were determined by experts and they reflect both clinical complexity and cost-intensity of surgical interventions. This way, complexity groups were distinguished for 26 surgical specialties and the complexity scale ranged from 1 to 6 depending on the specialty. The list of specialties and the number of identified complexity groups is given in Annex 2.

The following principles were applied for creating the code structure for each complexity group:
- the first and second characters: code of surgical specialty;
- the third character: the letter S – referring to surgical partition; and
- the fourth and fifth characters: sequence number of the complexity level within a medical specialty.

As an example, a list of complexity levels of the specialty "Surgeries on the central nervous system and the cerebrum" is shown in Table 3.

Table 3. Complexity levels of selected specialty

Complexity lever ID	Complexity level text
01S01	Surgeries on the central nervous system and the cerebrum (complexity level 1)
01S02	Surgeries on the central nervous system and the cerebrum (complexity level 2)
01S03	Surgeries on the central nervous system and the cerebrum (complexity level 3)

Source: Authors.

The overall decision-making algorithm to create the surgical DRG was as follows:
- Each surgical code is classified into a "complexity group".
- If a specific DgCat has a high number of surgical cases falling within a particular "complexity group", a surgical DRG is created from this DgCat.
- When there are limited surgical cases of a specific "complexity group" within a particular DgCat where a diagnosis code is assigned, a surgical group is established using all diagnosis codes in the MDC.

For instance, based on this analysis, a surgical DRG S010801: Intracranial and peripheral nerve diseases with surgery was identified among the diagnoses included in DgCat 01M08: Cranial and peripheral nerve disorders. It includes the following groups of surgical operations by complexity level:
- 01S01: Surgeries on the central nervous system and the cerebrum (complexity level 1)
- 01S02: Surgeries on the central nervous system and the cerebrum (complexity level 2)
- 03S01: Surgeries on the peripheral nervous system (complexity level 1)
- 03S02: Surgeries on the peripheral nervous system (complexity level 2)
- 03S03: Surgeries on the peripheral nervous system (complexity level 3).

3.2.4. The grouping principles for the day care DRGs

In developing the day care DRGs, a simplified approach was used for both medical and surgical partition. In order to assign a case into a day care DRG, two conditions must have been met, namely:
- the length of stay must be less than 24 hours; and
- the diagnosis or surgical intervention code must be included in a list approved by the MoH.

For medical partition, within each MDC one DRG was based on the MoH list. In total, there were 664 such diagnoses.

To classify surgical cases into these DRGs within each MDC (except MDC 19: Mental Diseases and Disorders), intervention codes with complexity level 1 were determined in the MoH list.

3.2.5. Developing the DRG logic table

In order to formalize all decisions and use them for the subsequent development of the DRG grouper software, all decisions made on the grouping principles by using primary and secondary grouping criteria were integrated into a **DRG logic table**. The logic table is an integral component of the MS Excel file that also contains reference manuals and classifications used in the DRG system. The structure of the key columns of the DRG logic table are shown in Table 4.

Table 4. The structure of the key columns of the DRG logic table

Source: Authors.

Variable
• DRG ID
• DRG name
• MDC
• DgCat
• Surgery operation complexity group code
• Discharge status
• Treatment in ICU
• Diagnosis Property
• Secondary diagnosis code
• Birth-weight
• Age
• Thrombolytic therapy
• DRG CW

The grouping principles and sequence of using grouping criteria is defined by the logic shown in Fig. 2. As a result of applying this logic, each case is exclusively classified into one DRG. A fragment of the logic table is shown in Annex 3.

In the logic table, all DRGs within a single DgCat are sorted in descending order according to the complexity/cost-intensity of treated cases. In other words, the DRG with the maximum CW is placed in the first row, among all DRGs covered by a particular DgCat.

The developed DRG system uses a DRG code structure based on a seven-digit code as summarized in Table 5.

Table 5. DRG code structure in the DRG logic table

Source: Authors.

Character's sequence	Explanation
1	Refers to the DRG partition to which a DRG belongs: • S – Surgical DRG • T – Medical DRG • A – Medical day care DRG • D – Surgical day care DRG
2–3	MDC code
4–5	Code of the DgCat within the MDC
6–7	Sequence number within the DgCat

If surgical cases are grouped directly in MDCs (without defining a DgCat), the "MD" symbol is used in place of the DgCat number (see the **DRG surgical partition** section for more information). Some examples of interpreting DRG code structure are shown in Box 2.

Box 2. Examples of DRG code structure

S010202: Nervous system neoplasms, with surgery
- S: the case was classified into the DRG surgical partition;
- 01: the primary diagnosis was classified into MDC 01: Diseases of the nervous system;
- 02: within this MDC, the diagnosis was classified into DgCat 01M02: Nervous system neoplasms; and
- 02: running number of the DRG in this DgCat – 2.

T081501: Fracture, sprain and strain of the capsular ligament
- T: the case was classified into the DRG medical partition;
- 08: the primary diagnosis was classified into MDC 08: Diseases and disorders of the skin and subcutaneous tissue;
- 15: within this MDC, the diagnosis was classified into DgCat 08M15: Fracture, sprain, strain and dislocation of the upper arm and lower leg; and
- 01: running number of the DRG in this DgCat – 1.

D02MD01: Eye disease, surgery in a day stay setting
- D: Surgical day care DRG;
- 02: the primary diagnosis was classified into MDC 02: Diseases and disorders of the eye;
- MD: the DRG was formed within the MDC, and not within a specific DgCat; and
- 01: running number of DRG in this MDC.

Source: Authors.

The total number of DRGs is summarized in Table 6.

Table 6. Summary of number of the DRGs

DRG type	Surgical partition	Medical partition	Total
Inpatient DRGs	176	211	386
Day care DRGs	22	23	45
Total	191	234	431

Source: Authors.

Summary of the secondary grouping criteria used in the assignment of cases into DRGs according to new DRG version is shown in Table 7.

Table 7. Summary of the secondary grouping criteria for inpatient DRGs

Secondary grouping criteria	Surgical partition	Medical partition	Total
Secondary diagnosis codes	5	6	11
Treatment in ICU	3	24	27
Age of patients	0	12	12
Discharge status	0	5	5
Treatment with thrombolytics	0	2	2
Birth-weight of newborn	0	2	2

Source: Authors.

Various challenges were encountered in the process of developing grouping principles.

Firstly, the complexity of basic coding systems for diagnoses and operations, coupled with the limited availability of statistical data on secondary grouping criteria, led to the need for many expert opinion-based solutions. However, these solutions were not always based on reliable information.

Secondly, there were issues related to the participation of medical community representatives with diverse backgrounds. Their uneven involvement in discussions sometimes resulted in decision-making delays and the requirement for additional consultations.

Thirdly, reaching a consensus on the number of DRGs and grouping principles proved difficult for some medical experts. This was because they had a predominantly "clinical" mindset, often pushing for an increased number of DRGs without a justifiable need. They tended to overlook the importance of statistical representativeness and the potential risks associated with overly detailed DRGs.

Lastly, certain clinical area experts had significant differences of opinion. These differences were rooted in factors such as their place of training, work experience and other variables, leading to fundamentally different approaches to grouping principles.

3.3. The new DRG version as a payment system

3.3.1. Preparations for the costing study

An integral part of the DRG system revision is the calculation of the DRG CWs. To achieve this goal, the leadership of the MoH and the MHIF decided to conduct a cost-analysis study in hospitals.[9] The additional objective

9. The methodological and technical support for this activity was provided by the WHO Country Office in Kyrgyzstan.

was to institutionalize this process to obtain regular information on the structure of costs in hospitals, as well as other economic parameters of their performance.

The initial cost study took place from February to December 2019, utilizing data from hospital budgets and statistics (e.g. the number of treated cases, information used as the cost allocation criteria etc.) for the year 2018. The subsequent study occurred in 2020–2021, based on the data from 2019. While the first study served as a pilot, contributing to the capacity-building of MHIF and hospital staff, the second study, being more comprehensive and reliable, predominantly informed the calculation of DRG CWs.

To prepare and carry out a cost study, an inter-agency working group was established by a joint decree of the MoH and the MHIF. This working group was responsible for coordinating relevant activities and resolving emerging methodological, administrative and organizational issues.

The decision to employ the standard top-down costing methodology was influenced by several key factors.

Firstly, a similar methodology had already been used in Kyrgyzstan in the process of developing the first DRG system in the 90s, and the country has retained the relevant capacity (including MHIF staff and some provider managers) *(3)*.

Secondly, in 2014, the Joint Learning Network for Universal Health Coverage international consortium published a practical guide on cost analysis *(13)* that was developed based on the experience of numerous countries, which allowed a methodological basis for the study to be created based on the best international practices.

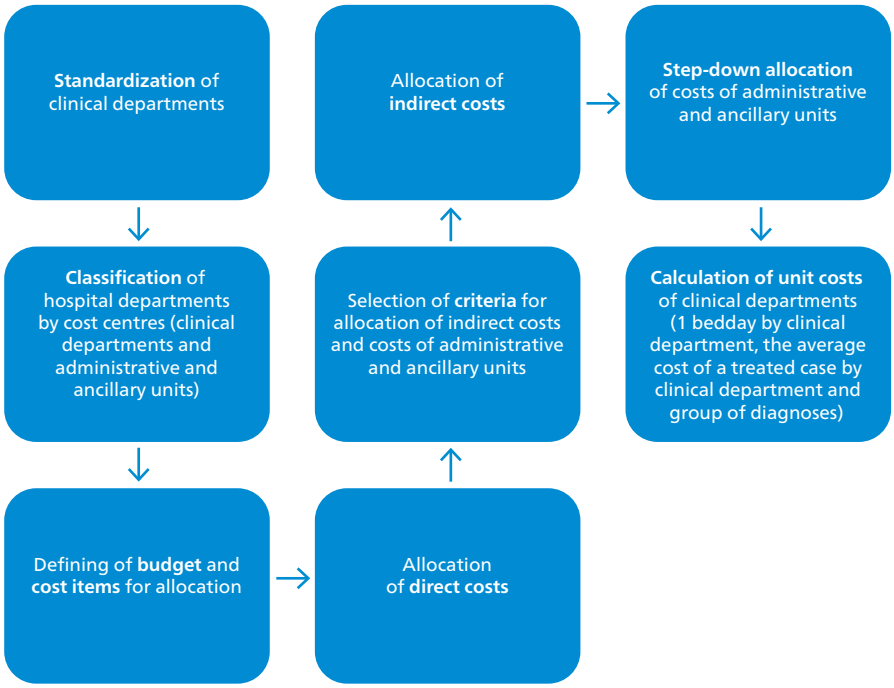
Furthermore, the methodology published by the Joint Learning Network had already been successfully piloted in neighboring countries within the region, including Ukraine in 2018, and technical tools were available at no cost, this created additional benefits and reduced the administrative costs of implementing the study.

Based on the Joint Learning Network guidelines, the working group developed the Methodology for calculating the cost of medical services provided by health organizations operating in the single payer system within the framework of the SGBP for the provision of health care to citizens (henceforth the Methodology; approved by the joint decree of the Ministry of Health and MHIF No. 938 dated 10 February 2019) to Kyrgyzstan's context.

The Methodology outlines the rules of procedure for conducting a cost analysis, including the main stages that were implemented in the process of the cost study (Fig. 7).

Fig. 7. The main stages of a cost analysis

Source: Authors.



For each category, the working group developed appropriate criteria, on the basis of which 20% of the total number of hospitals and approximately 44% of the total hospital admissions across the country for 2019 were selected, which amounted to 28 hospitals (rural, urban; regional and national). The interest and willingness of hospital managers to take part in this study was taken into account. Detailed selection criteria (Box 3) and analysis were described in the relevant documents of the working group.

Box 3. Selection criteria of reference hospitals

The selection of hospitals was based on the following criteria:
- hospitals ensure maximum coverage in terms of the range of services provided (number of diagnosis and operation codes);
- in the structure of patients, all age categories are representative (to assess this criterion, seven main age groups were selected in terms of health services consumption: ≤ 1, 2–4, 5–17, 18–29, 30–49, 50–65, > 65 years);
- hospital ISs generate basic information in an automatic mode;
- hospitals are located in different geographic regions;
- hospitals of different bed size and levels of care are presented ;
- hospitals have a good performance according to indicators (ALOS, share of unavoidable hospitalizations, etc.); and
- hospitals meet the best medical practice criteria (MHIF expert assessment).

3.3.2. Conducting the costing study

Calculations resulted in a large number of indicators for each clinical department, including for instance the cost of a bed day, the cost per case and the cost structure of departments.

To facilitate analysis and subsequent calculations, the results of the cost analysis were linked with the reference hospitals database by comparing hospital codes and discharging department codes. An example of data linking is shown in Fig. 8. Thus, for each treated case in the database, the cost of a bed day in the patient's discharging department was estimated, which then served as a basis for further calculations of the cost parameters. This IS was the basis for the calculations of average cost of cases.

Fig. 8. Linking cost analysis results to the reference hospital database[a]

Provider ID	Department ID	Provider Name	Number of patients	Number of bed days	ALOS	Total budget, KGS	Case cost, KGS	Bed day cost, KGS	Drugs cost per bed day	Food cost per bed day
14051	22	(01) БНИЦТиО	1118	12857	11.5	10,760,926.4	9,625.2	837.0	231.8	74.3
14051	21	(01) БНИЦТиО	428	10.112	23.6	8,729,633.6	20,396.3	863.3	232.0	74.3
14051	29	(01) БНИЦТиО	783	6.054	7.7	5,586,335.2	7,134.5	922.8	233.0	74.7
14051	31	(01) БНИЦТиО	989	7061	7.1	7,493,084.0	7,576.4	1,061.2	212.4	68.1
14051	11	(01) БНИЦТиО	643	11380	17.7	14,240,166.9	22,146.5	1,251.3	217.1	69.6
14051	24	(01) БНИЦТиО	859	10.868	12.7	9,305,736.8	10,833.2	856.3	229.0	73.4
14051	25	(01) БНИЦТиО	879	11.837	13.5	11,087,339.8	12,613.6	936.7	209.3	67.1
14051	26	(01) БНИЦТиО	1141	12506	11	10,512,011.7	9,213.0	840.6	226.6	72.6
14051	4	(01) БНИЦТиО	1191	4.422	3.7	10,536,933.2	8,847.1	2,382.8	130.5	41.8
14051	17	(01) БНИЦТиО	852	8.242	9.7	8,256,400.7	9,690.6	1,001.8	225.2	72.2
14051	18	(01) БНИЦТиО	902	11092	12.3	9,657,997.2	10,707.3	870.7	225.3	72.2
14051	19	(01) БНИЦТиО	909	10643	11.7	9,250,243.0	10,176.3	869.1	226.2	72.5
14051	20	(01) БНИЦТиО	868	8239	9.5	8,043,358.2	9,266.5	976.3	225.5	72.3
14051	28	(01) БНИЦТиО	883	6755	7.7	5,902,140.9	6,684.2	873.7	233.4	77.3
14051	27	(01) БНИЦТиО	1144	12.254	10.7	12,568,045.6	10,986.1	1,025.6	211.5	67.8

Provider ID	Department ID	Hospitalization date	Discharge date	ICU_day	Sex	Age	Main diagnosis (ICD10)	Diagnosis 2 (ICD10)	Diagnosis 3 (ICD10)	Diagnosis 4 (ICD10)	Number of surgery operation	Main surgery operation (ICD9CM)	LOS	Bed day cost, KGS	Case cost, KGS (LOS*Bed day cost, KGS)
10001	24	08/06/2018	11/06/2018	0	1	24	O80.0	O36	O99	-	0	-	2	837.0	1,674
13291	35	11/01/2018	19/01/2018	0	2	22	Z37.8	-	-	-	1	47.01	7	863.3	6,043.1
62121	57	28/01/2018	31/01/2018	0	1	20	O80.0	O71.4	O99	-	1	74.09	3	9,228.0	27,684
33341	34	04/08/2018	11/08/2018	2	2	1	A08.4	D64.9	-	-	0	-	7	1,061.2	7,428.4
71831	55	12/01/2018	20/01/2018	0	1	70	I25.1	I50.1	K86.1	-	0	-	8	1,251.3	10,010.4
90001	33	23/01/2018	05/02/2018	0	1	41	J17.0	J 96.1	J44.1	I27.9	0	-	12	856.3	10,275.6
31001	18	08/09/2018	13/09/2018	0	1	0	P52.3	P36.9	P22.	P7.1	0	-	4	936.7	3,746.8
14051	18	28/11/2018	11/12/2018	1	2	32	I21.6	-	-	-	1	45.96	13	840.6	10,927.8
12931	18	14/06/2018	18/06/2018	0	1	22	O80.8	O66.8	O14	O99	1	-	4	2,382.8	9,531.2
10001	24	27/06/2018	02/07/2018	0	2	2	J40	-	Q90.9	B34.9	0	-	4	1,001.7	4,006.8
14091	35	16/04/2018	26/04/2018	0	2	69	I20.1	-	I25.1	-	0	-	10	870.7	8,707
90001	57	24/02/2018	05/03/2018	3	2	35	J31.0	-	-		1	47.04	8	869.1	6,952.8
12991	34	05/11/2018	09/11/2018	0	1	30	K80.0	-	-	-	0	-	4	976.3	3,905.2
10001	55	14/06/2018	22/06/2018	0	2	0	D69.3	D69.8	K83.8	K02.0	0	-	7	873.7	6,115.9
12991	33	09/01/2018	17/01/2018	0	1	61	K91.5	-	K85.0	E10.6	0	-	7	1,025.6	7,179.2
54991	18	24/11/2018	27/11/2018	0	1	30	O80.0	-	O99	-	0	-	2	1,251.3	2,502.6
21001	18	02/04/2018	16/04/2018	0	2	1	G80.0	F84.8	-	-	0	-	13	856.3	11,131.9
60441	18	04/08/2018	07/08/2018	0	1	27	O80.0	-	O99	-	0	-	3	936.7	2,810.1
82701	24	27/06/2018	29/06/2018	0	1	0	Z37.0	-	-	-	0	-	2	840.6	1,681.2
41291	35	05/04/2018	10/04/2018	0	1	26	O80.0	-	-	-	0	-	5	23,828.0	119,140
62121	57	07/12/2018	17/12/2018	0	2	70	I20	I15	I25.1	I11	0	-	10	1,001.7	10,017
54991	34	13/09/2018	17/09/2018	0	1	0	P08.1	-	-		0	-	4	870.7	3,482.8
32581	55	20/02/2018	07/03/2018	0	1	21	O82.1	O63.1	O14.1	O99	1	74.04	14	869.1	12,167.4
51681	33	09/09/2018	12/09/2018	0	2	0	P08.1	-	-	-	0	-	2	976.3	1,952.6

Notes: ID: identification; KGS: Kyrgyzstani Som; LOS: length of stay.

a. Grey colour columns contain input statistical and financial information; green colour columns contain calculated values

Source: Data provided by MHIF in personal communication.

To calculate an initial average cost, the cost of each case was calculated in the database of reference hospitals using the formula:

$$CaseCost = BDcost * LOS$$

Where,
CaseCost = case cost in the database
BDcost = cost per bed day of the department where the patient is treated (based on the cost analysis)
LOS = length of stay of each patient.

Further, when calculating the average case cost for each DgCat, all cases with a length of stay of more than two standard deviations from the ALOS (outliers) were discarded from the analysis. Outlier cases, or cases with an atypically long or atypically short length of stay for a particular DRG, were discarded to keep the cost distribution within a case group tight and compute a more precise average (3).

For each DgCat, the CW was calculated using the formula:

$$CW_i = \frac{Average\ cost\ per\ case_i}{Global\ average\ cost}$$

Where,
CW_i = cost weight of $DgCat_i$
cost weight of $DgCat_i$ = average cost of a case in $DgCat_i$
Global average cost = an average cost of a case in the whole system.

It was not possible to calculate the CWs specifically for surgical DRGs based on the costing study. This was because the new classification of surgical procedures used for the new DRG version, had not yet been implemented in 2019. In addition, data on many secondary grouping criteria in the treated patient database was not representative (e.g. birth-weight, use of continuous positive airway pressure, etc.). This information was included in the new CSF format and had only been collected since 2020. Therefore, hospital admissions, that were included in the 2019 database could not be correctly assigned into new DRGs.

In light of these considerations, the DRG CWs involved in calculating CWs by DgCats were established based on cost analysis, which formed the basis for the new DRGs. Subsequently, in July 2022, a series of meetings convened with representatives from the expert community to review the results of the cost analysis and determine the CWs for each DRG. Following these discussions and the finalization of the new DRG version, another round of expert adjustments of the CWs was undertaken to ensure their alignment with health policy objectives and other relevant factors.

When determining DRG CWs, several essential principles were adhered to. The CWs for DRGs within the same DgCat needed to be closely aligned. This alignment helped maintain consistency within the DgCats. Additionally, principles of clinical meaningfulness were incorporated into the CW calculations. Furthermore, the potential impact on health-care provider behaviour was considered. The goal was to prevent the potential manipulation of information to shift patients into more expensive DRGs while monitoring for any such behaviour.

The cost analysis process faced several significant challenges.

First, despite previous cost analysis efforts within hospitals in 2015, a lack of clear methodological approaches and a common understanding within the MHIF regarding the study's objectives and potential applications of the results created obstacles.

Second, there was a lack of standardization within health-care providers at the departmental level. The number and types of departments often did not align with those registered in the Treated Case IS.

Third, there were difficulties in obtaining statistics for attributing the costs of auxiliary departments (e.g. operations units, laboratories) in an electronic format.

Finally, the cost analysis was based on 2019 data, which lacked the necessary information to assign cases to the new DRGs. Consequently, calculating the CWs for each DRG was not feasible. Instead, CWs were initially calculated for DgCats, with the subsequent involvement of experts in determining CWs for individual DRGs.

3.3.3. Developing the payment formula

The suggested payment formula for the new DRG version was:

$$\textbf{Price per case} = \textbf{BR} * \textbf{CW}_j * \textit{GeoC}$$

Where,

Price per case	= payment rate per treated case $_i$
BR	= base rate[10]
CWj	= cost weight of the group i
GeoC	= geographic coefficient of highland or remoteness, established by the law for certain settlements.

10. The base rate is the aggregate average cost per hospital case across a group of hospitals

The decision on the application of the previously used hospital-level coefficient and other risk correction tools will be made later, after analyzing and assessing the risks but before practical implementation.

It is important to note that a newly developed more advanced DRG grouping logic took into account the severity of the clinical condition and the use of high-tech methods. This made it possible not to use the "administrative" coefficients that were previously in use. However, at the time of writing no final decisions have been made on the financing formula.

As in the previous DRG version, the base rate is calculated (see the formula below) based on the amount of the budget that will be allocated to pay for services of all hospitals under the DRG-based payment system. The hospital sector budget should be divided by the expected number of cases across all hospitals in the region, taking into account the casemix index (CMI) and other adjustments. This makes it possible to ensure compliance with the principles of "budget neutrality" and not exceed the existing budget limit.

$$BR_t = \frac{HP_t}{(\sum_h \sum_i Cases_{h,i}) * (CMI) * (AC)}$$

Where,

BR_t	= Base rate for year t
H_t	= Hospital pool in year t
$Cases_{h,i}$	= Expected number of cases in case group i in hospital h
CMI	= Expected CMI
AC	= Excepted weighted average of all other coefficients in the DRG system.

3.4. Other enabling factors

To run and maintain the DRG system, critical enabling factors include the information technology (IT) system, data collection, the claims management system and the development of the grouper software. Their roles in the development of the new DRG version in Kyrgyzstan are discussed below.

3.4.1. IT system

The MHIF IT system consists of two main elements: the central component and the client component.

The **central component** consists of a centralized database, which stores all information, directories/classifiers and allows access to information for all stakeholders following the established access rights. This component accommodates the DRG grouper which assigns each case into a DRG, based on the information fed into the grouper. In addition, the grouper contains an "analytical add-on" that allows MHIF experts to analyze data and monitor the activities of providers.

The **client component** is the web-interface on the providers' side, through which providers interact with the central component (entering information, receiving feedback, generating reports, etc.). It performs automatic checks to ensure data accuracy, including gender and age-specific diagnoses, date correctness and other essential criteria. The number of filters and information quality control elements is gradually increasing.

3.4.2. Data collection

The basis for data collection in the hospital financing system is the CSF. The CSFs are filled out for each patient who is discharged from the hospital. Providers are obliged to enter the CSFs into the Treated Case IS.

The CSF contains the following main data types:
- patient demographic information (gender, age, social status, address etc.);
- main clinical parameters (codes of diagnoses and operations, type of anesthesia, use of ICU, etc.); and
- infrastructural information (hospitalization method, referring provider code, discharging department, attending physician, etc.).

As the DRG system developed, the CSF underwent several upgrades and its content as well as design were significantly changed, taking into account IS development and transition to automated data processing.

In developing the new DRG version, the CSF was also adapted to ensure that the collection and availability of information played an important role. So, compared to the previous CSF version, the following parameters were added to the new form:
- use of continuous positive airway pressure and artificial mechanical ventilation
- birth-weight
- use of thrombotic therapy.

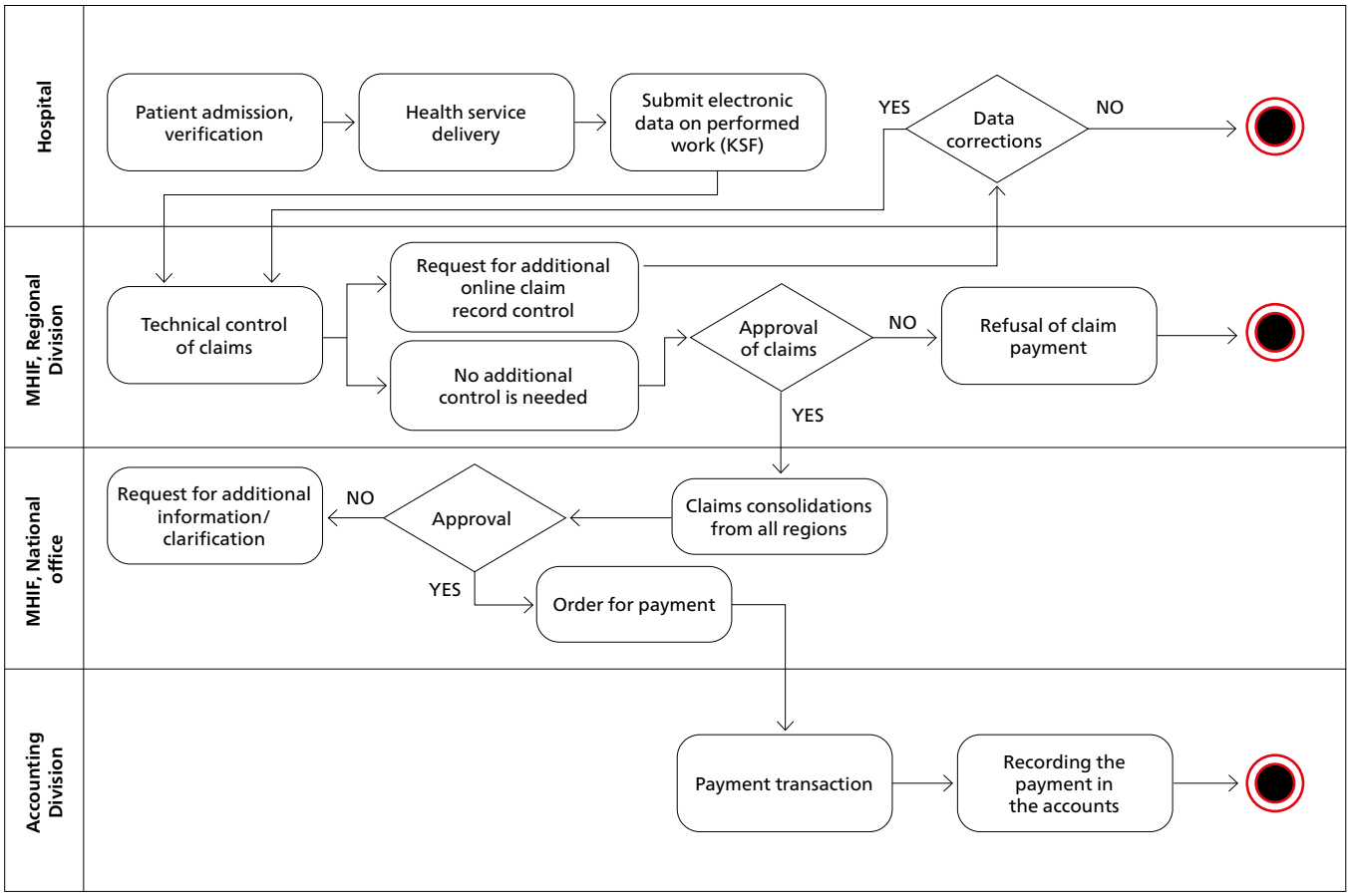
The full new CSF is provided in Annex 4.

3.4.3. Claims management

With the development of the IT system and the increase in MHIF and provider capacity, the claims management system has been improved and developed accordingly. At the initial stage of DRG system development (before 2005), the information from providers was consolidated in local MHIF branches and then transferred to the national office in the “offline” mode. In recent years, an online-based claims management system has been developed (Fig. 9), which will be retained to support the updated DRG system.

Fig. 9. Claims Management Process, MHIF, KGZ

Source: Authors.



The main stakeholders and their roles in the claims management system are as follows:

Providers:

- After the discharge of the patient from the hospital, the provider enters information into the MHIF Treated Case IS. The entered information corresponds to the structure of the CSF. Two main models of data entry into the Treated Case IS are in use:
  - entering information from paper-based CSF forms (for providers with limited IT capabilities); and
  - automated formation and export of CSF data to the Treated Case IS from advanced hospital ISs (for providers with advanced IT capabilities).
- Upon receipt of additional requests from the MHIF local branches, the provider delivers additional information or corrects the earlier submitted data. If the provider has not responded to the request, payment for individual cases may be rejected.

MHIF local branches:
- carry out the ongoing monitoring of information, and in case of questions regarding the quality of data or need for additional information on patients, forms a request for additional information to the provider;
- on the 25th of each month, approve all claims from providers reporting to the respective local branch; and
- respond to clarifying requests from the MHIF national office.

The MHIF national office:
- consolidates all information from the MHIF local branches
- performs data analysis
- interacts with the MHIF local branches, if necessary, to verify information gaps
- makes the payments to health-care providers.

3.4.4. Grouper software

None of the previous models of the DRG based payment system in Kyrgyzstan considered the existence of complex mechanisms for assigning the cases into DRGs. In fact, in previous models, a diagnosis code was directly and unambiguously assigned into a medical DRG and a surgical intervention code into a surgical DRG. This simplified approach did not require a special software to assign the cases into DRGs. In this regard, the grouping was carried out directly within the framework of the Treated Case IS on the basis of the CSF information.

After the development of the main parameters of the new DRG version, the MHIF management decided to develop a separate product – the DRG grouper software – due to a significant change and improvement in the grouping logic, which now is using additional classification criteria.

In 2021 the DRG grouper software requirements were developed and it was decided not to limit this product only to grouping functions, but to make it a more universal tool that would meet the analytical needs of the MHIF and build an institutional basis for the subsequent development of a new DRG system.

The software requirements defined the following main functionalities of the software:
- **grouping:** assignment of cases into the DRGs based on the CSF information in accordance with the grouping algorithm described in the DRG logic table;
- **upgrade of the DRG system:** functionality for changing the grouping logic, including the formation of new DRGs and their aggregation, the introduction of new grouping criteria, and changing the classifications used by providers etc; and
- **reporting:** generating analytical reports based on the information entered into the Treated Case IS, the availability of standard reports, as well as the possibility of flexible generation of new reports by various MHIF department staff, depending on their scope of work.

Based on the developed software requirements, a tender was held, which was won by a local IT company. During 2021 the software product development was completed and tested using the test database of 1000 cases, in which the assignment into the DRGs was done manually by the MHIF staff.

3.4.5. Challenges related to the critical enabling factors

Developing and maintaining the DRG system in Kyrgyzstan presented several challenges related to the critical enabling factors.

Firstly, the Treated Case IS had undergone multiple upgrades by various developers in recent years, leading to variations in data formats, provider coding systems and other parameters. This lack of uniformity complicated the historical statistical analysis.

Secondly, in 2023, a significant modernization of the Treated Case IS was carried out, posing challenges in testing the results of the new DRG version.

Furthermore, the company responsible for the DRG grouper software had no prior experience in the health-care sector. This required substantial time for developers to familiarize themselves with the technical intricacies specific to health care.

Lastly, historical data management involved six separate, non-integrated databases for registering hospital care information across different specialties and facilities. Integrating these diverse databases presented a considerable challenge during the development and implementation of the updated DRG system.

3.5. The process of development of the new DRG version

During the development of the new DRG version, much attention was paid to the institutionalization of regular DRG revision processes, enactment of the respective regulation and engagement of stakeholders.

The primary decisions regarding the development were made by the working group, established by the MoH's decree in 2018. This working group consisted of 18 representatives from the MHIF, the MoH, and the E-Health Center, and it was empowered to invite clinical experts from diverse backgrounds to participate as members. Experts from 19 medical specialties participated in the discussion of medical DRGs, while experts from nine surgical specialties participated in the discussion of surgical DRGs. Typically, each specialty had five to 12 participants in the discussion, including a chief staff expert from the MoH, representatives of relevant medical associations, and leading experts from national clinics and other large hospitals.

This process was highly beneficial for the working group and medical community in general to better understand the goals and objectives of the ongoing DRG revision process, as well as the basic principles of the DRG system.

To oversee the revision of the DRG system, a dedicated unit was established within the Department for Control and Analysis of the Quality of Medical Care of the MHIF consisting of four specialists: a head of unit, responsible for strategic issues and overall coordination; a clinician; an IT specialist; and a statistical analyst. The primary responsibilities of this unit included monitoring and evaluating the outcomes of DRG implementation, engaging with health-care providers to address ongoing issues and manage any proposals, and making recommendations to MHIF and MoH management for refining specific aspects of the new DRG version.

In order to align the new classification of surgical operations with the evolving state of health technologies and establish a process for its regular updates, the MoH approved relevant regulations in 2021 to support the update process. These regulations also delineated the roles and responsibilities of the MoH, MHIF, and the E-Health Centre in managing this aspect.

IT experts from the MHIF played a pivotal role in the development of the new DRG version. They identified significant issues within the Treated Case IS, developed the software requirements for a new version of the Treated Case IS – one that consolidates six separate databases into a unified system – and devised a transparent payment calculation algorithm.

In addition, another department within MHIF was assigned to be responsible for the cost analysis. Even though costing studies had been previously conducted, they had never been carried out within the framework of the DRG system. A standard methodology was approved jointly by the MoH and MHIF, serving as the foundation for regular analysis aimed at updating the DRG CWs.

The day care DRGs were developed with the main objective of creating economic incentives for providers to treat patients in day care settings. At the same time, it should be noted that this model is a first step in creating an effective financing system for day care services and will be developed as information is gathered and provider responses to the incentives are evaluated.

4. Implementation related considerations and next steps

4.1. Impact assessment of the new DRG version

To build MHIF capacity and prepare for the implementation of the new DRG version, an impact assessment was conducted using different scenarios. The main objective was to assess the budget impact of the new version by comparing the actual budgets received by providers with the budgets they would have received under the new DRG version.

The analysis was based on data from the MHIF's Treated Case IS, covering the first half of 2022 and containing 489 214 patient records from 131 hospitals. To focus on standard multidisciplinary hospitals for the impact assessment, specific hospital types were excluded from the analysis, such as tuberculosis, oncology, narcological, psychiatric hospitals and national clinics. This resulted in a final database for the modeling exercise, comprising 84 providers and 429 816 treated patients. During this period, these hospitals had a combined actual budget of 5.7 million Kyrgyz som. The base rate, CMI and other key parameters needed to conduct the impact assessment were calculated (Table 8).

This modeling did not take into account the hospital-level coefficients and other adjustment coefficients, which were used in the old DRG system. The CMI for the new system turned out to be very close to 1.0[11] (1.009), which indicates a good statistical balance of the new DRG version.

11. CMI represents the average relative weight and is equal to 1. A CMI higher than 1 indicates a greater need for resources compared to average while the CMI lower than 1 indicates a lower need for resources.

Table 8. Basic parameters of the financing system for the impact assessment

Basic parameters	Value
Budget (thousand Kyrgyz som)	5 699 740
Number of cases	429 816
CMI	1.009
Geographical coefficient	1.145
Base rate	11 480

Source: Authors, based on data provided by MHIF in personal communication.

For analysis purposes, the cases were grouped using the new DRG grouper, and a “new” DRG code was assigned to each case in the database. This facilitated the comparison with the “old” DRG code. Such modeling enabled the evaluation of critical risks that that some providers might encounter during the implementation of a new DRG version as a payment system.

The main results of the impact assessment modelling, in diagram format and by provider, are presented in Annex 5. The results revealed that the budget impact of the new DRG system on hospitals varied from -40% to +52%.

During the analysis, several limitations were taken into account.

Firstly, despite the introduction of a new CSF form in 2021, not all providers have consistently registered data according to this new format or entered the required data into the IT system.

Secondly, technical monitoring of coding quality revealed a decline in the analysis's reliability due to ongoing issues with data accuracy, including a limited range of diagnosis and procedure codes used by physicians, inadequate coding of secondary diagnoses, and insufficient information on tumor treatment methods in patients with oncological diagnoses. Table 9 shows some results of the data quality analysis conducted in 2022.

Table 9. Results of the data quality analysis in Bishkek city hospitals in 2022

Indicator	Value
Unspecified diagnoses (*.9)	13.90%
Incomplete ICD10 code (3 digits)	1.09 %
Surgical cases without operation codes	2.48 %
Cases with invalid dates	0.01%
Inconsistency of the diagnosis with the age of the patient	0.09%

Source: Authors, based on data provided by MHIF in personal communication.

Given the limitations outlined above, the results of this modeling were considered preliminary. Based on this analysis, the MHIF initiated a discussion with providers on the need to improve the quality of data coding, which would have much greater importance in the new DRG version. A follow-up impact assessment is scheduled for autumn 2024, using more recent data from January to September 2024. It is expected that the results of this assessment will inform political decisions related to the implementation of specific risk mitigation measures.

4.2. Implementation strategy

The new DRG version was finalized in the fall of 2023 when the budget process for 2024 had already been completed. The parameters of the 2024 inpatient budget were determined considering the structure of patients treated in 2022 (whole year) in the context of the "old" DRGs. This procedure is set out in the current budget planning rules.

Taking into account these circumstances, the management of the MHIF made a decision that in 2024, the new DRG version would be implemented in the mode of "paper piloting"[12] without actual impact on the budget of medical organizations.

12. Paper piloting is a stage in the development and testing of a new DRG version when the DRG payments do not yet impact the provider's budget. Instead, they are used for statistical purposes, such as analyzing the potential impact of the new DRG system on provider budgets, testing the grouper and more.

The following factors influenced this decision:
- Development of the new DRG version was carried out under conditions of significant information limitations described earlier. A large share of decisions was made based on expert assessments. Accordingly, before full-fledged practical implementation, it is planned to improve and modernize the system, considering objective statistics of treated cases for at least a year in accordance with the new classification criteria.
- Starting from 1 January 2024, the MHIF have switched to using a completely new Treated Case IS throughout the country, which collects information to classify patients in the new DRGs. The new IT system may need to be refined and modernized during the implementation process, which may also lead to risks in terms of the correct assignment of cases.
- As of the end of 2023, not all health-care providers have been trained on coding based on new principles and therefore, incorrect use of the new classification criteria can be applied in the new DRG version.

Therefore, it was tentatively decided that the practical use of the new payment model for provider financing will begin in 2025. The 2025 budget is proposed to be formed as combination of 80% of the "historical budget" and 20% of the budget to be allocated based on the new DRG version. In subsequent years, the proportion of the budget allocated based on the DRG will increase.

4.3. Planned next steps to improve the Kyrgyz DRG system

As mentioned earlier, the new DRG version has significant potential for further enhancement as higher quality data becomes available and the actual impact on the system becomes more apparent during the initial years of implementation. The structure of the DRG logic table and the DRG grouper is designed to allow the MHIF to continuously refine the grouper algorithm as the volume of data increases, taking into account the results of performance monitoring and other relevant factors.

Key recommended steps for the short term (2024):

- **Re-analysis and assessment of budget impact:** Perform a comprehensive analysis and budget impact assessment based on the data of the first half of 2024. Implement mechanisms to manage and mitigate any identified critical risks.

- **Development of payment principles:** Design and formalize the payment principles based on DRGs, including approaches for handling outliers, multiple hospital admissions and other relevant parameters.

- **Testing of the DRG grouper:** Use large data for testing the DRG grouper and correct possible errors in grouping the cases.

- **Conduction of another analysis of clinical and economic homogeneity:** Conduct further adjustment of the principles of formation of DRGs (if necessary).

Key recommended steps for the medium term (2025 onwards):

- **Assessment of DRG homogeneity:** Conduct an assessment of the homogeneity of each DRG based on 2024–2025 data. Modify the DRG grouping logic as needed to enhance homogeneity. This is essential as the initial model was developed without complete statistical information on certain classification criteria.

- **Monitoring of data quality:** Establish an effective system for monitoring data quality and provider performance to detect deviations from the average and potential fraud. Use this information to make informed decisions regarding DRG system updates.

- **Provision of training for hospital managers:** Develop and institutionalize training courses for hospital managers, focusing on financial management of health-care facilities and health financing principles.

- **Engagement of clinical communities:** Define the roles of clinical communities and engage them through monitoring, interpreting results, and improving the DRG system. Provide them with access to analytical data and create a platform for discussion within the MHIF.

5. Summary and lessons learned

The Kyrgyz DRG system has gone through various updates since 1997. The primary driver and rational for regular revision were the need to update the DRG system to reflect changes in medical practices. Simultaneously, the capacity of the MHIF and providers has increased to improve and accommodate more sophisticated DRG grouping logic. The development of ISs has played a crucial role by facilitating data collection and analysis and transitioning from manual DRG assignment to automated DRG grouper software.

Several lessons have been learned in the process of developing the Kyrgyz DRG system, which can be valuable for other countries, especially low- and middle-income countries. The first set of lessons is specific to the development of the national DRG system, while the second is relevant for DRG system development in general.

In 1997 Kyrgyzstan started with a very simple DRG version that matched the capacities of the MHIF and providers at that time, as well as the available data. Over the years, Kyrgyzstan has gradually introduced complexities into the system, driven by local-level needs. Kyrgyzstan's experience suggests that opting for a domestically developed DRG grouper may offer certain advantages over adopting a DRG system from other countries, such as:

- the possibility to start with a simple version and add complexity as capacities increase and data quality improves;
- that development is driven by local needs, not by the needs of already developed groupers;
- a strong sense of local ownership;
- transparency, as the grouping logic is available (which is not always the case for all DRG systems) and as it is locally developed, the people engaged understand it;
- that starting simply allows for easier use of local cost data for CW calculation and for using DRGs for strategic purchasing; and
- developing the grouper and conducting CW calculations with costing studies locally builds local capacity and improves collaboration between the MoH, purchasers, providers and clinicians.

In addition, as Kyrgyzstan has 25 years of experience in developing and implementing a DRG system, there are several lessons learned that are not specific to a nationally developed DRG grouper as presented below.

- **Active use of available data, even when it is initially lacking or of poor quality.** Through analysis and continuous quality monitoring, the country can gain a deeper understanding of system bottlenecks and areas in need of improvement. This process facilitates the development of critical enablers for the development of the DRG system.

- **Implementation of a system for monitoring provider performance.** Continuous monitoring and evaluation of the DRG system is essential to identify areas requiring revision or improvement, especially in harmonizing the coding standard and monitoring and enforcing compliance.

- **Regular adjustment of the DRG system and financing rules.** Over time, providers adapt to the payment system and learn to exploit its shortcomings.

- **Develop the DRG system at least two years after changes in primary classification systems.** The transition to a new classification of surgical operations in Kyrgyzstan, and the inability to correctly analyze historical data when developing a new DRG version resulted in challenges in developing surgical DRGs. The same applies on the secondary grouping criteria that were not previously collected. It may take a significant time (1–2 years) to collect this data before starting to use it in designing the DRG groping logic.

- **Continuous effort is needed to analyze the data quality and train statisticians, doctors, and managers in health information coding principles.** In Kyrgyzstan, the E-Health Centre and the MoH play important role in this regard.

- **Active involvement of the medical community in the process of developing a DRG system.** The participation of experts from different clinical fields may extend the development time, but it enhances ownership of the DRG system and improves understanding of its basic principles. Shared responsibility between the MHIF and the medical professional community is crucial.

- **Establishment of a dedicated unit or at least designating employees within the purchasing agency structure to work full-time on processes related to DRG system development.** This should be accompanied by the approval of the scope of work and regulations for regular system review and development. The Kyrgyz experience shows that the process of developing the new DRG version significantly contributes to building the capacity of the MHIF. However, overloading staff with routine tasks reduces their engagement in the development work. In such cases, external experts play a larger role, which poses a threat to institutional stability.

Annex 1. Secondary grouping criteria

Secondary diagnosis codes
Given the limited historical information on secondary diagnosis codes, and also taking into account possible negative incentives that can be created by the intensive use of levels of clinical complexity of cases under this diagnosis related group (DRG) system, it was decided to minimize the list of groups of secondary diagnosis codes that are taken into account when assigning cases into DRGs. Each group is given a variable called complication/co-morbidity (CC) property as shown in Table A1.1.

Table A1.1. Secondary diagnosis codes

Source: Authors, based on data provided by MHIF in personal communication.

CC property ID	Text
05C01	Diabetes mellitus with complications
03C01	Hearing loss uni-/bilateral
06C01	Peritonitis
11C01	Acute and chronic renal failure, end-stage kidney disease
14C01	Complications during pregnancy and childbirth
16C01	Acute and chronic posthemorrhagic anemia

In total, this criterion is taken into account when classifying cases into 11 DRGs.

Discharge status
One criterion of the discharge status category is applied as shown in Table A1.2.

Table A1.2. Discharge status

Source: Authors, based on data provided by MHIF in personal communication.

Discharge status ID	Text
3	Deceased

In total, this criterion is taken into account when classifying cases into five DRGs.

Treatment with thrombolytics
This criterion is used for grouping the patients with diseases of the cardiovascular system as shown in Table A1.3.

Table A1.3. Treatment with thrombolytics

ID	Text
1	Delivered thrombolytic therapy

Source: Authors, based on data provided by MHIF in personal communication.

In total, this criterion is taken into account when classifying cases into two DRGs.

Treatment in an intensive care unit (ICU)
This criterion aims to account for the use of expensive clinical technologies in ICU units as shown in Table A1.4.

Table A1.4. Treatment in an ICU

ID	Text
1	Stay in intensive care for more than three days
2	Artificial mechanical ventilation for more than three days
3	Artificial mechanical ventilation for more than five days
4	Continuous positive airway pressure for more than three days

Source: Authors, based on data provided by MHIF in personal communication.

In total, this criterion is taken into account when classifying cases into 27 DRGs.

Age of young pediatric patients
This criterion is used to take into account the age of patients when classifying into pediatric DRGs:
- ≤ 365 days
- ≤ 1985 days.

In total, this criterion is taken into account when classifying cases into six DRGs.

Birth-weight of newborn
This criterion is used to take into account the birth-weight of the newborn in the classification in the DRG. Three different weight categories are used as follows:
- Less than 1000 grams
- 1000–1499 grams
- > 1499 grams

In total, this criterion is taken into account when classifying cases into three DRGs.

Annex 2. List of surgical specialties and the number of complexity levels

Table A2.1. List of surgical specialties and the number of complexity levels

Specialty	Complexity levels
Operations on the central nervous system and brain	3
Operations on the musculoskeletal system and joints	5
Operations on the peripheral nervous system	3
Operations on endocrine glands other than the pituitary gland	2
Operations on the organ of vision	**6**
Operations on the organ of hearing, paranasal sinuses and the upper respiratory tract	**5**
Operations on the skin, subcutaneous tissue, skin appendages	**4**
Operations on the organs of the oral cavity	**4**
Operations on the organs of hematopoiesis and the immune system	**3**
Operations on the lower respiratory tract and lung tissue, mediastinal organs	**4**
Other abdominal surgeriesw	**3**
Operations on the heart and coronary vessels	**3**
Operations on vessels	**5**
Operations on the esophagus, stomach, duodenum	**4**
Operations on the intestines and anal area	**3**
Appendectomy	**2**
Operations on the liver and pancreas	**3**
Operations on the gallbladder and biliary tract	**4**
Operations for hernias	**3**
Operations on the kidney and urinary system	**6**
Operations on the female genital organs	**4**
Operations on the male genital organs	**4**
Operations on the mammary gland	**3**
Operations of the retroperitoneal space	**3**
Transplantation	**1**
Endoprosthetics of joints	**1**

Source: WHO 2019 (*5*).

Annex 3. Fragment of the diagnosis-related group logic table

Notes: DRG ID: diagnosis related group identification; DgCat: diagnosis category; ICU: intensive care unit; MDC: major diagnostic category; TIA: transient ischemic attack.

Source: Authors.

Table A3.1. Fragment of the DRG logic table

DRG ID	Name	MDC	DgCat	Procedure Property	Discharge status	ICU	Diagnosis property	Complications	Birth weight	Age	Trombolisis	DRG Relative Weight
T010101	Diseases and injuries of the spine	01	01M01	-	-	-	-	-	-	-	-	1.060
S010201	Nervous system neoplasms, with surgery, ICU more than 3 days	02	01M02	01S02, 01S01	-	1	-	-	-	-	-	2.750
S010202	Nervous system neoplasms, with surgery	03	01M02	01S02, 01S01	-	-	-	-	-	-	-	1.900
T010203	Nervous system neoplasms	04	01M02	-	-	-	-	-	-	-	-	0.600
S010301	Degenerating diseases of the nervous system, with surgery	05	01M03	01S02, 01S01	-	-	-	-	-	-	-	1.800
T010301	Degenerating diseases of the nervous system	06	01M03	-	-	-	-	-	-	-	-	1.600
T010302	Degenerating diseases of the nervous system, consequencesof cerebrovascular diseases	07	01M03	-	-	-	01T01	-	-	-	-	0.800
T010401	Multiple sclerosis and cerebellar ataxia	08	01M04	-	-	-	-	-	-	-	-	1.600
S010501	Specific disorders of cerebral circulation, except for TIA, with surgery	09	01M05	01S02, 01S01	-	-	-	-	-	-	-	2.600
T010501	Specific cerebral circulatory disorders, except for TIA, ICU for more than 3 days	10	01M05	-	-	1	-	-	-	-	-	2.300
T010502	Specific disorders of cerebral circulation, except for TIA	11	01M05	-	-	-	-	-	-	-	-	1.700
T010503	Specific cerebral circulatory disorders, except for TIA, died before 3 days	12	01M05	-	3	-	-	-	-	-	-	0.800
T010601	Transient ischemic attack and occlusions of anterior cerebral vessels without infarction	13	01M06	-	-	-	-	-	-	-	-	1.070
T010701	Non-specific cerebrovascular diseases	14	01M07	-	-	-	-	-	-	-	-	1.010
S010801	Disease of intracranial and peripheral nerves, with surgery	15	01M08	01S02, 03S03, 01S01, 03S02, 03S01	-	-	-	-	-	-	-	1.600
T010801	Disease of intracranial and peripheral nerves	16	01M08	-	-	-	-	-	-	-	-	0.990
T010901	Infections of the nervous system, ICU for more than 3 days	17	01M09	-	-	1	-	-	-	-		2.700
T010902	Infectionsof the nervous system	18	01M09	-	-	-	-	-	-	-	-	1.450
T011201	Stupor or coma of non-traumatic origin	19	01M12	-	-	-	-	-	-	-	-	1.020
T011301	Convulsionsand headaches, ICU for more than 3 days	20	01M13	-	-	1	-	-	-	-	-	1.800
T011302	Convulsions and headaches, epilepsy	21	01M13	-	-	-	-	-	-	-	-	1.020
T011303	Convulsionsand headaches, migraine	22	01M13	-	-	-	01T02	-	-	-	-	0.980
S011401	Cranial and brain injuries, with surgery, ICU for more than 3 days	23	01M14	01S02, 01S01	-	1	-	-	-	-	-	2.500
S011402	Cranial and brain injuries, with surgery	24	01M14	01S02, 01S01	-	-	-	-	-	-	-	2.020
TO11401	Cranial and brain injuries, ICU morethan 3 days	25	01M14	-	-	1	-	-	-	-	-	2.010
T011402	Skull and brain injuries	26	01M14	-	-	-	-	-	-	-	-	1.020
T011403	Cranial and brain injuries, died up to 3 days	27	01M14	-	3	-	-	-	-	-	-	1.010
T011501	Concussion	28	01M15	-	-	-	-	-	-	-	-	0.700
S019901	Other diseases of the nervous system, with surgery, ICU morethan 3 days	29	01M99	01S02, 01S01	-	1	-	-	-	-	-	2.020
S019902	Other diseases of the nervous system, with surgery	30	01M99	01S02, 01S01	-	-	-	-	-	-	-	1.840
T019901	Other diseases of nervous system, ICU morethan 3 days	31	01M99		-	1	-	-	-	-	-	1.400
T019902	Other diseases of the nervous system	32	01M99		-	-	-	-	-	-	-	1.020
S01MD01	Diseases of the nervous system, musculoskeletal surgery, high level	33	MDC01	02S05, 02S04	-	-	-	-	-	-	-	2.400
S01MD02	Nervous system diseases, musculoskeletal surgery, intermediate level	34	MDC02	02S03	-	-	-	-	-	-	-	2.020
S01MD03	Nervous system diseases, musculoskeletal surgery, low level	35	MDC03	02S02, 02S01	-	-	-	-	-	-	-	1.300

Annex 4. New clinical statistical form

Fig. A4.1. New clinical statistical form

Source: MoH 2021 (*14*).

HOSPITAL DISCHARGE FORM

CLINICAL RECORD NUMBER | DATE OF ADMISSION | TIME | DATE OF DISCHARGE | TIME | BED DAYS | TIME

HOSPITAL ID | HOSPITAL NAME

DEPARTMENT | CLINICAL DEPARTMENT ID | DEPARTMENT NAME

PROFILE CODE | EMC | TIME SPENT IN EMC | DC | TIME SPENT IN EMC

TREATED IN ICU | DAYS | HOURS

FOR PATIENTS RECEIVING HAEMODIALYSIS:

NUMBER OF SESSIONS

HOSPITALISATION OUTCOME:

- DISCHARGED
- DIED
- TRANSFERRED TO ANOTHER HOSPITAL
- UNAUTHORIZED DEPARTURE
- REFUSAL OF HOSPITALIZATION

PATIENT REFERRED:

- PHC
- OTHER HOSPITAL
- CDD
- SELF-REFERRED
- MMD
- NEWBORN
- EMS
- OTHER

HOSPITALISATION OUTCOME:

- PLANNED
- EMERGENCY < 24 H
- INCLUDING < 12 H FOR ICD CODES I20.0-I22.9
- EMERGENCY > 24 H

WHEN TRANSFERRING TO ANOTHER HOSPITAL

HOSPITAL ID

HOSPITAL NAME

REFERRING PROVIDER'S ID | **REFERRING PROVIDER'S NAME**

ICD 10 CODE | ADMISSION DIAGNOSIS

PIN | SHI POLICY #

LAST NAME | DOB

FIRST NAME | AGE ADMISSION | SEX M F

PARENTAGE | CITIZENSHIP

ADRESS:

REGION | STREET

DISTRICT | HOUSE

SETTLEMENT | CITY

SOCIAL STATUS CODE

SOCIAL BENEFIT CATEGORY

MEDICAL BENEFIT CATEGORY

NO. AND NAME OF IDENTITY DOCUMENT | WITHOUT DOCUMENTS

NO. AND NAME OF THE DOCUMENT CONFIRMING THE RIGHT TO BENEFITS

CO-PAYMENT | CONFIRMATION NUMBER | CO-PAYMENT DATE | RECEIPT NUMBER

FOR ICD10 CODES S00-T35 (TRAUMA TYPE):

- WORK-RELATED
- STREET
- AGRICULTURAL
- SPORT
- HOME
- ROAD TRAFFIC INJURY
- SCHOOL
- OTHER

IN A SUICIDE ATTEMPT ICD-10 CODE SELF-HARM (X60-X84)

Notes: CDD: Consultative and Diagnostic Department; COVID-19: coronavirus disease; DOB: date of birth; F: female; CPAP/BIPAP: continuous positive airway pressure and bilevel positive airway pressure DC: day care; EMC: emergency medical care; EMS: emergency medical services; ICD-10: International Classification of Diseases, tenth revision; ID: identification; M: male; MMD: Military Medical Board; PHC: primary health care; PIN: personal identification number.

THE FINAL CLINICAL DIAGNOSIS:

☐☐☐☐ ICD10 CODE — MAIN DIAGNOSIS _____

☐☐☐☐ ICD10 CODE — COMPLICATION #1 _____

☐☐☐☐ ICD10 CODE — COMPLICATION #2 _____

☐☐☐☐ ICD10 CODE — CONCOMITANT DIAGNOSIS #1 _____

☐☐☐☐ ICD10 CODE — CONCOMITANT DIAGNOSIS #2 _____

IN THE EVENT OF DEATH:

PRIMARY CAUSE OF DEATH: _____

☐☐☐☐ ICD10 CODE _____

SURGICAL OPERATIONS / MANIPULATIONS:

MAJOR SURGERY: _____

OTHER SURGICAL OPERATIONS / MANIPULATIONS: _____

CODE	DATE AND TIME		ANAESTHESIA
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐
☐☐☐☐☐☐	☐☐☐☐☐☐	☐☐☐☐	☐

***ANAESTHESIA: GENERAL - 1, LOCAL - 2, INCLUDING SPINAL - 2.1 COMBINED - 3**

☐ **POSTOPERATIVE COMPLICATIONS**
☐ INCLUDING INFECTIOUS

☐ **PERIOPERATIVE ANTIBIOTIC PROPHYLAXIS**
☐ **ANTIBIOTIC THERAPY (FOR SURGICAL INTERVENTIONS)**

FOR ICD-10 CODES FOR ACUTE CORONARY SYNDROME (I20.0-I22.9)

☐ WITH ELEVATION OF THE ST SEGMENT
☐ WITHOUT ELEVATION OF THE ST SEGMENT
☐ THROMBOLYTIC THERAPY WAS PERFORMED

FOR ICD-10 CODES FOR TUBERCULOSIS A15.0-A16.9

☐ SENSITIVE, CLINICALLY CONFIRMED
☐ SENSITIVE, CONFIRMED BACTERIOLOGICALLY AND HISTOLOGICALLY
☐ RESISTANT, CONFIRMED BACTERIOLOGICALLY AND HISTOLOGICALLY

FOR COVID19 CODES U07.1, U07.2. COVID19

PCR TEST RESULT
☐ NEGATIVE ☐ POSITIVE
☐☐☐☐☐☐ TEST DATE

THE PATIENT WAS ON:

☐ OXIGEN THERAPY	☐☐ DAYS	☐☐ TIME
☐ NON-INVASIVE VENTILATION (CPAP/BIPAP)	☐☐ DAYS	☐☐ TIME
☐ INVASIVE VENTILATION	☐☐ DAYS	☐☐ TIME

FOR DELIVERY

☐ PHYSIOLOGICAL DELIVERY (OBSTETRICIAN-GYNAECOLOGIST)
☐ ABNORMAL DELIVERY (OBSTETRICIAN-GYNAECOLOGIST)
☐ PHYSIOLOGICAL DELIVERY (MIDWIFE)
☐ BIRTHS ATTENDED BY ANOTHER SPECIALIST
☐ UNATTENDED BIRTH

THE SEVERITY OF COVID19

☐ MEDIUM SEVERITY
☐ SEVERE LEVEL
☐ EXTREMELY SEVERE

FOR A NEWBORN

BIRTH WEIGHT (GRAMS)

☐ 500 - 999 GR
☐ 1000 - 1499 Grams
☐ 1500- 2499 Grams
☐ > 2500 Grams

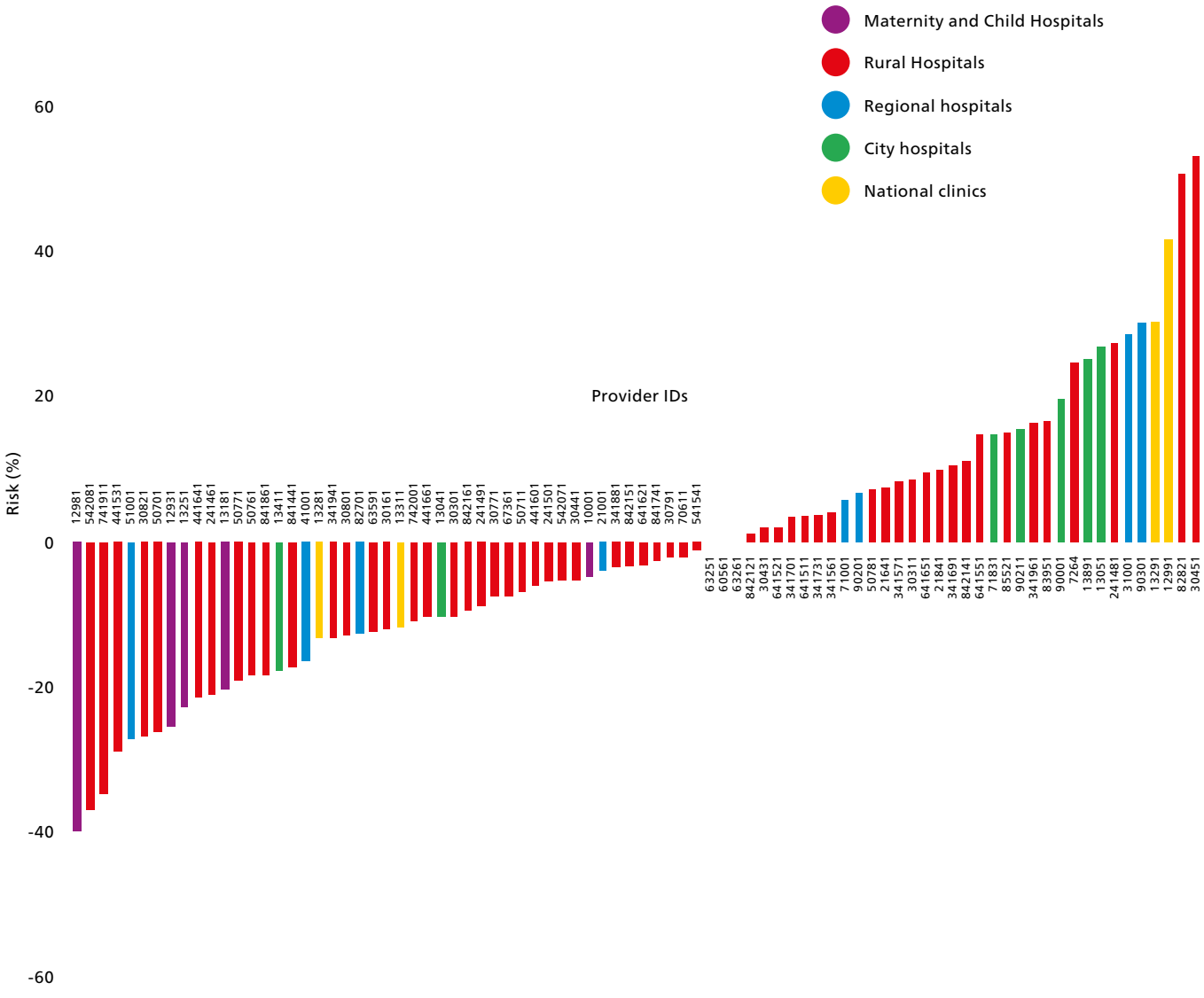
DOCTOR (SIGNATURE) _____ ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ DOCTOR'S CODE

HEAD OF THE DEPARTMENT _____ ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ HEAD OF THE DEPARTMENT CODE

Annex 5. Results of the initial modeling of the budget impact on hospital revenues

Fig. A.5.1. Results of the initial modeling of the budget impact on hospital revenues

Source: Authors, based on data provided by MHIF in personal communication.



References[13]

1. Moldoisaeva S, Kaliev M, Sydykova A, Muratalieva E, Ismailov M, Madureira Lima J, et al. Kyrgyzstan: Health system review. Health Systems in Transition. 2022;24(3): i-152 (https://iris.who.int/handle/10665/363175).

2. Klein A, Mathauer I, Stenberg K, Habich T. Diagnosis-related groups: a question and answer guide on case-based classification and payment systems. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/333717). License: CC BY-NC-SA 3.0 IGO

3. Langenbrunner JC, Cash in C, O'Dougherty S. Designing and Implementing Health Care Provider Payment Systems: How-To Manuals. Washington DC: World Bank; 2009 (https://hdl.handle.net/10986/13806).

4. World Health Organization. International Classification of Diseases—ninth revision (ICD-9). Weekly Epidemiological Record. 1988;6(45):343–344 (https://iris.who.int/handle/10665/226922).

5. ICD10. In: International Statistical Classification of Diseases and Related Health Problems (ICD); World Health Organization [website]. Geneva: World Health Organization; 2019 (https://icd.who.int/browse10/2019/en).

6. Программа Правительства КР по охране здоровья населения и развитию системы здравоохранения на 2019-2030 годы «Здоровый человек – процветающая страна» [The Programme of the Kyrgyz Republic Government on Public Health Protection and Health Care: System Development for 2019–2030 "Healthy Person, Prosperous Country. Bishkek: Government of Kyrgyzstan; 2019 (https://www.gov.kg/ru/programs/13) (in Russian).

7. Nordic casemix center [website]. Helsinki: NordCase; 2024 (www.nordcase.org).

8. World Health Assembly, 72. Eleventh revision of the International Classification of Diseases. Geneva: World Health Organization: 2019 (https://iris.who.int/handle/10665/329357).

9. International Classification of Health Interventions (ICHI) [online database]. Geneva: World Health Organization; 2024 (https://icd.who.int/dev11/l-ichi/en).

10. 2024 ICD-10-PCS. In: Centers for Medicare & Medicaid Services [website]. Woodlawn: Centers for Medicare & Medicaid Services; 2024 (https://www.cms.gov/medicare/coding-billing/icd-10-codes/2024-icd-10-pcs).

13. All references were accessed 1 May 2024.

11. ICD-10-AM/ACHI/ACS. In: Independent Health and Aged Care Pricing Authority [website]. Sydney: Independent Health and Aged Care Pricing Authority; 2024 (https://www.ihacpa.gov.au/health-care/classification/icd-10-amachiacs).

12. NOMESCO Classification of Surgical Procedures (2011). In: NCSP - Classification of Surgical Procedures; Nordic Health & Welfare Statistics. Copenhagen: Nordic Health & Welfare Statistics; 2024 (https://nhwstat.org/publications/ncsp-classification-surgical-procedures).

13. Приказ Министерства здравоохранения РФ от 13 октября 2017 г. N 804н "Об утверждении номенклатуры медицинских услуг" (с изменениями и дополнениями) [Order of the Ministry of Health of the Russian Federation dated October 13, 2017 N 804n “On approval of the range of medical services” (with amendments and additions)]. Moscow: Ministry of Health; 2017 (https://base.garant.ru/71805302/) (In Russian).

14. Приложение 1 к приказу Министерства здравоохранения СР 2021г. “Учетная форма № 066/у. Клинико-статистическая форма выбывшего из стационара” [Annex 1 of the Order of the Ministry of Health dated 2021 “Reporting form № 066/u. Clinical-statistical discharge form”]. Bishkek: Ministry of Health; 2021 (In Russian).

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