NEW APPROACHES TO FORMATION OF DIAGNOSIS-RELATED GROUPS FOR PAYMENT FOR RADIOTHERAPY AND CHEMOTHERAPY BASED ON CLINICAL GUIDELINES WITH THE USE OF STANDARDIZED MODULES OF HEALTHCARE

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Abstract

The article presents a methodology and results of developing diagnosis related groups (DRGs) for the cases of healthcare provided with the use of radiotherapy and chemoradiotherapy for malignant neoplasms in Russian Federation. A key element of the methodology is the standardized module of healthcare (SM) which allows calculating the tariffs for medical care in accordance with clinical guidelines. As a result of the application of the new methodology, in 2019, changes were made to the DRG model in terms of payment for radiotherapy and chemoradiotherapy. The changes included developing 10 DRGs for in-patient radiotherapy and 10 DRGs in day hospital; 7 DRGs for in-patient chemoradiotherapy and 5 DRGs in day hospital. New classification criteria have been introduced into the DRG model for attributing the case to a certain DRG, in addition to the medical service used before. The number of fractions became a new criterion for radiotherapy, the number of fractions and the international non-proprietary name of the drug were proposed for chemoradiotherapy. A wider range of DRG's weight coefficients was calculated, which allows more differentiated reimbursement of the costs of medical care provided by medical organizations depending on the method and the regimen used.

Keywords: radiotherapy, chemoradiotherapy, diagnosis related group, standardized module of healthcare, clinical guidelines, standard of medical care.

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НОВЫЕ ПОДХОДЫ К ФОРМИРОВАНИЮ КЛИНИКО-СТАТИСТИЧЕСКИХ ГРУПП ДЛЯ ОПЛАТЫ ЛУЧЕВОЙ И ХИМИОЛУЧЕВОЙ ТЕРАПИИ НА ОСНОВЕ КЛИНИЧЕСКИХ РЕКОМЕНДАЦИЙ С ИСПОЛЬЗОВАНИЕМ СТАНДАРТИЗИРОВАННЫХ МОДУЛЕЙ МЕДИЦИНСКОЙ ПОМОЩИ

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Резюме

В статье представлены методика и результаты формирования клинико-статистических групп (КСГ) для оплаты случаев госпитализации при проведении лучевой и химиолучевой терапии больным со злокачественными новообразованиями. КСГ сформированы в результате расчета затрат на оказание медицинской помощи на основе стандартизированных модулей медицинской помощи, которые, в свою очередь, сформированы исходя из клинических рекомендаций. В результате применения новой методики внесены изменения в модель КСГ 2019 г. в части оплаты лучевой и химиолучевой терапии: вместо трех КСГ, существовавших ранее, сформировано по 10 КСГ для лучевой терапии в условиях круглосуточного и дневного стационара; 7 КСГ для химиолучевой терапии в условиях круглосуточного стационара и 5 КСГ для химиолучевой терапии в условиях дневного стационара. В модель КСГ введены новые, дополнительные к медицинской услуге, использованной ранее, классификационные критерии, позволяющие отнести случай госпитализации к КСГ: для лучевой терапии – количество фракций, для химиолучевой – количество фракций и международное непатентованное наименование лекарственного препарата. Увеличен диапазон коэффициентов затратоемкости КСГ, что позволяет более дифференцированно возмещать медицинским организациям затраты за оказанную медицинскую помощь в зависимости от проводимого метода и режима лучевой или химиолучевой терапии.

Ключевые слова: лучевая терапия, химиолучевая терапия, клинико-статистические группы, стандартизированный модуль, клинические рекомендации, стандарты медицинской помощи.

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Introduction

According to the legislation in the field of healthcare in the Russian Federation (RF), medical care must be provided on the basis of clinical recommendations [1]. Currently, payment for specialized medical care provided in a round-the-clock and day hospital at the expense of compulsory medical insurance (CHI) is effected for a case of hospitalization pertaining to a group of diseases, including the diagnosis-related group (DRG). The DRG-based payment method is used in most of the Russian regions.

In 2018, the DRG intended for payment for antitumor drug therapy of solid tumors in adults was significantly changed; a method was used that allows for bringing the rates for paying for medical care in accordance with clinical recommendations through standardized modules (SM) of medical care [2]. However, the DRG for payments for medical care connected with radiation therapy has not changed since the development of the group: for both round-the-clock (since 2013) and day hospitals (since 2016), there were only three DRGs, and assignment to them was based on the type of service provided, encoded in accordance with the nomenclature of medical services. A small variation in the relative cost-intensity coefficients (CIC) of DRG did not allow for adequate payment for resource-intensive radiation therapy. In this regard, it was necessary to review the DRG in order to align the rates with clinical recommendations, which should contribute to a more equitable reimbursement of expenses of medical organizations that provide care for cancer. The purpose of this work was to form DRGs for payment for radiation and chemoradiation therapy, based on clinical recommendations.

Materials and methods

Coordination of DRG with clinical recommendations was carried out by creating SMs for cases of hospitalization for the purpose of radiation and chemoradiation therapy and calculating the cost of medical care based on them, followed by attributing cases with a similar cost to a single DRG.

The method of forming DRGs on the basis of clinical recommendations with the use of SMs developed by the FSBI "Center for Expertise and Quality Control of Medical Care" of the Ministry of Health of Russia [3], includes 4 stages:

1. The development of SMs containing complexes of medical interventions used to provide medical care with a certain method and mode of radiation or chemoradiation therapy in the case of hospitalization in a round-the-clock or day hospital.
2. The estimation of the expected number of hospitalizations to the round-the-clock and day hospitals for radiotherapy and chemoradiotherapy on a national scale.
3. SM-based calculation of hospitalization costs with the use of each method and radiation or chemoradiation therapy.
4. DRG formation.

SMs at the first stage are formed in the case of hospitalization of a patient with a specific malignant neoplasm for radiation or chemoradiotherapy by a certain method and in a certain mode. The structure of SMs corresponds to the standard structure of medical care approved by order of Ministry of Health of Russia: SMs included lists of the medical services used, medicines and medical supplies, with indication of frequency and number of admin-

istrations within the same hospitalization [4].

SM development was based on the following:

- 35 clinical recommendations for solid tumors in adults approved by the Association of Oncologists of Russia (AOR) at the time of the work (from June to September 2018), which described the methods and modes of radiation or chemoradiation therapy (Table 1);
- the procedure for providing medical care in the "Oncology" profile [5],
- medical services nomenclature [6],
- the state register of selling price limits [7],
- statistical data on the incidence of malignant tumors in 2017 [8].

The SM was formed with due consideration of the method of radiation therapy described in the clinical recommendations: remote (conventional or conformal), contact (intrastitial or intracavity) or radionuclide therapy, as well as of the equipment necessary for radiotherapy (X-ray devices, gamma-ray devices, linear electron accelerators).

The number of hospitalizations for radiotherapy and chemoradiotherapy is predicted at the second stage by constructing and processing decision trees that schematically represent the management options for patients with a certain malignant neoplasm. The tree nodes contain signs that influence the choice of patient management tactics; they were determined for each malignant neoplasm type based on clinical recommendations. The frequency of each treatment option was determined by expert oncologists and radiotherapists. The number of patients to be treated was calculated based on statistical data on the incidence of malignant tumors [8].

The cost of hospitalization for radiation or chemoradiotherapy by a specific method and in a specific mode is calculated at the third stage based on the developed SMs. The cost of the case is formed from the sum of the costs of medical services, medicines and therapeutic food indicated in the SM, and included the salary expenses (doctors, nurses and other medical personnel and specialists with higher and secondary medical education involved in the provision of medical care, and administrative and general support personnel of the institution) and other direct and indirect costs of the medical organization. Based on the actual data on the current practice in the Russian regions, the estimated expected number of hospitalizations was distributed according to the conditions for the provision of actual medical care: 65% of cases were attributed to the conditions of a 24-hour hospital and 35% to a day hospital.

The formation of the DRG at the fourth stage was performed by dividing the SM covering a certain group of radiotherapy and chemoradiotherapy methods into subgroups and then combining subgroups with a similar cost in the DRG, based on the calculated cost of the corresponding SM and the number of hospitalizations received for it. The clinical parameters that characterize the methods and modes of radiation or chemoradiation therapy were determined, allowing for attributing the case of hospitalization to the selected subgroup. These clinical parameters are proposed as classification criteria for assigning a case of hospitalization to a DRG.

Based on the estimated number of hospitalizations included in the DRG and their cost, the weighted average cost of each DRG in rubles was calculated and converted to the cost-intensity coefficient (CIC) by dividing by the base rate equal to 20,911.95 rubles for a 24-hour hospital and 11,629.43 rubles for a day hospital.

Results

Based on 35 clinical recommendations, 245 SMs for radiotherapy and 275 SMs for chemoradiotherapy were created. All but three of the SMs described hospitalization in both round-the-clock and day-care settings. The remaining 3 SMs, for radioiodotherapy, radioiodine ablation and intracranial radiotherapy, have been developed only for round-the-clock hospitalization, as these methods may not be used in a day hospital.

To determine the expected number of hospital admissions, 35 decision trees were constructed, one for each clinical recommendation. For example, figure 1 shows a fragment of the decision tree related to stomach cancer.

Based on the methods used, which are characterized by different resource consumption, the developed SMs for radiation therapy are divided into 4 groups of methods: remote, conformal, contact and radionuclide therapy. SMs for chemoradiotherapy are divided similarly, but according to three groups of methods (Table 2).

Within the groups of radiotherapy and chemoradiotherapy methods, subgroups are identified that are characterized by economic homogeneity, with due account for the distribution of the number of hospitalization cases.

SMs related to the conditions of a 24-hour hospital, developed for conformal teletherapy, were classified into 5 subgroups (Fig. 2), and for conventional therapy, radionuclide therapy, and contact radiotherapy, into 3, 2, and 1 subgroup, respectively.

For teletherapy methods, the number of fractions became the clinical parameter that allows for attributing the case of hospitalization to the selected subgroup; for radionuclide therapy, this factor is the INN of a radiopharmaceutical drug; for chemoradiotherapy methods, two parameters are used: the number of fractions and the INN of the antineoplastic drugs, or a combination of INNs of the antineoplastic drugs. The list of INNs of antitumor drugs or their combinations was formed on the basis of information about antitumor drugs included in the SM of chemoradiotherapy (Table 3).

Таблица 1
Перечень клинических рекомендаций, включенных в работу по формированию СМ для методов и режимов лучевой и химиолучевой терапии
Table 1
List of the clinical guidelines used for the developing SM for methods and regimens of radiotherapy and chemoradiotherapy

№	Наименование клинической рекомендации Clinical guidelines
1	Рак пищевода Esophageal cancer
2	Рак желудка Gastric cancer
3	Рак поджелудочной железы Pancreatic cancer
4	Рак прямой кишки Rectal cancer
5	Рак щитовидной железы Thyroid cancer
6	Рак гортани Cancer of the larynx
7	Рак шейки матки Cervical cancer
8	Рак тела матки Uterine corpus cancer
9	Рак предстательной железы Prostate cancer
10	Рак мочевого пузыря Bladder cancer
11	Меланома кожи Skin melanoma
12	Рак кожи базальноклеточный и плоскоклеточный Basal cell and squamous cell skin carcinoma
13	Рак молочной железы Breast cancer
14	Рак легкого Lung cancer
15	Рак печени Liver cancer
16	Рак желчевыводящих путей Hepatobiliary cancer
17	Мезотелиома плевры Pleural mesothelioma
18	Опухоли средостения и сердца Mediastinal mass and cardiac tumor
19	Рак трахеи Tracheal cancer
20	Опухоли слюнных желез Salivary gland tumors
21	Рак гортаноглотки Cancer of the hypopharynx
22	Рак губы Cancer of the lip
23	Рак носоглотки Cancer of the nasopharynx
24	Рак полости носа и придаточных пазух Cancer of nasal cavity and paranasal sinuses
25	Рак ротоглотки Cancer of the oropharynx
26	Плоскоклеточный рак вульвы Squamous cell vulvar cancer
27	Плоскоклеточный рак влагалища Squamous cell vagina cancer
28	Рак полового члена Penile cancer
29	Герминогенные опухоли у мужчин Germ cell tumors in men
30	Плоскоклеточный рак анального канала, анального края, перианальной кожи Squamous cell cancer of anal canal, anal margin, perianal skin
31	Карцинома Меркеля Merkel cell carcinoma
32	Злокачественные опухоли костей Malignant bone tumors
33	Саркомы мягких тканей Soft tissue sarcoma
34	Первичные опухоли центральной нервной системы Central nervous system primary cancer
35	Метастатическое поражение головного мозга Central nervous system metastatic tumor

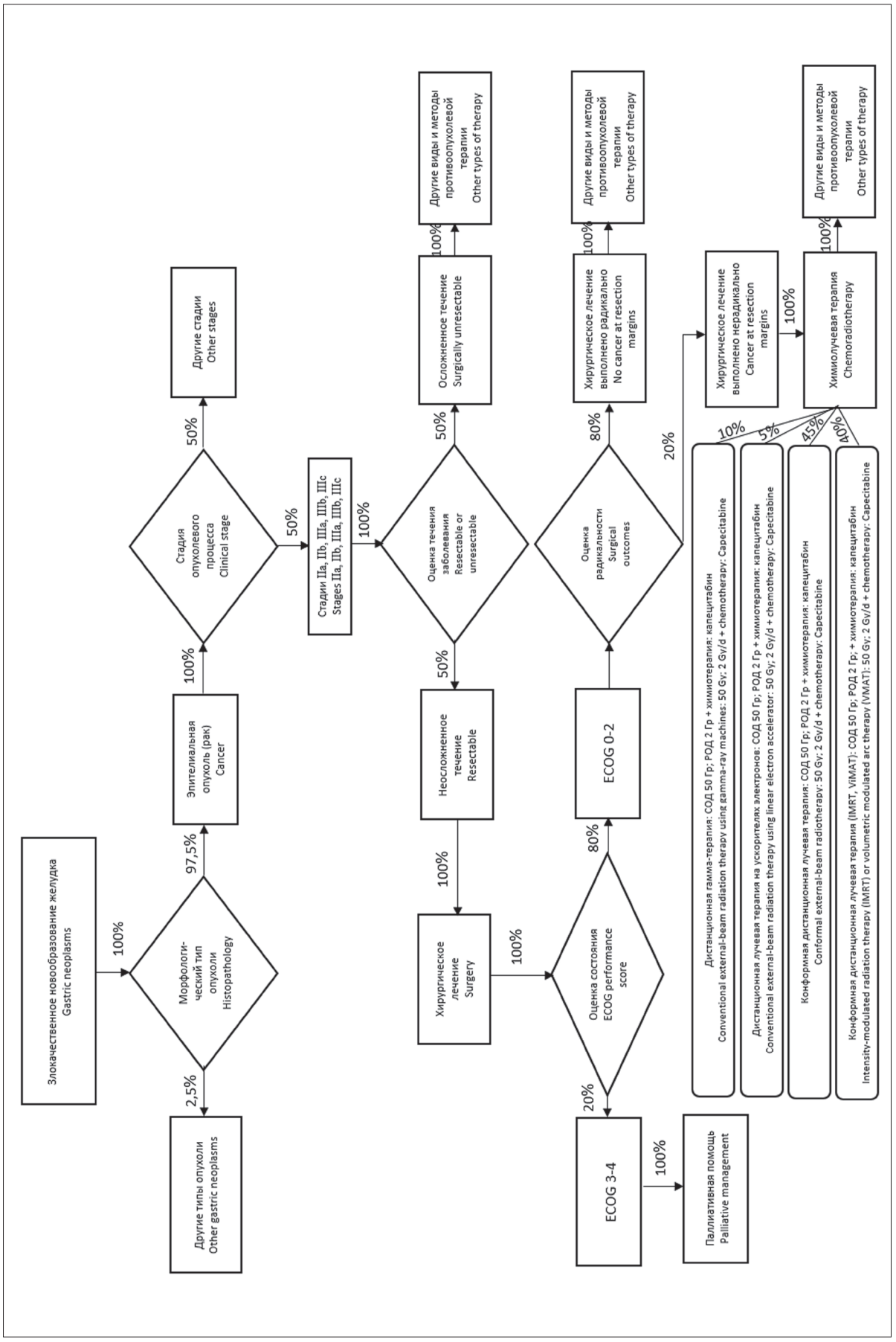

Рис. 1. Фрагмент дерева решений, использованного для расчета количества госпитализаций: ведение больного с раком желудка с использованием разных методов и режимов химиолучевой терапии
Fig. 1. A part of the decision tree for gastric cancer indicating chemoradiotherapy methods and regimens

Таблица 2
Перечень групп методов лучевой и химиолучевой терапии
Table 2
List of groups of radiotherapy and chemoradiotherapy methods

Вид противоопухолевой терапии Type of antineoplastic therapy	Группы методов лучевой и химиолучевой терапии Groups of methods of radiotherapy and chemoradiotherapy
Лучевая терапия Radiotherapy	Дистанционная лучевая терапия конвенциональная (включает терапию на рентгенотерапевтических аппаратах, гамма-аппараты, линейные ускорители электронов) Conventional external-beam radiotherapy (including therapy using X-ray machines, gamma-ray machines, linear electron accelerators)
	Конформная дистанционная терапия (включает технологии IMRT, IGRT, VMAT) Conformal external-beam radiotherapy (including IMRT, IGRT, VMAT technologies)
	Контактная лучевая терапия (включает внутритканевую и внутриполостную терапию) Brachytherapy (including interstitial and intracavitary therapy)
	Радионуклидная терапия Radionuclide therapy
Химиолучевая терапия Chemoradiotherapy	Дистанционная лучевая терапия конвенциональная в сочетании с противоопухолевой лекарственной терапией (включает терапию на гамма-аппараты, линейные ускорители электронов) Conventional external-beam radiotherapy in combination with chemotherapy (including therapy using gamma-ray machines, linear electron accelerators)
	Конформная дистанционная терапия в сочетании с противоопухолевой лекарственной терапией (включает технологии IMRT, IGRT, VMAT) Conformal external-beam radiotherapy in combination with chemotherapy (including IMRT, IGRT, VMAT technologies)
	Контактная лучевая терапия в сочетании с противоопухолевой лекарственной терапией (включает внутриполостную терапию) Brachytherapy in combination with chemotherapy (including interstitial and intracavitary therapy)

IMRT – лучевая терапия с модулированной интенсивностью / intensity-modulated radiation therapy
IGRT – лучевая терапия с визуальным контролем / image-guided radiation therapy
VMAT – ротационное объемно-модулированное облучение / volumetric modulated art therapy

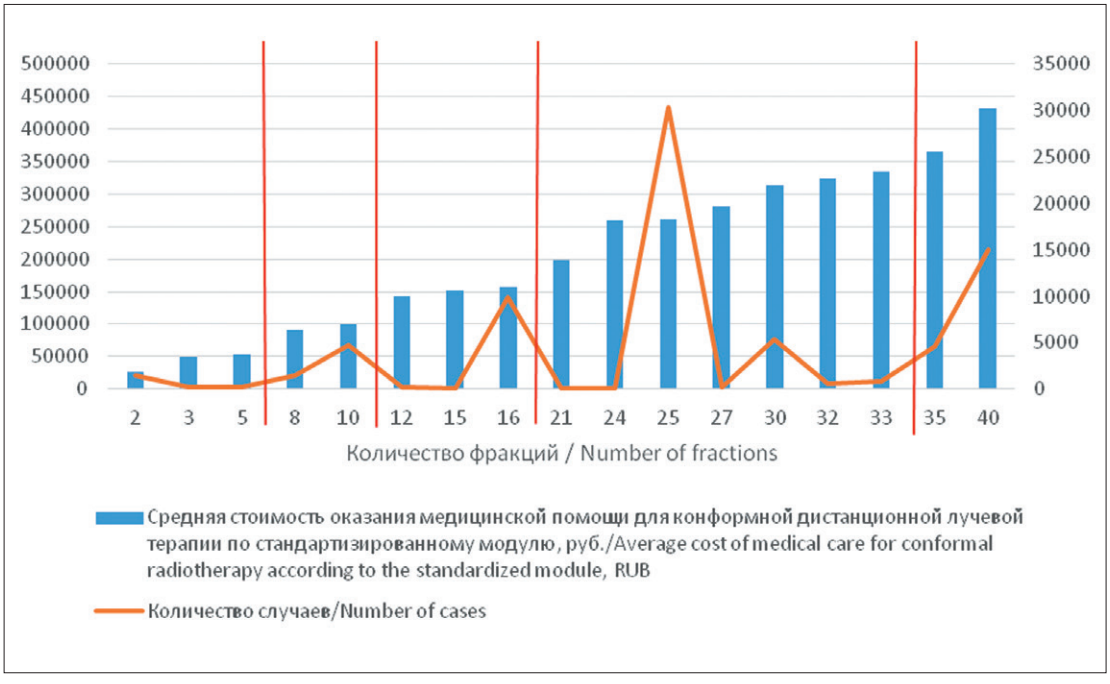

Рис. 2. Определение подгрупп методов лучевой и химиолучевой терапии на примере конформной дистанционной лучевой терапии, проводимой в условиях круглосуточного стационара
Fig. 2. Determination of the subgroups of radiotherapy and chemoradiotherapy methods by the example of conformal external-beam radiotherapy conducted in a full-time hospital

Таблица 3
Перечень международных непатентованных названий лекарственных препаратов и их сочетаний, используемых при формировании клинико-статистических групп
Table 3
List of drugs and their combinations used for developing diagnosis related groups (according to their international non-proprietary name)

№	МНН лекарственных препаратов и их сочетаний Drugs and their combinations
1	Доксорубицин Doxorubicin
2	Капецитабин Capecitabine
3	Карбоплатин Carboplatin
4	Митомицин + капецитабин Mitimycin + Capecitabin
5	Митомицин + фторурацил Mitomycin + Fluorouracil
6	Паклитаксел + карбоплатин Paclitaxel + Carboplatin
7	Темозоломид Temozolomide
8	Трастузумаб Trastuzumab
9	Трастузумаб + пертузумаб Trastuzumab + Pertuzumab
10	Фторурацил Fluorouracil
11	Цетуксимаб Cetuximab
12	Циклофосфамид + доксорубицин + цисплатин Cyclophosphamide + Doxorubicin + Cisplatin
13	Цисплатин Cisplatin
14	Цисплатин + доцетаксел Cisplatin + Docetaxel
15	Цисплатин + капецитабин Cisplatin + Capecitabine
16	Цисплатин + фторурацил Cisplatin + Fluorouracil
17	Этопозид + цисплатин Etoposide + Cisplatin

МНН – международное непатентованное название

In the next stage, some subgroups from different groups of methods were combined into one DRG based on the similar cost.

For methods of remote conventional radiotherapy, including therapy on X-ray devices, gamma-ray devices, linear electron accelerators, 3 DRGs were formed for radiotherapy in round-the-clock and day hospitals with a range of fractions up to 5 (inclusive), from 6 to 20 and more than 21 (inclusive).

For conformal remote radiotherapy, including IMRT, IGRT, and VMAT technologies, 5 DRGs were formed for round-the-clock and day hospitals with a range of fractions up to 7 (inclusive), 8 to 10, 11 to 20, 21 to 32, and more than 33 (inclusive).

Contact radiotherapy, which includes intra-cavity and intra-tissue therapy, is combined with radionuclide therapy, which places radioiodotherapy and radioiodine ablation and strontium chloride therapy [^{89}Sr], into the same DRG for both round-the-clock and day-care hospitals. Interstitial radiation therapy, radioiodine therapy and radioiodine ablation were included only in the DRG for 24-hour hospital.

The two remaining radionuclide therapies (samarium oxabifor [^{153}Sm] and radium chloride [^{223}Ra]) are combined into one DRG due to the higher cost.

For methods of chemoradiotherapy with a combination of remote conventional radiation therapy with antineoplastic drugs (with the exception of Temozolomide, Cetuximab and a combination of Trastuzumab and Pertuzumab), 2 DRGs were formed for a 24-hour hospital with a range of fractions of up to 29 (inclusive) and more than 30 (inclusive) and one DRG for a day hospital (without a division by the number of fractions).

In respect of the combination of conformal remote radiotherapy with antitumor drugs (with the exception of Temozolomide, Cetuximab, a combination of Trastuzumab and Pertuzumab), 2 DRGs were formed for a 24-hour hospital with a range of fractions up to 29 (inclusive) and more than 30 (inclusive), and one DRG for a day hospital (without division by the number of fractions).

Methods of remote radiotherapy in combination with Trastuzumab and Pertuzumab are combined into a single DRG for both round-the-clock and day-care hospitals, regardless of the method of radiation therapy and the number of fractions, since the calculated cost of hospitalization for the SM was largely determined by the cost of antineoplastic medications.

Similarly, methods of remote radiotherapy in combination with temozolomide or cetuximab were also combined into a single DRG for both round-the-clock and day-care hospitals, regardless of the method of radiotherapy and the number of fractions.

Based on the results of the work performed, the DRGs were established, and the corresponding CICs were calculated:

- for payments for radiation therapy, 10 DRGs of a round-the-clock hospital and 10 KSG of a day hospital (Table 4);
- for payments for chemoradiotherapy (radiation therapy in combination with drug therapy), 7 DRGs of a round-the-clock hospital and 5 DRGs of a day hospital (Table 5).

Clinical parameters that characterize methods and modes of radiation or chemoradiation therapy were introduced as additional classification criteria for previously used medical services encoded in accordance with the nomenclature, which made it possible to refer the case

Таблица 4
Клинико-статистические группы для лучевой терапии по условиям оказания медицинской помощи с указанием коэффициентов затратоемкости
Table 4
Diagnosis related groups and their weight coefficients for radiotherapy conducted in full-time and day hospitals

Описание в расшифровщике Name of a DGR	Метод и режим лучевой терапии Method and regimen of radiotherapy	КЗ Coeff.
	Круглосуточный стационар Full-time hospital	
Лучевая терапия (уровень 1) Radiotherapy (level 1)	Конвенциальная дистанционная лучевая терапия (1–5 фракций) Conventional external-beam radiotherapy (1–5 fractions)	1,04
Лучевая терапия (уровень 2) Radiotherapy (level 2)	Конформная дистанционная лучевая терапия (1–7 фракций) Conformal external-beam radiotherapy (1–7 fractions)	1,49
Лучевая терапия (уровень 3) Radiotherapy (level 3)	Контактная и радионуклидная лучевая терапия (радиойодтерапия, радиойодабляция, терапия стронция хлоридом [^{89}Sr]) Brachytherapy and radionuclide therapy (radioiodine therapy, radioiodine ablation therapy, strontium chloride [^{89}Sr] therapy)	4,15
Лучевая терапия (уровень 4) Radiotherapy (level 4)	Конвенциальная дистанционная лучевая терапия (6–20 фракций) Conventional external-beam radiotherapy (6–20 fractions)	5,32
Лучевая терапия (уровень 5) Radiotherapy (level 5)	Конформная дистанционная лучевая терапия (8–10 фракций) Conformal external-beam radiotherapy (8–10 fractions)	4,68
Лучевая терапия (уровень 6) Radiotherapy (level 6)	Конформная дистанционная лучевая терапия (11–20 фракций) Conformal external-beam radiotherapy (11–20 fractions)	7,47
Лучевая терапия (уровень 7) Radiotherapy (level 7)	Радионуклидная лучевая терапия (терапия самария оксабифором [^{153}Sm] и радия хлоридом [^{223}Ra]) Radionuclide therapy (samarium oxabifor [^{153}Sm] therapy and radium chloride [^{223}Ra] therapy)	8,71
Лучевая терапия (уровень 8) Radiotherapy (level 8)	Конвенциальная дистанционная лучевая терапия (более 21 фракций) Conventional external-beam radiotherapy (more than 21 fractions)	9,42
Лучевая терапия (уровень 9) Radiotherapy (level 9)	Конформная дистанционная лучевая терапия (21–32 фракций) Conformal external-beam radiotherapy (21–32 fractions)	12,87
Лучевая терапия (уровень 10) Radiotherapy (level 10)	Конформная дистанционная лучевая терапия (более 33 фракций) Conformal external-beam radiotherapy (more than 33 fractions)	19,73
	Дневной стационар Day hospital	
Лучевая терапия (уровень 1) Radiotherapy (level 1)	Конвенциальная дистанционная лучевая терапия (1–5 фракций) Conventional external-beam radiotherapy (1–5 fractions)	1,06
Лучевая терапия (уровень 2) Radiotherapy (level 2)	Конформная дистанционная лучевая терапия (1–7 фракций) Conformal external-beam radiotherapy (1–7 fractions)	1,83
Лучевая терапия (уровень 3) Radiotherapy (level 3)	Конвенциальная дистанционная лучевая терапия (6–20 фракций) Conventional external-beam radiotherapy (6–20 fractions)	2,31
Лучевая терапия (уровень 4) Radiotherapy (level 4)	Контактная и радионуклидная лучевая терапия (терапия стронция хлоридом [^{89}Sr]) Internal radiotherapy and radionuclide therapy (radioiodine therapy, radioiodine ablation therapy, strontium chloride [^{89}Sr] therapy)	2,84
Лучевая терапия (уровень 5) Radiotherapy (level 5)	Конформная дистанционная лучевая терапия (8–10 фракций) Conformal external-beam radiotherapy (8–10 fractions)	4,16
Лучевая терапия (уровень 6) Radiotherapy (level 6)	Конвенциальная дистанционная лучевая терапия (более 21 фракций) Conventional external-beam radiotherapy (more than 21 fractions)	4,5
Лучевая терапия (уровень 7) Radiotherapy (level 7)	Конформная дистанционная лучевая терапия (11–20 фракций) Conformal external-beam radiotherapy (11–20 fractions)	6,31
Лучевая терапия (уровень 8) Radiotherapy (level 8)	Конформная дистанционная лучевая терапия (21–32 фракций) Conformal external-beam radiotherapy (21–32 fractions)	11,19
Лучевая терапия (уровень 9) Radiotherapy (level 9)	Радионуклидная лучевая терапия (терапия самария оксабифором [^{153}Sm] и радия хлоридом [^{223}Ra]) Radionuclide therapy (samarium oxabifor [^{153}Sm] therapy and radium chloride [^{223}Ra] therapy)	15,29
Лучевая терапия (уровень 10) Radiotherapy (level 10)	Конформная дистанционная лучевая терапия (более 33 фракций) Conformal external-beam radiotherapy (more than 33 fractions)	17,42

КЗ – коэффициент затратности
DRP – diagnosis related group

Таблица 5
Клинико-статистические группы для химиолучевой терапии (лучевая терапия в сочетании с лекарственной терапией) по условиям оказания медицинской помощи с указанием коэффициентов затратоемкости
Table 5
Diagnosis related groups and their weight coefficients for chemoradiotherapy (radiotherapy in combination with chemotherapy) conducted in full-time and day hospitals

Описание в расшифровщике Name of a DGR	Метод и режим лучевой терапии Method and regimen of radiotherapy	КЗ Coeff.
	Круглосуточный стационар Full-time hospital	
Лучевая терапия в сочетании с лекарственной терапией (уровень 1) Chemoradiotherapy (level 1)	Контактная лучевая терапия в сочетании с лекарственной терапией Brachytherapy in combination with chemotherapy	3,85
Лучевая терапия в сочетании с лекарственной терапией (уровень 2) Chemoradiotherapy (level 2)	Конвенциальная дистанционная лучевая терапия (1–29 фракций) в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conventional external-beam radiotherapy (1–29 fractions) in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	9,47
Лучевая терапия в сочетании с лекарственной терапией (уровень 3) Chemoradiotherapy (level 3)	Конвенциальная дистанционная лучевая терапия (более 30 фракций включительно) в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conventional external-beam radiotherapy (more than 30 fractions) in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	10,95
Лучевая терапия в сочетании с лекарственной терапией (уровень 4) Chemoradiotherapy (level 4)	Конформная дистанционная лучевая терапия лучевая терапия (1–29 фракций) в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conformal external-beam radiotherapy (1–29 fractions) in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	13,16
Лучевая терапия в сочетании с лекарственной терапией (уровень 5) Chemoradiotherapy (level 5)	Конформная дистанционная лучевая терапия лучевая терапия (более 30 фракций включительно) в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conformal external-beam radiotherapy (more than 30 fractions) in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	14,63
Лучевая терапия в сочетании с лекарственной терапией (уровень 6) Chemoradiotherapy (level 6)	Конвенциальная и конформная дистанционная лучевая терапия, в сочетании с лекарственной терапией трастузумабом+пертузумабом Conventional and conformal external-beam radiotherapy in combination with chemotherapy using Trastuzumab + Pertuzumab	19,17
Лучевая терапия в сочетании с лекарственной терапией (уровень 7) Chemoradiotherapy (level 7)	Конвенциальная и конформная дистанционная лучевая терапия, в сочетании с лекарственной терапией темозоломидом или цетуксимабом Conventional and conformal external-beam radiotherapy in combination with chemotherapy using Temozolomide or Cetuximab	31,29
	Дневной стационар Day hospital	
Лучевая терапия в сочетании с лекарственной терапией (уровень 1) Chemoradiotherapy (level 1)	Контактная лучевая терапия в сочетании с лекарственной терапией Brachytherapy in combination with chemotherapy	3,92
Лучевая терапия в сочетании с лекарственной терапией (уровень 2) Chemoradiotherapy (level 2)	Конвенциальная дистанционная лучевая терапия в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conventional external-beam radiotherapy in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	7,49

Лучевая терапия в сочетании с лекарственной терапией (уровень 3) Chemoradiotherapy (level 3)	Конформная дистанционная лучевая терапия лучевая терапия в сочетании с лекарственной терапией (за исключением лекарственной терапии темозоломидом, цетуксимабом или трастузумабом+пертузумабом) Conformal external-beam radiotherapy in combination with chemotherapy (excluding Temozolomide, Cetuximab, Trastuzumab + Pertuzumab)	13,98
Лучевая терапия в сочетании с лекарственной терапией (уровень 4) Chemoradiotherapy (level 4)	Конвенциальная и конформная дистанционная лучевая терапия в сочетании с лекарственной терапией трастузумабом+пертузумабом Conventional and conformal external-beam radiotherapy in combination with chemotherapy using Trastuzumab + Pertuzumab	25,11
Лучевая терапия в сочетании с лекарственной терапией (уровень 5) Chemoradiotherapy (level 5)	Конвенциальная и конформная дистанционная лучевая терапия дистанционная лучевая терапия в сочетании с лекарственной терапией темозоломидом или цетуксимабом Conventional and conformal external-beam radiotherapy in combination with chemotherapy using Temozolomide or Cetuximab	44,65

КЗ – коэффициент затратности
DRP – diagnosis related group

of hospitalization to the proposed DRG for radiation and chemoradiation therapy. For radiation therapy, an additional classification criterion was the number of fractions, for chemoradiation, the number of fractions and the INN of the drug, in accordance with the list shown in Table 3.

Discussion

The calculation of the cost of medical care to patients with malignant neoplasms with radiotherapy and chemoradiotherapy methods in 2019 allowed us to review the approaches to the formation of DRG used for billing hospital admissions in the CHI system. The costs are calculated by processing the SMs created on the basis of clinical recommendations, thus creating conditions for solving the task facing the Russian healthcare system, i. e., the implementation of clinical recommendations in practice.

As a result of this work, the number of DRGs for radiation therapy in the DRG model 2019 has been increased compared to the previous year: from 3 to 10, for round-the-clock and day hospital conditions. CICs underwent a major revision: if the previous models featured the spread of 2.0–3.53 for a 24-hour hospital and 3.64–6.42 for a day hospital, in the 2019 model they went up to 1.04-19.73 and 1.06-17.42 for a 24-hour hospital and day hospital, respectively. DRGs for chemoradiotherapy were developed, which were absent from the previous versions of the model. New classification criteria have been introduced for classifying a case of hospitalization as DRG in addition to the medical service previously used: the number of fractions for radiation therapy; the number of fractions and INN of antineoplastic drugs for chemoradiotherapy [9].

The changes made to the DRG model should contribute to differentiated and more equitable reimbursement of costs for medical care provided to medical organizations, depending on the treatment performed. The use of additional classification criteria will make it possible to accumulate information about the methods and modes of radiation and chemoradiotherapy used in actual practice, and thus improve the approaches to planning the volume of medical care at the level of the subject of the Russian Federation. In the future, it will be possible to compare the actual data on the methods and modes of radiation and chemotherapy used with expert assessments and use the results of such analysis for the development of the DRG model. This information will also made it possible to evaluate the compliance of the method and the mode of radiation or chemoradiation therapy used in the provision of medical care to a specific patient with clinical recommendations.

The classification of hospital admissions for radiotherapy as DRG based on the number of fractions is used in similar DRG classification systems in European countries, such as Denmark [10] and Germany [5, 6]. However, DRG models are usually based on the data on the actual costs incurred by medical organizations [13]. However, in the Russian Federation, the information about the actual costs of radiation and chemoradiotherapy is very scarce. In addition, there is a widespread belief among specialists that the current CHI rates are insufficient to meet the effective clinical recommendations. The proposed approach is aimed at aligning tariffs with clinical recommendations.

It is obvious that as the clinical recommendations are updated, a revision of the DRG in terms of payment for radiation and chemoradiation therapy will be required, which will continue to maintain the rates for medical care at a level sufficient to comply with the clinical recommendations.

Conclusion

The 2019 DRG model for paying for radiation and chemoradiation therapy was formed on the basis of a

methodology that allows for the alignment of the rates for payments for medical care with clinical recommendations. The proposed DRG model differs from the previous ones by the fact that it features a larger number of groups, includes allocated groups for payment for chemoradiotherapy, uses new classification criteria (the number of fractions and the INN of antineoplastic drugs) and a range of cost-intensity coefficients, which will allow for adequate reimbursement of costs for medical care depending on the method used and the mode of radiation or chemoradiotherapy.

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