Development an algorithm for information support of the internal quality control system in the medical information system

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Abstract. The most important element of health management at all levels is currently information support. The article presents the results of developing an algorithm for information support of the internal quality control system in the medical information system. As a result of a survey of experts, quality assessment criteria were identified: medical documentation, patient survey data, information from books of reviews and suggestions, oral and written appeals to the administration. The calculation of the quality factor for maintaining a patient's medical record in the medical information system (MIS) should be performed automatically. The results of the ongoing internal control of MIS automated generation of reporting forms in time and in levels, containing the following information: the reporting period; volume of performed internal control: the number of verified cases; the volume percentage of the specified minimum volumes; the results of the internal control, General and in the context of the number of branches of the revealed defects of medical aid by kinds; a summary of the actions taken responsible for conducting monitoring; proposals on the result of internal control for the head of the institution.

1. Introduction
Internal quality control of the treatment process is an important element of the quality management system, as well as various quality management systems (ISO 9001: 2015, JCI, EFQM, etc.). Large volume of documents to maintain all quality control systems, the required frequency of control measures and the associated time required maximum coverage of documentation checks and their objectivity. These requirements can be meet by automating the process. For this purpose, the MIS should implement the functionality of internal quality control of specific cases of medical care according to medical documentation in accordance with the requirements of the legislation.

2. Materials and methods
The basis of an independent author's empirical study was a survey (questionnaire) of second-year clinical residents of Volgograd State Medical University (2019). The sample size was 453 respondents. The reliability of the results is ensured by the representativeness of the sample and empirical material.

As a result of the survey, sources of information for quality control in the medical information system were identified. To increase the objectivity of this process, the following sources of information were identified: medical documentation (medical histories, outpatient records, accounting and reporting statistical forms, etc.); patient survey data; information in the established forms: a book of reviews and suggestions, the "Question and answer" section of the site, oral and written appeals to the administration. Based on empirical data, a subsystem of three-level quality control of medical care has been developed.

At level I, internal control is carried out by department managers. All cases of medical care are evaluated by examination according to the criteria for evaluating the case in question.
Table 1. Quality criteria for maintaining a medical record of an inpatient patient.

| №  | Criterion                                                                                       | Points |
|----|------------------------------------------------------------------------------------------------|--------|
| 1. | Title page design                                                                             | 0.5    |
| 2. | Making informed consents                                                                       | 0.5    |
| 3. | Availability of records established by the standard (justification of the clinical diagnosis, preoperative epicrisis, operation Protocol, diary of the doctor on duty on the day of the operation, etc.) | 1.5    |
| 4. | Compliance of the clinical diagnosis and the diagnosis code                                    | 1.5    |
| 5. | Compliance of the treatment method and diagnosis                                               | 1.5    |
| 6. | Completeness of registration of entries in MIS                                                  | 1.0    |
| 7. | Date of cancellation of appointments in the appointment list                                   | 1.0    |
| 8. | The regularity of the management of diaries, monitoring                                        | 1.0    |
| 9. | Compliance with deadlines for providing medical history                                         | 1.5    |

Each criterion is assigned a certain number of points depending on the significance of the criterion. The patient's medical record that meets the standard of medical records management according to the control criteria is rated at 10 points. For registration of violations according to the control criteria, the corresponding number of points is deducted.

The calculation of the quality factor for maintaining a patient's medical record should be performed automatically.

Based on the assessment of the deviation of the achieved total score from the formula determines the overall quality factor for maintaining the patient's medical record:

$$\text{Quality factor} = \frac{\text{Total score}}{\text{Standard value of the total score}} \times 100$$

The acceptable value of the quality indicator for maintaining a patient's medical record is considered to be at least 95%. On the basis of the completed cards "Assessment of the quality of medical documentation" in the MIS, reports are generated that reflect both the results of the assessment of a specific case of medical care, and the quality coefficient in the context of each doctor, Department, and institution as a whole.

Internal quality control of medical care at level II and III is carried out according to the method of expert assessment of each component of a specific case of medical care: collection of complaints and anamnesis, diagnostic measures, making a diagnosis, medical measures, preventive measures, medical examination, registration of medical documentation. For each case of expert assessment, an entry "Internal control expert assessment Card" is made in the patient's electronic medical record, with an assessment of each component and a score.

Based on the results of filling in the form, the average quality coefficient is automatically calculated and the final assessment of the case of medical care is determined: "good" (high-quality medical care provided medical assistance), "satisfactory" (high-quality medical care that was accompanied by isolated defects in the provision of medical care that did not lead to a deterioration in the patient's health), "unsatisfactory" (poor-quality medical care).

Based on the results of internal control, the MIS automated the formation of reporting forms by time and level, containing the following information: reporting period; the volume of internal control: the number of verified cases; the volume as a percentage of the established minimum volumes; results of internal control: the number of cases of high-quality medical care; the number of cases of high-quality medical care, accompanied by individual defects in medical care; the number of cases of poor-quality medical care (in absolute numbers and as a percentage of verified cases); total and by Department number of detected defects in medical care by type (structure of defects): defects in the...
collection of complaints or anamnesis; defects in diagnostic measures; defects in diagnosis; defects in treatment measures; defects in preventive measures; defects in medical examination or medical examination; defects in medical documentation; brief information about the measures taken by the person responsible for conducting control based on the results of internal control; proposals based on the results of internal control for head of establishment.

| Scope of internal control                  |
|--------------------------------------------|
| Information about taken measures            |
| Quantity of the revealed defects of medical aid by kinds |
| Results of internal control                 |
| Reporting period                            |
| Number of cases of quality medical care provided |
| Suggestions for the head of the institution |

**Figure 1.** Information about reporting forms in the MIS.

The second source of information for the quality management system is the patient survey. The sociological survey (questionnaire) of patients is conducted in the course of current work, after inpatient treatment, at the stage of dynamic observation in the consulting clinic.

3. **Conclusion**

Comprehensive information support for the internal quality control of medical care personnel, including a comprehensive medical information system, which provides automation of the internal quality control process of medical care with differentiation by individual components.

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