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Evaluation of Usage of Information Diagnostic Technology in Family and General Medicine

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SUMMARY

Introduction: In recent decades, the development and improvement of technology is rapidly advancing. The development of science, new materials, information technology, new procedures and other modern achievements were his first confirmation sought to improve living conditions, particularly in achieving better health conditions. In an effort to improve living conditions, solve the problem of severe diseases and to facilitate treatment, new technologies, almost always find its first application in medicine. In such conditions of general pressure of new modern technologies, health professionals often succumb to uncritically use these technologies. **Methodology:** Analyzing data collected from 30,000 research papers that have done 30 doctors of family medicine and 30 doctors of general medicine, and from interviews conducted with all 60 doctors who participated in the research. **Results:** a) Teams of family medicine have a significantly higher professional education, and it should be noted that there was no significant difference in length of service of employees; b) Teams of family medicine have significantly less committed population on which the care; c) Teams of family medicine in an average have fewer visits per day than the teams in general medicine; d) Information diagnostic technologies are more accessible to family medicine teams. **Conclusion:** It is necessary to introduce a technology assessment as a standard scientific methods in decision making and the creation of the health system. In fact, it is necessary to establish and enable institutions to assess health technologies and join the developed world in creating better health care.

Key words: Family practice, Information technologies.

1. 1. INTRODUCTION

The term technology is of Greek origin and means a skill, while logos mean–science. Technology means applied knowledge or applied science. According to the “Office of Technology Assessment,” Medical technology is a set of techniques, medicines, equipment, tools and procedures used by health professionals in providing health care to individuals and systems in which such technology is used (1, 2, 3, 4, 5, 6). Broader concept of medical technology is the health technology, which includes all the procedures, tools and techniques that are used in order to improve health, and the simplest and most effective way to treat and rehabilitate certain population. Information technology in medicine and healthcare can be presented by one complex technological model (Technology Package) which includes all the components of technological packages such as hardware, software, brain ware and orgwar,e and that can actually cover all the medical technology and technology in health activities. Advances in medicine in recent decades are in significant correlation with the advance of information technology. Modern information technologies have enabled faster, more reliable and comprehensive

data collection, however, they have started to create a large number of irrelevant information, which is a limiting factor and a real growing gap between medical knowledge on the one hand, and the ability of doctors to follow its growth. Furthermore, in our environment the term technology is generally reserved for its technical component, however, this terminology essentially means not only the purchase of computer and related equipment, but technological foresight and technological progress, which is defined as a specific combination of fundamental scientific, research and development work which gives a concrete result—from fundamental discoveries to their application in the form of innovations (7, 8, 9, 10, 11).

Computer, in general terms is the device by which information is processed, or the device for automatic processing of numerical and data of non-numeric nature. On these are based computer information systems (information technology package) which traditionally have been composed of at least two components, or two subsystems consisting of multiple elements:

- Hardware
- Software

These two components act synergistically and both are essentially important for the proper operation of computer system and its use in medical education. Hardware therefore belongs to all mechanical, visible and “tangible” component of the computer. We can divide the elements of the hardware system into several groups that act in interactive computer systems (2,7):

- Data entry mechanism;
- Data processing mechanism;
- Data storage mechanism;
- A mechanism for retrieving the processed data.

Within each of these groups there is fairly large number of computer components, and to this number is added almost daily new, just discovered and produced.

Software part of the computer is a general term for software of a computer, i.e. a set of instructions prepared so that it is performing in an appropriate way to obtain an adequate final result. The software is further divided into system and application software. System components would belonged to the operating system (now the predominant Windows operating systems, and to a lesser extent Linux, Mac, etc.). Examples of application software are components of Office, e.g. Word, Excel, etc., and the extremely large number of other programs (applications), used for various purposes. Here is another term that is rarely used—Firmware, a special type of software that provides system functions within a computer system and by the end user in principle cannot be changed without the danger of damage to the basic logical relations, and that the computer is blocked.

Computer systems are certainly one of the most important inventions in the past century. The introduction of computers has led to the introduction of a special method of education known by the term “learning with computers”, i.e., the Anglo-Saxon literature known under the abbreviation CAI or CAL (computer assisted instruction/learning). This method is particularly useful in educating students in the transition from preclinical to clinical part, and very important in the field of introducing new diagnostic and therapeutic procedures. Using this method, the student has enough time for solving problems, making decisions in accordance with the speed of their own understanding, to rest when they want, and relieve the pressure that is normally present by teachers, colleagues or patients.

It's been a long time since 1978. , when the WHO announced 38 objectives of “Health for All 2000. year” (7, 8, 9). In this program, the sixth chapter, “The prerequisites for the development of health care” was emphasized by the fourth section, “Evaluation of health technology”, and the last 38th goal of “Appropriate health technology” was “Before 1990. all member countries should already have in place systematic mechanisms for evaluating the use of medical technology, its feasibility, efficiency, security, availability, and maintenance of national health policy and economic restrictions for use.” But this proclaimed goals and aspirations, unfortunately, did not give the desired result, particularly in some areas of the world. Where was seated culture of quality management and where the market economy dictated the use of technology, there are agencies for the evaluation of technology prior to setting these goals by WHO (the United States and some Western European countries), while in some societies, this

principle has not lived even today.

2. PROBLEM OF THE STUDY

The situation in Bosnia and Herzegovina is far from similar. Fragmented health care system does not give effort to the decision makers in health policy-making process, the ability to control the use of health technologies. The management those resources is left to health professionals who are not trained in the organization, economics and decision-making, and about quality assess the use of health technologies is no trace in our region. Economic and socio-political environment, a disorganized health care system and the high costs associated with the use of diagnostic technologies require vigorous measures in terms of achieving the higher quality, more efficient and less expensive as, in other words, rational health care services. In Bosnia and Herzegovina, as in many developed countries do indicate the number of diagnostic tests in primary care is growing, but at the same time the consent of algorithms based on the evidence of many of these tests is considered unnecessary. In providing health care, it is not common practice evaluate the use of technology, and this is particularly uncommon in primary care. This is to the institutional, organizational and political obstacles, as well as the lack of instruments to assess .Health workers in an effort to comprehensively review the problem, do not overlook the impact of individual technologies to solve this problem and, besides, no singles enough number of cases to extract statistically relevant data.

This research was conducted in order to reaffirm or to encourage thinking about the skills needed to adoption the assess of health technologies, and also to develop instruments and algorithms that estimate, in this case the evaluation of implementation of family medicine in the health care system of Bosnia and Herzegovina. In recent decades, in Bosnia were carried out substantial reform activities in the health system, especially in the reform of primary health care in what they have invested significant domestic and international community assets. This reform is reflected in the substitution of general practice with family medicine and applying the principles of family medicine in all its aspects.

So in our health care system currently works two models of health care in primary health care, one is inherited in which primary care doctors provide general practitioners, and another model with the introduction of family medicine doctors and specialists in family medicine. In addition, in the postwar period intensified continuous medical education and other forms of medical education. The question is whether health education, a different arrangement of the health system is actually a different principle of health care providers may give different efficiency and effectiveness in the use of certain diagnostic technology?

3. AIMS

The overall objective of this research is to establish a rational utilization of diagnostic information technologies in units of family and general practitioners at health centers in Canton Zenica-Doboj using quantitative and qualitative variables designed for this study. Fact whether the existing differences in the provision of health care reform justify interventions in primary care. One type of observed vari-

ables are the inputs into the health system, which produced different results using technology. These variables are:

- education of doctors who classified the group of general medicine and family medicine group,
- technological resources that apply in their daily work,
- conditions,
- existing administrative, income and functional concept of primary health care,
- existing standards in the domain of primary health care.

The second group consists of qualitative or quantitative indicators as a result of applying certain diagnostic technology (output), based on what was done:

- Assessment of general diagnostic effectiveness of information technology in primary medicine and family medicine and the identification of differences,
- Assessment of the correct indications for the use of such technology and determine the difference between general doctors and family medicine,
- Assessment of effectiveness of interpretation of the results and determine the difference,
- Research on the effectiveness of specific individual diagnoses often impressions of diagnostic technology and information to determine differences,
- Assessment of the economic aspects of diagnostic applications of information technology and defining the differences between family medicine (a better organized system) and general medicine,
- Determining the differences in the subjective assess probable diagnosis of clinicians before and after diagnostic use of information technology and defining the differences between doctors in general and family medicine,
- Determining whether there is a difference when applying diagnostic definition of information technology in treatment planning,
- Determining whether there is a significant difference in impact on the patient's health that arise after the application of information of diagnostic technologies.

4. RESULTS

Analyzing data collected from 30,000 research papers that have done 30 doctors of family medicine and 30 doctors of general medicine, and from interviews conducted with all 60 doctors who participated in the research, led to the following results:

- Teams of family medicine have a significantly higher professional education, and it should be noted that

Variable	General practice teams	Family medicine teams	t - test	Significance (p)
The average number of collected CME points	48.57	169.78	3.863	0.002
The average number of points acquired in professional education	1.643	3.111	3.796	0.002
The average length of service	15.42	19.06	1.725	0.092
The average number of assigned population	4976.67	2300	- 15.041	0.000
The average daily number of patients in ambulances	60.13	39.30	- 6.858	0.000
The average number of indicated consultative examinations	9.29	9.22	- 0.033	0.642

Table 1. Calculated statistical differences in the characteristics of staff and the significance of differences between groups of physicians

	Family medicine	General practice	test	sign. (p)
Daily average of patients referred to examination	2.29	1.39	- 0.51 (t)	0.696
Positive confirmed diagnoses (%)	60.5	59.9	0.178 (X ²)	0.673
Unnecessary procedures (%)	17.8	21.5	12.773 (X ²)	0.0004
Confirmed diagnoses (%)	53.8	48.3	17.939 (X ²)	<0.0001
Health improvement (%)	44.2	27	201.28 (X ²)	<0.0001
Cost effectiveness ratio	36.5/	38.2	=	1.04

Table 2. Performance of teams in the use of ultrasound diagnostic technology

there was no significant difference in length of service of employees.

- Teams of family medicine have significantly less committed population on which the care.
- Teams of family medicine in an average have fewer visits per day than the teams in general medicine.
- Information diagnostic technologies are more accessible to family medicine teams.
- Minimal use of a guide for both groups of doctors.

Family Medicine Doctors have developed mechanisms for rational deliberation and acceptance of requests of patients.

Organized process of providing health care services reduces the pressure of stressful demands on service providers where they make better decisions. Appointment patients, teamwork, visiting nurses ... reduce the stressful pressures at the request of family medicine teams.

Prevention activities, which would ultimately reduce the stressful demands of the population, are poorly implemented in family teams and teams in general medicine.

Figure 1. The ratio of the observed characteristics in two groups of doctors

Active registration of patients and the appropriation of doctors has created a continuous doctor-patient relationship, statistically significantly more frequent than in teams in general medicine.

All of these principles, the better in family medicine, gave a better performance of family medicine teams in rational use of diagnostic information technology. Because the family medicine teams:

- On average, significantly fewer patients were sent for tests,
- On average, significantly fewer had unnecessarily spent procedure,
- Had an average of better economic relationship between services rendered and results obtained,
- Significantly more confirmed working the diagnosis,
- Performed diagnostic procedures were significantly more likely to affect the therapeutic protocols,
- Performed diagnostic procedures were significantly more favorable effect on patient health,
- The value of the operating characteristics of the implemented procedure is considerably more favorable to the doctor of family medicine.

5. CONCLUSIONS

Based on everything we can say, there is a confirmed hypothesis that the rationality of the diagnostic application of information technology depends on the concept of providing primary health care, level of professional medical education, the existing technological resources, working conditions and implementation of standards in primary care. However, it should be noted that although the number of unnecessary procedures significantly lower in family medicine doctor, that number is still significant and the laboratory tests are moving up to 33% and significantly affects the efficiency of health care. Therefore it is necessary to continue with the implementation of the principles of family medicine, especially in those areas where there has not been sufficiently implemented, which would further improve the performance of primary health care. To use the guide, the active registration of patients, visiting nurses, greater coverage of population, etc. (7, 10, 11).

It is necessary to introduce a technology assessment as a standard scientific methods in decision making and the creation of the health system. In fact, it is necessary to establish and enable institutions to assess health technologies and join the developed world in creating better health care.

Thus, it became clear that family or general practitioners cannot accept the quantity of information from different areas of medicine, especially if we consider the aspect of speed and intensity in which new knowledge arrives. It is necessary in the system of education to limit the amount of

factual information that they must know.

It is necessary to adopt methods that will identify those physicians who will later be able to learn independently and develop educational skills during continuing education.

Medical schools/universities/health centers/polyclinics/hospitals etc., must reduce passive learning, and from students/physicians require active learning and solving problems.

Medical schools/universities must introduce a system of education in information technology during undergraduate and postgraduate study (1, 7).

Information technologies have the capacity more than any other medium to facilitate all kind of learning and problem solving, as well as many other benefits.

REFERENCES

1. Masic I, Ridjanovic Z. Medical informatics. Avicena, Sarajevo, 2009: 276-316.
2. Petković D, Sivić S. Osnove tehnologija i menadžmenta u zdravstvu. Zdravstveni fakultet Univerziteta u Zenici, Zenica 2008.
3. Lettieri E, Masella C. Health-care costs and health technology assessment. *G Ital Nefrol*, 2007 Nov-Dec; 24(Suppl 40): 22-36,
4. Thomas JW, Elizabeth AM, Paul N, Yuchiao C, Mary EC, Laura M, Lillian VA, Thompson BT, Michael F, William W, Amy W, Mark J, Michael AF. A Utilization Management Intervention to Reduce Unnecessary Testing in the Coronary Care Unit. *Arch Intern Med*, 2002; 162: 1885-90,
5. Lehoux P. The problem of health technology: policy implications for modern health care systems. Taylor & Francis Group, LLC, New York, 2006.
6. Sox H, Stern S, Owens D, Abrams LH. Assessment of diagnostic technology in health care: rationale, methods, problems and directions. Institute of Medicine, National Academy Press, Washington DC, 1989.
7. Mašić I, Toromanović S, Smajkić A. Socijalna medicina s osnovama zdravstvene njege u zajednici i polivalentnoj patronaži. Avicena, Sarajevo, 2009: 263-76.
8. SZO. Ciljevi zdravstva za sve: zdravstvena politika za Evropu. Škola narodnog zdravstva Medicinskog fakulteta Univerziteta u Sarajevu, Sarajevo 1997.
9. SZO. Zdravlje 21 – zdravlje za sve u 21. stoljeću. Zavod za zdravstvenu zaštitu BiH. Sarajevo 2000.
10. Sivić S, Masić I, Petković D, Huseinagić S. How to use rationally information technologies in the family and general medicine practice. *Mat Soc Med*, 2009; 21(1): 40-7.
11. Sivić S, Tandir S, Huseinagić S, Zunić L. Assessment effectiveness of hematological laboratory usage in ambulance of family medicine in Zenica. *Med Arh*, 2007; 61(4): 215-7.

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