QR – Issue   QR – Article

Lubov Vladimirovna Galitskaya
Moscow Pedagogical State University,
doctor of Technical Sciences, lecturer, Anapa, Russia

Natalia Maksimovna Diagileva
Moscow Polytechnic University,
senior teacher, Moscow, Russia

Natalia Grigorievna Metelitsa
Moscow Polytechnic University,
senior teacher of chair "Foreign Languages", Moscow, Russia

Olga Evgenievna Travnikova
Moscow Polytechnic University,
student, Moscow, Russia

INNOVATIVE APPROACH TO SOLVING MEDICAL ERRORS

Abstract: This article addresses the problem of medical errors. The term "medical error" is investigated and it's revealed that the term has not been defined clearly. It is shown that changing the hospital management system does not affect the number of medical errors. It is suggested that this is due to their cognitive nature. Recommendations on the use of AI to reduce the number of medical errors are given.

Key words: health care, quality of healthcare management, medical error, cognitive mistakes of doctors, artificial intelligence, innovative activity in medicine.

Language: English

Citation: Galitskaya, L. V., Diagileva, N. M., Metelitsa, N. G., & Travnikova, O. E. (2019). Innovative approach to solving medical errors. ISJ Theoretical & Applied Science, 09 (77), 332-336.

Soi: http://s-o-i.org/1.1/TAS-09-77-58   Doi: cross ref https://dx.doi.org/10.15863/TAS.2019.09.77.58
Scopus ASCC: 1000.

Introduction

Now it is clear that the biggest challenge for the healthcare system is medical errors. In the legislation of the Russian Federation there is no concept of "Medical error", but of course this does not exclude their occurrence. The medical and legal literature contains more than 60 definitions of the concept of "medical error", while in the legislative acts of many countries this concept is absent [1]. In an integrated form, a medical error is an accidental harm to the life or health of a patient caused by erroneous actions or inaction of a medical worker, characterized by his delusion with due regard to professional duties and the absence of signs of negligence.

The media also pays great attention to the death of patients due to medical errors and the demands for improvements in the health system are growing [2].

Previously the following researchers addressed this problem: Charabciev Y. T., Fomina T. K., Jumanazarov N. A., Ibatullina Y. F., Kovalev V. M., Sokol A. F., and R. V. Shurupova. However, we can state that this problem has not been investigated to the fullest. In this article we would like to investigate possible solutions for the major errors made by medical workers, i.e. adjustment of management system and artificial intelligence. This research can contribute to further investigations and experiments of the possibility of combining modern technologies and management in hospitals. The findings we would like to present could be incorporated in the current medical management systems.

The problem of solving medical errors

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Currently, one of the pressing issues of medical practice is the study of the effect of defects in the provision of medical care on the health of patients and the identification of the most common prerequisites and causes of professional offenses of medical workers [3].

There is no consensus between representatives of the legal and medical community on the definition and significance of medical errors, and there is no official statistics of offenses in the field of medical care, as a result of which patients were harmed. The term medical error is currently absent in the legislation of the Russian Federation, and there is no generally accepted definition of the term and medical literature. One of the most common definitions is given by Ippolit Vasilyevich Davydovsky (Soviet pathologist, academician of the USSR Academy of Medical Sciences): "Medical error is a consequence of a conscientious error of a doctor in the performance of his professional duties. The main difference between errors and other defects of medical activity - the exclusion of intentional criminal acts - negligence, negligence and ignorance». According to foreign researchers, medical error is cases of negative consequences arising from the provision of medical care, which could be prevented [4].

Kovalev VM in his work notes an important feature. Unlike misconduct and medical crime, medical error cannot be foreseen and prevented by this doctor, it is not the result of negligence of the doctor to his duties, ignorance or malicious action. Therefore, for medical errors, regardless of their consequences, the doctor can not be punished either in disciplinary or criminal proceedings. The term "medical error" did not refer to legal concepts; the criminal code and its commentary did not contain the term "error". It is usually used in the daily analysis of diagnostic and therapeutic work, as well as in the identification of short-term and long-term outcomes of medical interventions, which in some cases can become the subject of forensic research [5].

Errors are divided into several groups: diagnostic (non-recognition or incorrect recognition of the disease), medical-tactical and medical-technical (errors in the organization of medical care).

Pashinyan A. G summarizes the various authors and leads the classification. The causes of medical errors can be divided into objective and subjective. Objective do not depend on the doctor, the degree of his knowledge, training and professionalism, subjective errors are directly dependent on the knowledge of the doctor, his experience. Thus, the objective reasons can be attributed to the lack of necessary scientific data on certain diseases (rare diseases or recently discovered). The subjective reasons include the error in diagnosis, errors in the collection of anamnesis of the disease, the lack of necessary studies, the conduct of which was mandatory and possible (laboratory, x-ray, etc.),

violation of the terms of medical care, errors in the appointment of drugs, etc. [6]

After analyzing the work of the aforementioned authors, as well as having regard to the opinion of Sokol A. F., and R. V. Shurupova, who has studied the approach to the concept of medical error on the part of the authors Groopman D., Rigelman, R., Sokol A. F., paying attention to the peculiarities of the thinking of the doctors we can identify the characteristics and consequences of the phenomenon of "medical error" [7-10]:

1. The frequency of medical errors does not significantly depend on the quality of medical care in a particular country.

2. The frequency of medical errors does not decrease with the growth and progress of technological equipment of medical institutions.

3. The frequency of medical errors is not reduced due to the progress of pedagogical science and technology of training of future doctors and postgraduate education.

4. Medical errors significantly increase health care costs. Thus, in the United States in 2008, the costs associated with the provision of additional services to patients, including in connection with medical errors, ranged from 18 to 45% of all funds allocated for health care .

In addition, we can conclude that the priority of management in medicine is the quality management of the diagnostic and treatment processes in order to ensure the safety of patients.

Changes in management system that could be made

In 90-ies of XX century W. E. Deming said "In the poor quality of any product in 98% fault system and only 2% fault performers. What to do? The solution is obvious: change the system!". The concepts he put forward offer unlimited opportunities for continuous improvement of the management system and the quality of products and services. Deming's philosophy, which is formed from his concepts, changes the meaning of the organization as a whole, changes the content of the activities of each employee: as customers expect from the organization of new and increasingly high-quality goods or services, and the organization expects from the working staff innovations and continuous improvement of their activities.

Based on this philosophy, using the 14 management rules proposed by W. E. Deming and open sources of literature in most medical institutions, the following shortcomings can be identified:

There are many current problems and struggle with endless routine, long-term goals are a small number of hospitals. The system of prevention of medical errors exists, but works on the principle of detection of post factum and severe punishment of the involved persons without changing the processes

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themselves. The most common way to assess the quality of care is total control, mainly through checking the medical records of patients who do not represent the real picture. Often there is a charge of individual doctors and nurses for mistakes and blunders without assessing and changing the processes that led to these defects. There are no full-time specialists in the field of quality improvement in medical organizations. Corporate culture is poorly developed. The work is rigidly divided into the functioning of departments, divisions, offices. Medical workers are awarded two or three times a year, but the reward is directly proportional to the years given to the work. Few doctors and nurses work on their continuing education, the existing system of continuing education is more formal.

In 1987 the US pediatricians Donald Berwick and Paul Batalden with the support of the Joseph Juran Institute and quality experts from various industries implemented a successful project with a grant from the John Hartford Foundation: they introduced modern principles and methods of quality management into the health care system.

But after about 18 years during which various methods of improving the quality of services were used in American hospitals, the American company "HealthGrades", which rates medical institutions and doctors of the United States, published the report on medical errors for the period from 2003 to 2005. According to it, the number of medical errors increased by 3%. In total, statistics on 40 million hospitalizations in more than 5 thousand hospitals were analyzed. According to the authors of the report, 1.16 million medical errors and errors were noted for 3 years. 247.6 thousand people died due to incorrect diagnoses, incorrectly prescribed treatment, etc., although their lives could be saved[11].

The number of medical errors and cases of irreparable harm to patients indicates that quality management has not made the same revolution in health care as in electronics and automotive industry. Examples of successful implementation of quality management methods in the health sector, of course, exist. But it cannot be said that these results fully met expectations.

This case is meaningful, but not unique, there are a lot of practices on introduction of innovative technologies of management in hospitals as a result of which the main indicators improved, but the number of medical errors either remained at the same level, or increased. Medical activity is associated with high risks, which may vary depending on the complexity of the case. The most difficult is to improve the aspect that is associated with medical errors.

This means that changes in the management system, the introduction of management technologies does not affect the number of mistakes made by doctors. Based on the article Sokol A. F. and

Shurupova R. V. we concluded that this is due to the cognitive nature of medical errors.

Artificial intelligence and medical errors

The conclusion that the nature of medical errors is mainly cognitive, as well as the experience of implementing innovative management systems, which did not affect the level of medical errors, suggests the use of artificial intelligence in medical practice, because it will help avoid cognitive medical errors.

During the early 80-ies in some medical institutions of the Ministry of health and the USSR Academy of Sciences scientific laboratories started to be created, which faced the need to solve a number of important problems for theoretical and practical medicine with the expectation of using mathematical methods and computer technology. Even then, the main thesis of the direction of work was formulated: there is no need to solve all the problems of medicine. Doctors need reasonable and reasoned support in solving difficult problems for them — whether it is a diagnosis, prognosis or the choice of a drug. And it was determined that the problem should be solved not instead of doctors, but with them [12].

To correctly identify the cause of the disease and give competent treatment, it is necessary to study the data about a patient, i.e. see the case record, tests, pictures, etc. Sometimes the most experienced doctors can not make a solid diagnosis due to the fact that they do not see the full picture of the disease. According to analytical data from Google, every tenth patient suffers from an incorrect diagnosis [13].

The newest technologies in this area belong to the company DeepMind which in partnership with the Department of veterans Affairs of the United States has developed an AI algorithm for predicting the disease. In an article published in Nature, they share their findings on how the algorithm can predict the presence of renal failure 48 hours before it occurs. The model correctly identified the condition of 9 out of 10 patients. The results show that for each patient the doctors spent 15 minutes, not several hours. And only in 3.3% of cases they missed the disease, compared to 12% of cases without using AI. This means that in the future AI will reduce the number of medical errors by almost 4 times [14].

In our opinion, AI can help in the fight against cognitive errors right now. Cognitive error is something we can't control, but we can detect it. At this stage of AI development, the main emphasis is on creating a unified base of medical knowledge and technologies that can be used in everyday clinical practice. The ability of the neural network to learn from a variety of examples in cases where the patterns of development of the situation and any dependencies between the input and output data are unknown. Thus, if the exact dependence is not known, but it is known

that it exists, the neural network is able to find a relationship[15].

Even I. A. Davidovsky believed that since medicine is a scientific discipline, medical errors are subject to registration, systematization and study. Somewhere before the 50s, doctors made public mistakes, analyzed them, shared them with students, to prevent the occurrence of such cases in the future. But now, unfortunately, in many countries, health workers tend to hide information about their mistakes. This is primarily because such information has traditionally been used to punish [1].

From the above arguments it follows that the most promising direction of development of artificial intelligence to eliminate medical errors is the formation of an open database with known cases of medical errors and analysis of medical history through this database to identify possible errors.

Conclusions and limitations

Medical errors are an inevitable part of a doctor's professional activity: they were, are and will be. The desire to reduce their number is a real goal that requires serious efforts on the part of both the medical community and the government institutions responsible for the country's health.

According to Dats A.V., Gorbachev S. M., scientific and technical progress and development of medicine, equipping medical institutions with modern medical and diagnostic equipment and means of intensive therapy led not only to improve the quality of diagnosis and treatment, but also caused a significant increase in undesirable and adverse effects of medical actions [16].

Our study suggests that it is necessary not only to change the hospital management system, but also to start discussion of medical errors in order to detect and eliminate their causes (and not people who made mistakes), and this is possible only through a change in the culture of professional activity and greater openness towards patients.

After that, on the basis of published cases of medical errors, it will be possible to form an open database and train the AI to determine the likely error that may occur during the work with this case. This approach will allow the doctor to clearly understand the points where the recheck the diagnosis should be done or therapy prescribed.

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