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ORIGINAL ARTICLE

USING THE DIGITAL ARCHIVE OF PATHOLOGY REPORTS OF STOMACH CANCER AS INTERNAL QUALITY CONTROL OF CODING ACCORDING TO THE ICD-O SYSTEM

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ABSTRACT

Purpose of the study. Demonstrate the possibilities of statistical analysis of the digital archive at pathological department (PD). To conduct internal quality control of the coding of malignant tumors according to the ICD-O-3 system of pathology reports using the example of gastric cancer (GC).

Materials and methods. We retrospectively analyzed the digital archive of 368,157 pathology reports of the National Medical Research Centre for Oncology of the Ministry of Health of Russia from 2000 to 2019. For the study, 4,857 pathology reports of patients operated for gastric malignancies (ICD-X codes: C16.0 – C16.9) were selected for the period from 2000 to 2019.

Results. The analysis of 368,157 protocols of the digital archive of PD revealed 4,614 malignant epithelial tumors of the stomach: tubular adenocarcinoma – 2,958, signet ring cell carcinoma – 791, undifferentiated cancer – 565, mucinous adenocarcinoma – 210, neuroendocrine neoplasia – 90. A significant increase in the ICD-O codes for "adenocarcinoma NOS" was found in 2018 and 2019. The pathology reports for these 2 years were reviewed by an independent pathologist and changes were made to the ICD-O codes according to the WHO classification digestive system tumors 2019. The adenocarcinoma NOS (8140/3) was replaced by the codes: tubular adenocarcinoma (ICD-O: 8211/3) – 41%, papillary adenocarcinoma (8260/3) – 9% and adenocarcinoma with mixed subtypes (8255/3) – 29%.

Conclusion. The study, based on analysis of coding ICD-O stomach MN demonstrated the importance of digital archive at the PD, as a tool for rapid static analysis pathology reports and quality control of coding. The coding system can be the basis for large multicenter studies in oncology. Therefore, it is important to control the quality of coding of the pathology reports and to timely update the codes when new pathological classifications are released.

Keywords:
quality control, stomach cancer, signet-cell adenocarcinoma, poorly cohesive adenocarcinoma, tubular adenocarcinoma, diffuse type, intestinal type.

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ОРИГИНАЛЬНАЯ СТАТЬЯ

ИСПОЛЬЗОВАНИЕ ЭЛЕКТРОННОГО АРХИВА РЕЗУЛЬТАТОВ ПРИЖИЗНЕННЫХ ПАТОЛОГОАНАТОМИЧЕСКИХ ИССЛЕДОВАНИЙ, КАК ИНСТРУМЕНТ ВНУТРЕННЕГО КОНТРОЛЯ КАЧЕСТВА КОДИРОВАНИЯ ПО СИСТЕМЕ МКБ-О-3 (ICD-O), НА ПРИМЕРЕ АНАЛИЗА ЗЛОКАЧЕСТВЕННЫХ НОВООБРАЗОВАНИЙ ЖЕЛУДКА

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РЕЗЮМЕ

Цель исследования. Продемонстрировать возможности статистического анализа электронного архива ПАО. Провести внутренний контроль качества кодирования злокачественных опухолей по системе МКБ-О-3 (ICD-O) прижизненных патологоанатомических исследований (ППАИ) на примере ЗНО желудка.
Материалы и методы. Нами был ретроспективно произведен экспресс-анализ 368 157 протоколов прижизненных патологоанатомических исследований электронного архива ПАО ФГБУ «НМИЦ онкологии» Минздрава России с 2000 по 2019 год включительно. Для исследования были отобраны 4 857 протоколов прижизненных патологоанатомических исследований пациентов, прооперированных в ФГБУ «НМИЦ онкологии» Минздрава России по поводу злокачественных новообразований желудка (коды МКБ-Х: С16.0 – С16.9), в период с 2000 по 2019 год включительно.
Результаты. При анализе 368 157 протоколов электронного архива ПАО было выявлено 4614 злокачественных эпителиальных опухолей желудка, которые распределились следующим образом: аденокарцинома БДУ – 2958, перстневидноклеточный рак – 791, недифференцированный рак – 565, муцинозная аденокарцинома – 210, нейроэндокринные опухоли – 90. Обнаружено значительное увеличение кодов МКБ-О «Аденокарцинома БДУ» РЖ в 2018, 2019 годах. Протоколы ППАИ за эти 2 года были пересмотрены независимым врачом-патологоанатом и внесены изменения в коды МКБ-О согласно классификации ВОЗ опухолей ЖКТ 2019 года. На смену коду АК БДУ (8140/3) пришли коды тубулярной АК (МКБ-О: 8211/3) – 41%, папиллярной АК (8260/3) – 9% и аденокарциномы со смешанными подтипами (8255/3) – 29%.
Заключение. В результате проведенного исследования, на примере анализа кодирования МКБ-О ЗНО желудка было продемонстрировано важное значение электронного архива в ПАО, как инструмента быстрого статического анализа ППАИ и контроля качества кодирования. Система кодирования ППАИ может быть основой для проведения крупных многоцентровых исследований в области онкологии. Важно своевременно обновлять коды МКБ-О при выходе новых морфологических классификаций.

Ключевые слова:
контроль качества, рак желудка, перстневидно-клеточная карцинома, карцинома из плохо сцепленных клеток, тубулярная аденокарцинома, диффузный тип, кишечный тип.

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Информация о финансировании: финансирование данной работы не проводилось.
Конфликт интересов: авторы заявляют об отсутствии конфликта интересов.
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RELEVANCE

The International Statistical Classification of Diseases and Related Health Problems (ICD) is a document used as a leading statistical and classification framework in health care, ensuring the unity of methodological approaches and international comparability of materials. In Russia, health authorities and institutions made the transition of statistical accounting to ICD-10 in 1999 [1]. ICD-O is an extension of the ICD for tumor diseases, widely used by cancer registries.

Accurate coding systems allow for statistical accounting of the incidence, prevalence and mortality of malignant neoplasms of various localizations, for example, gastric cancer (GC). In world statistics, GC is in 5th place in terms of occurrence and in 3rd place in mortality among all cancers. According to statistics from the International Agency for Research on Cancer, in 2018 about 1,033,701 new cases of GC and 782,685 deaths were registered in the world [2]. The highest morbidity is observed in the Russian Federation, with a relative increase in the incidence of diffuse type of GC [3].

The presence of clear criteria for the diagnosis of GC allows pathologists to correctly use the ICD-O coding systems.

Since 1965, the histological classification of GC has been based on the Lauren criteria: adenocarcinoma of the intestinal type (occurs in 54% of cases), diffuse type (occurs in 32% of cases), and indeterminate type (occurs in 15% of cases) [4, 5]. According to the literature data, diffuse GC is associated with sex (more often detected in female) and with age (found on average 7.3 years earlier) [6, 7], while intestinal GC is more often associated with intestinal metaplasia and infection Helicobacter pylori [8, 9]. GC demonstrates pronounced histological and cytological heterogeneity, and often several histological types are found in one tumor [10, 11].

The WHO classification for gastrointestinal tumors, published in 2019, identifies 5 main histological types of GC: tubular, papillary, mucinous, poorly cohesive cell carcinoma (including the signet-ring cell carcinoma) and mixed carcinoma [12]. We noticed that in most publications the WHO classification is considered alternative, and the main focus is on the Lauren classification [13-17]. Despite differences in terminology, the main subtypes are similar in clinical and morphological characteristics. For example, the diffuse type according to the Lauren classification and the poorly cohesive carcinoma according to the WHO classification more often contains a signet-ring cells and are associated with poor survival [18-20].

The greatest difficulty is the coding of the mixed subtype of adenocarcinoma, in view of the fact that in the WHO classification there are no clear criteria for the % ratio of various histological components in the tumor. For example, in a similar mixed subtype of gastric neuroendocrine tumors (MiNeN) there is a precise indication of "at least 30% of each of the components". Among the publications, data on the frequency of histological types of GC vary [21-23]. According to the literature, the incidence of mixed gastric adenocarcinoma is indicated from 6 to 22% [24].

We believe that the differences in the frequency of occurrence of histological types of gastric adenocarcinoma may be associated with different approaches to morphological diagnostics in different institutions. And therefore, the analysis of the use of the codes of histological types of gastric adenocarcinoma according to pathology reports from the digital archive of the pathology department (PD) of the National Medical Research Centre for Oncology of the Ministry of Health of Russia for the last 20 years became relevant for us.

Purpose of the study: demonstrate the possibilities of statistical analysis of the digital archive of pathology reports. To conduct internal quality control of malignant tumors coding according to the ICD-O-3 system of pathology reports using the example of GC.

MATERIALS AND METHODS

The digital archive of the pathology reports has been maintained at National Medical Research Centre for Oncology of the Ministry of Health of Russia in the Microsoft Access program since 1993 and contains the following patient data: registration number of the pathology reports, date of study, number of slides, personal name, gender, age, date of birth, place of residence (region, district, city), medical history num-

ber, department that sent the material, name of the investigated organ, localization of the pathological process in the organ, histological type of tumor, code according to the ICD-O-3 system, code according to the ICD-X system, Grade of differentiation, the nature of the material (biopsy, surgery), the type of tumor (epithelial, non-epithelial, tumor-like lesions), the nature of growth (primary cancer, metastatic cancer, benign neoplasm), full name of the pathologist, the category of complexity pathology reports. To date, since 1993, the digital archive has stored data from more than half a million pathology reports of biopsy and surgical material. Initially, the digital archive was created in Microsoft Access 9.0 with constant internal coding according to the 2000 WHO classifications, which over the years imposed certain difficulties in updating the coding when publishing new versions of the WHO classification.

For this research, data from Microsoft Access 9.0 were exported into the ".xlsx" table format for further express analysis of an digital database in Microsoft Excel 16.0 using the pivot table method. Taking into account the diversity of histological subtypes encoded by the corresponding ICD-O codes, GC was selected among all localizations for further analysis. It should be noted that by design this study is exploratory, not confirmative.

As a result, we selected pathology reports for patients with surgery for GC (ICD-X codes: C16 – Malignant neoplasms of the stomach: C16.0-C16.9) in the period from 2000 to 2019, with considering the current software version for this period. Each pathologist participating in the diagnosis of GC was assigned a number for statistical processing.

Statistical analysis was performed using the Statistica 10.0 software package. Quantitative data are presented as values in the form of Median [Lower quartile; Upper quartile]; comparison was carried out using Spearman's test. A p-value<0.05 was considered statistically significant.

RESULTS OF THE STUDY

From 2000 to 2019, the digital archive contains information from 368,157 pathology reports including 4,857 patients with surgery for GC (gastrectomy, distal gastric resection, proximal gastric resection).

Among these pathology reports of GC, malignant epithelial tumors – 4,614, non-Hodgkin's lymphomas – 112, malignant mesenchymal tumors (GIST) – 121 (fig. 1). According to the ICD-O codes, the data were distributed as follows: adenocarcinoma NOS (ICD-O: 8140/3) – 2,958 patients, signet-ring cell carcinoma (ICD-O: 8490/3) – 791, undifferentiated

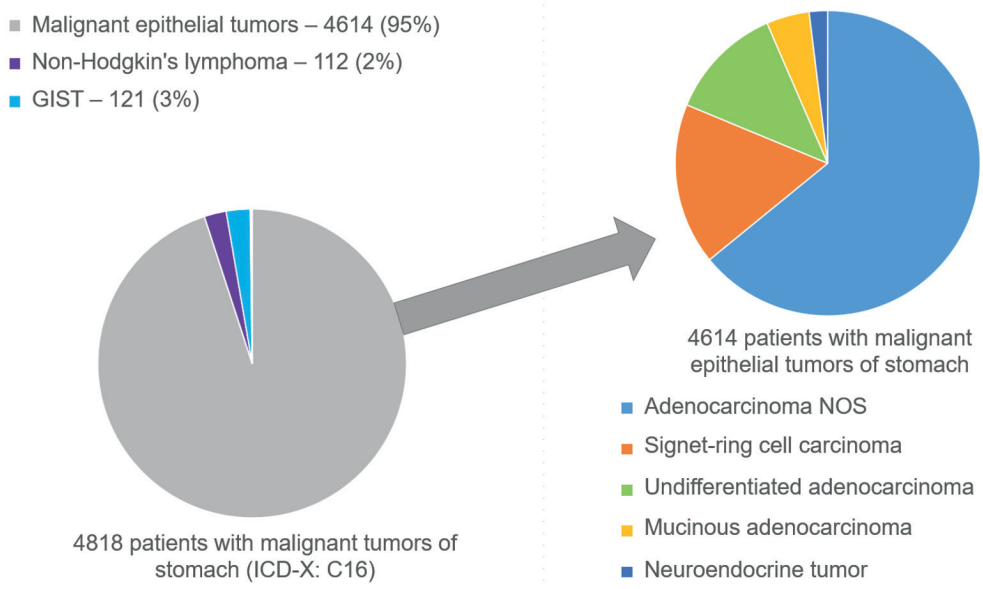

Fig. 1. The frequency of detection of various histological types of GC among patients with surgery for GC at the National Medical Research Centre for Oncology of the Ministry of Health of Russia from 2000 to 2019.

cancer (ICD-O: 8020/3) – 565, mucinous adenocarcinoma (ICD-O: 8480/3) – 210, neuroendocrine tumors (ICD-O: 8240/3, 8246/3) – 90.

According to anatomical sites, malignant epithelial tumors were coded as follows: body (ICD-10: C16.2) – 2,318 patients (50%), pylorus (ICD-10: C16.4) – 1,228 patients (27%), cardia (ICD-10: C16.0) – 1,024 patients (22%), lesser curvature (ICD-10: C16.5) – 38 patients (1%), fundus (ICD-10: C16.1) – 6 patients (0%).

In the WHO classification for gastrointestinal tumors 2000, the codes of adenocarcinoma NOS (8140/3), intestinal adenocarcinoma (8144/3), tubular adenocarcinoma (8211/3) could be used for a specific diagnosis of GC. The pathologist could choose any of them, but in this case it was impossible to maintain internal statistics on the frequency of types if several codes were used each time to designate one type. With each new edition of the WHO classification of gastrointestinal tumors, the coding system also undergoes changes. In PD of National Medical Research Centre for Oncology of the Ministry of Health of Russia, a pathologist in his

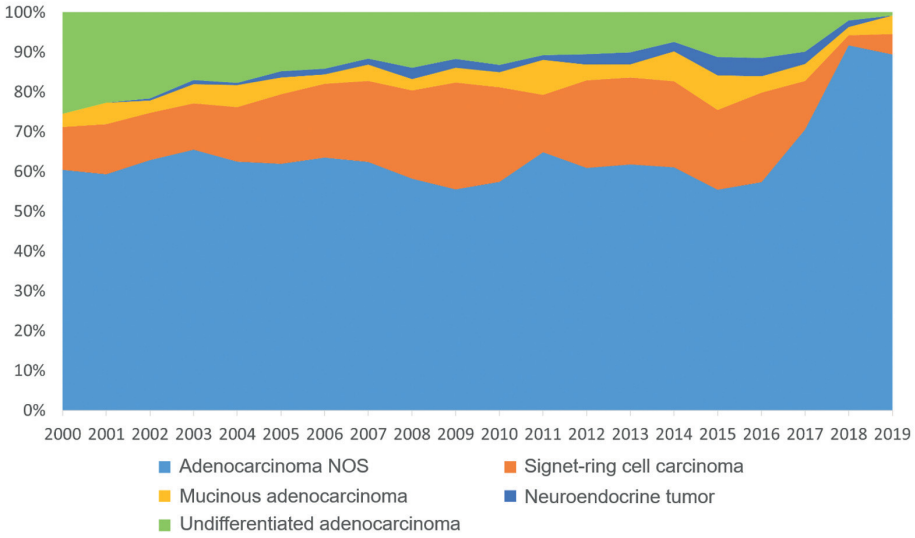

Fig. 2. Dynamics of the detection rate of various histological types of GS among patients with surgery for GC at the National Medical Research Centre for Oncology of the Ministry of Health of Russia in percentage terms from 2000 to 2019.

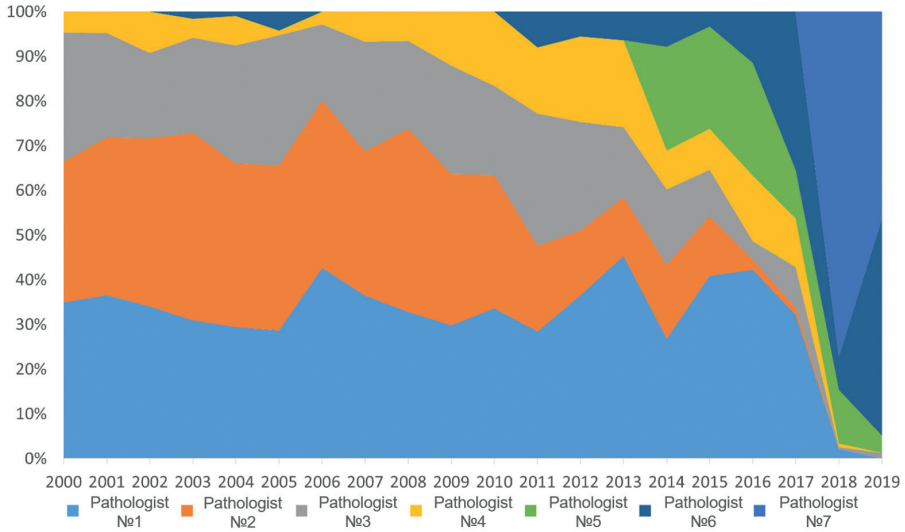

Fig. 3. Dynamics of distribution in percentage ratio of the number of pathology reports of epithelial GC between pathologists from 2000 to 2019.

pathology reports used a single code "adenocarcinoma NOS" (8140/3) to designate tubular, papillary and mixed AK, along with a detailed description of the slides indicating the percentage of each of the components. It should be noted that due to the heterogeneity of GC, this code allows you to get only general ideas about the diagnosis, since is established by the most predominant component in the tumor.

Since 2018, the Ministry of Health of the Russian Federation has recommended coding according to the ICD-O-3 system, we decided to revise the approaches to coding, taking into account the current classifications. We analyzed the frequency of histological types as a percentage by year (fig. 2). There was a statistically significant decrease in the number of diagnoses of "undifferentiated cancer" from 42 in 2000 to 2 in 2019 (median 30.5 [25.5; 34.75], R^2=0.638, p<0.01) and an increase in the number of diagnoses “Neuroendocrine tumor” from 1 in 2000 to 11 in 2016 (median 5 [3; 7.5], R^2=0.525, p<0.01). At the same time, the number of diagnoses

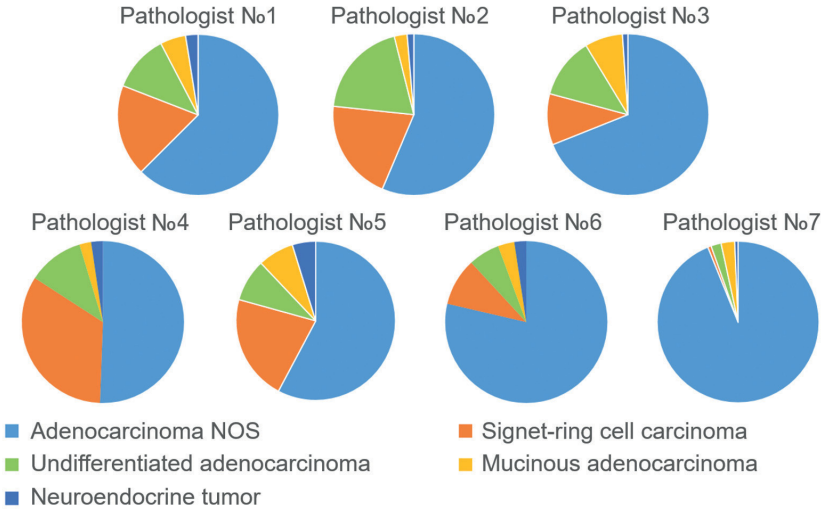

Fig. 4. Distribution of codes for histological types of GC for each of the pathologists separately.

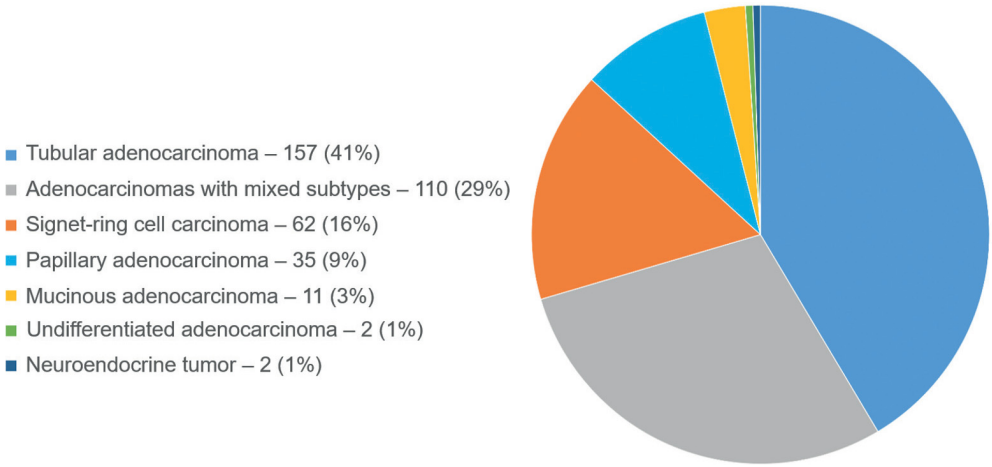

Fig. 5. The frequency of histological types of epithelial malignant neoplasms after revision of the pathology reports by an independent pathologist from 2018 to 2019 (379 patients).

of NOS adenocarcinoma increased significantly from 90 in 2000 to 221 in 2019, especially over the last 2 years (median 146.5 [123; 165.25], R^2=0.598, p<0.01).

We found an abnormal increase in the number of diagnoses of "adenocarcinoma NOS" and we analyzed the percentage distribution pathology reports of epithelial GC between pathologists from 2000 to 2019. The specifics of the work of a large oncological institution made us to introduce of narrow specializations among pathologists. Over the past 2 years, the morphological diagnosis of GC was assigned mainly to two pathologists (pathologists No. 6 and pathologists No. 7) (fig. 3).

We analyzed the distribution of codes for histological types of GC for each of the pathologists. As a result, pathologists No.1, pathologists No.2, pathologists No.3, pathologists No.4 and pathologists No.5 had approximately similar distribution of histological type codes.While pathologists No.6 and pathologists No.7 were much more likely to use the code for adenocarcinoma NOS (8140/3) in the conclusion (fig. 4).

The pathology reports from 2018 to 2019 were reviewed by an independent pathologist and recoded according to the 2019 WHO classification of gastrointestinal tumors (fig. 5). As a result, after the revision of the pathology reports, the code of adenocarcinoma NOS (8140/3) was replaced by the codes of tubular adenocarcinoma (ICD-O: 8211/3) – 41%, papillary adenocarcinoma (8260/3) – 9% and adenocarcinomas with mixed subtypes (8255/3) – 29%.

In the 5th edition of the WHO classification of gastrointestinal tumors, adenocarcinoma with mixed subtypes is established based on the identification of two or more histological subtypes in the tumor, however, the proportion of these subtypes is not discussed. In turn, in the recommendations of the College of American Pathologists (CAP), adenocarcinoma with mixed subtypes means "approximately equal ratio of intestinal to diffuse components". The question remains, which recommendations should be followed by a pathologist in Russia.

DISCUSSION

As a result of the study, using the example of the analysis of GC coding, it was demonstrated the importance of the digital archive in PD as a tool for rapid static analysis of pathology reports and quality control of coding of pathologists. Moreover, it is not so much the fact of the presence of such databases in the department that is important, but control over the maintenance of digital archives data, namely, training specialists in the principles of accurate coding of the detected pathology and timely updating of the coding system in accordance with modern editions of WHO classifications. In the order of the Ministry of Health of the Russian Federation of March 24, 2016 N 179n "On the Rules for conducting pathological and anatomical examinations" in Appendix No. 2 "Recommended staff standards of the PD and bureau", the position of a physician-statistician is provided for every 15 positions of doctors and specialists with a higher non-medical education only for the pathology bureau, and is not provided for the PD. We consider it expedient to introduce the position of a doctor-statistician in PD of large oncological institutions for accurate coding, maintenance and analysis of the digital archive.

CONCLUSION

Analysis of the digital archive of PD National Medical Research Centre for Oncology of the Ministry of Health of Russia on the example of GC revealed the unjustified frequent use of the code "adenocarcinoma NOS" (8140/3) by pathologists. Thanks to the research carried out, the PD digital archive system is being updated. In particular, new clinical and morphological parameters (TNM classification) are being introduced and combined with other information systems of the institution. The pathology reports coding system can be the basis for large multicenter trials of oncology, therefore, it is important to control the quality of coding of pathology reports and timely update of codes when new morphological classifications are released.

Authors contribution:
Kit O.I. – scientific editing.
Fomenko Yu.A. – scientific editing, participation in the development of the concept.
Karnaukhov N.S. – the concept and design of the research, writing the text.
Lapteva T.O. – participation in the development of the concept and design of the study, text writing, scientific editing.
Voloshin M.V. – literary review, text writing, data interpretation, material processing, preparation of illustrations, bibliographic list design.
Vakulenko G.Yu., Kaminskij G.V. – technical editing.
Bosenko S.Zh-P. – creation and maintenance of an digital archive of pathology department for 24 years, contribution in the coding of histological types.
Suhar I.A., Eremin K.S., Kuznecova M.A. – performing pathological studies, coding histological types, revising the protocols.

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