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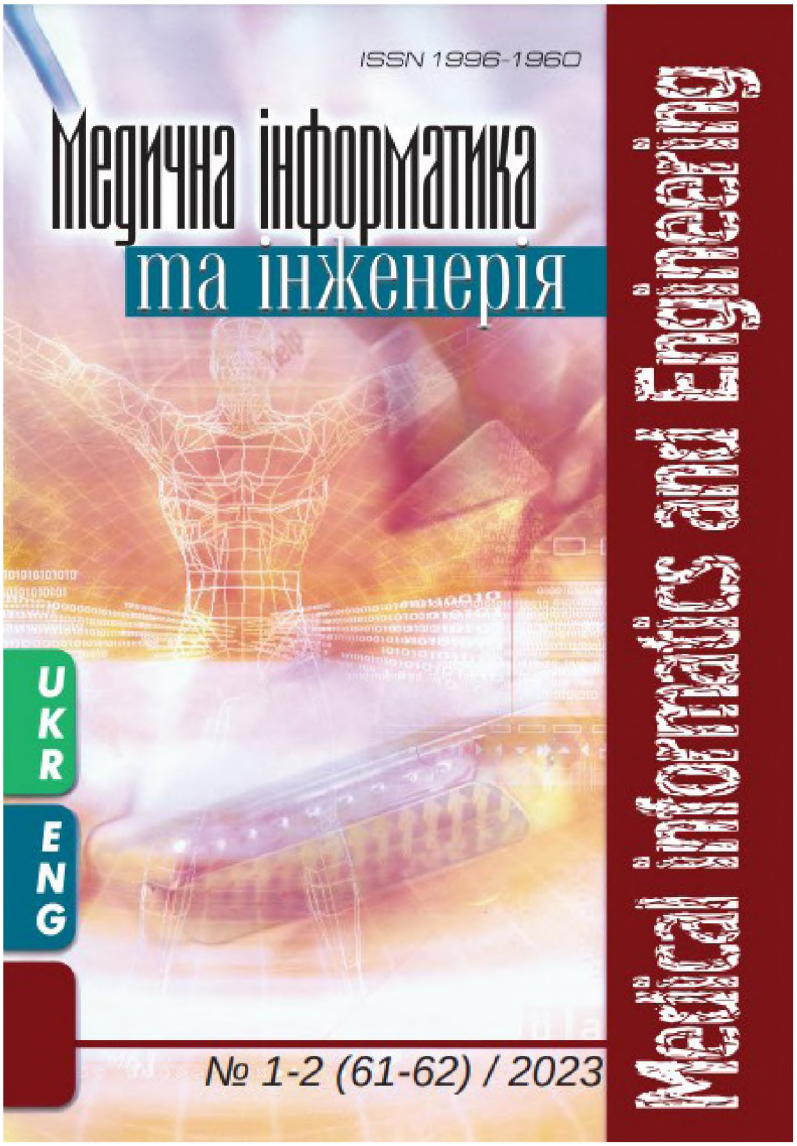

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# CONTENT

# Assessment of the Possibility of Implementing the Strategy of Information Integration of Health Care Systems

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## ABSTRACT

**This study considers the problems of globalization of medical education and practical health-care in consideration of the wide implementation of information technologies. The creation of unified educational medical systems is hindered by many factors, among which the most important are the lack of standardized technological platforms and educational programs, assessment processes, and most importantly, data processing methodology. The purpose of the study was to assess the possibility of integrating health-care information at the current stage of information systems development, in order to support future medical education. Conclusions: 1. The creation of a single integrated health-care system on a global scale seems unlikely today. We can only talk about the extent of harmonization of the relevant systems through the interoperability of their data. 2. The constant avalanche-like growth of data dictates the continuous growth of data management problems. At the same time, the right combination of localization, adaptation to cultural diversity and technologies, in the context of sufficient resources and adequate infrastructure in specific countries, is extremely necessary.**

## KEYWORDS

**Medical platforms, continuous professional development (CPD), globalization of education, regional platforms, information technology, integration of healthcare systems, big data, integration, interoperability and discrimination of medical data, flipped learning, online learning**

## 1. Introduction

Information integration of health-care systems is carried out both in the direction of providing medical care and in the globalization of medical education. The obvious goal of the integration of information systems is the creation of a virtual supersystem that provides the interconnection of systems in the strategy of providing medical or educational ambassadors to clients, a consistent work process and an integrated flow of information across the supersystem, and also contributes to the adoption of well-informed decisions in the field of health-care.[1] It is believed that an integrated information system (a network of interoperable and interconnected systems) is characterized by higher performance in terms of quality and security. It also facilitates the implementation of new clinical and administrative processes, the deployment of agreed clinical guidelines, and the coordination and management of patient care across healthcare settings.

Collaborative care is critically dependent on the ability to easily share information between service providers. At the same time, the inability to seamlessly share information between systems and between healthcare organizations is one of the main obstacles to advancing collaborative care, cost containment and globally consistent medical education underpinned by standardized educational platforms and medical evidence derived from integrated health information.

***Study aim:*** To assess the possibility of integration of health-care information at the current stage of information systems development.

## 2. Data received and discussion

Online education in its various forms is growing steadily worldwide due to the confluence of new technologies, the global adoption of the Internet, and the growing demand for skilled labor. By 2025, online education should become a mass phenomenon.[2] Eventually, the globalization of e-education will inevitably occur, just as we have witnessed the globalization of e-mail, e-commerce, and e-government.

Modern technologies allow teachers to objectively assess competencies using online assessments and receive the necessary personalized feedback. The transition to e-learning was a catalyst for adult learning theory, which redefined the role of medical educators as facilitators and assessors of competence.

The expansion of online education beyond national borders is primarily determined by global factors. These include having standard technology platforms (such as the Internet), bridging the digital divide, accommodating different languages and cultures, standard curriculum and assessment processes. Already this short list of factors should direct the organizers of such services.

But there are also regional and institutional factors. Regional factors include relevant country laws, information and communication technology (ICT) capabilities, Internet/mobile technology penetration, income gaps, and the digital divide. Institutional factors make up a group of conditions such as: support from administration, marketing, technology and top management; institutional culture, characteristics of the educational institution (public and private, commercial and non-commercial).

Finally, the institutional factor combines the characteristics of the educational program, the level of education, the peculiarities of the forms of information transmission - the online mode (mixed, inverted, fully online, as well as the degree of synchrony/asynchrony). At the micro level, the student factor is important, including motivation, culture, learning style and level of IT skills; learning outcomes using metric technologies (for example, Bloom's taxonomy); features of knowledge transfer technologies (learning platforms, LMS type), usefulness, ease of teaching and the level of IT skills; learning mode (cognitive, affective, managerial).

The huge number of factors that ensure quality education makes it practically impossible to compare different online education systems to choose the optimal integration model.

This study is indicative in this regard. In their work, O'Doherty et al.[3] tried to evaluate the experience of online education from the point of view of analyzing: a) barriers to the development and implementation of online education and b) ways to overcome them. Each article was analyzed and deductively coded under the appropriate headings.

A comprehensive literature review was conducted over three months by an interdisciplinary research team. The search, conducted by two reviewers, included dozens of well-known databases: Science Direct, Scopus, BioMedical, etc. Search queries included online learning, health educators, development, barriers, solutions, and digital literacy. Titles and abstracts were independently screened and considered for inclusion/exclusion criteria. Consensus was reached on which articles should be included. Data evaluation was carried out with the help of the checklist of qualitative studies. Of the 3,101 (!!) abstracts found in the search, only ten (!!!) full-text articles met the inclusion criteria. Data extraction was completed for seven articles of high methodological quality and for three articles of lower quality.

It is possible to debate for a long time about the main goal of research, but if only 0.25% of quality articles can be found as a result of search operations, then great doubts arise regarding the main problem - the integration of learning systems.

The literature findings suggest that the main barriers affecting the development and implementation of online learning in medical education include lack of time, weak technical skills, inadequate infrastructure, lack of institutional strategies and support, and negative attitudes towards all participants. Solutions for these include faculty development, incentives and rewards for time spent developing and delivering online content, improved institutional strategies, and support and positive attitudes from all involved in developing and delivering online content.

Even more problems are observed in the creation of an integrated platform in practical medicine, although it is absolutely clear that the integration of health-care platforms allows to significantly increase the efficiency of the institutions, simultaneously connecting various health-care services, pharmaceutical support, etc.

There are too many *different programs*, restrictions, and health data standards that need to be supported.[4,5] For example, in the US, the Readmission Reduction Program, an initiative of the Affordable Care Act, requires the Centers for Medicare and Medicaid Services (CMS) to reduce payments to facilities that have excessive readmissions; the Affordable Care Act of 2010 (the Affordable Care Act - ACA), Medicare and Medicaid programs.

*There are many different interoperability standards in use:* consolidated clinical data architecture (Consolidated Clinical Document Architecture C-CDA); specification of the document on continuity of patient care (Continuity of Care Document - CCD); of the Continuity of Care Record (CCR) standard. The Fast Healthcare Interoperability Resources (FHIR) medical information exchange standard is used. The standard describes the formats of medical data and the exchange of this data. FHIR is a trademark of the non-profit organization HL7 and is recommended in the US for access to public health information.[8] The goal of the standard is interaction between outdated healthcare systems, as well as access to medical data from various devices (computers, tablets, mobile phones). The known life cycle of software development is SDLC (Software Development Lifecycle).

The development of a healthcare integration platform is a strategic project in a healthcare organization, and such projects have very high visibility. In addition, a healthcare integration platform must have a set of well-defined functions, so requirements will need to be defined in advance. But its formalization also has no regional characteristics.

A similar situation is observed throughout the international space. It is enough to mention eight standards for improving the quality of medical care for mothers and pregnant women in medical institutions proposed by the World Health Organization (WHO). For example, Standard No. 1.: "Every woman and newborn receives routine, evidence-based care and management of complications during labour, childbirth and the early postnatal period".

Each of the listed standards is a complex document that requires considerable effort to encode medical data. Thus, in CDA, it is determined that the content of the document consists of a mandatory text part (which ensures the interpretation of the document content by a person) and optional structured parts (for software processing). The structured part is based on the HL7 reference information model and provides a basis for referencing the concepts of coding systems such as SNOMED or LOINC. A patient summary contains a basic data set of the most important administrative, demographic, and clinical information facts about a patient's health, covering one or more medical encounters. It provides a practitioner or system with the means to combine relevant patient data and forward it to another practitioner (system) to support continuity of care. To be certified for this federal program, an electronic medical record must be able to generate a CCD (or equivalent CCR) that includes allergy, medication, problem, and lab results sections in addition to patient information. Some of these sections also contain mandatory dictionaries, such as LOINC for laboratory results, according to the federal program. This provides a snapshot in time containing relevant clinical, demographic and administrative data for a particular patient. It is clear that the CCD specification contains specific US requirements; therefore, its use is limited by this state. Because CCD is a new format that harmonizes the continuity of medical records and the HL7 clinical document architecture specification, most electronic medical record vendors have adopted CCD to ensure the continuity of medical records. Accordingly, the use of this standard has become widespread in other countries, but with other insufficiently developed specifications. Not surprisingly, different providers of electronic medical records have implemented the CCD standard in different and often incompatible ways.[1]

The second part of the problems is related to the so-called data discrimination. Data discrimination, also called "algorithmic discrimination," is a bias that occurs when predefined types of data or data sources are treated differently than others in advance or unanticipatedly .

Discrimination of data can lead, first of all, to a significant decrease in the quality of medical care, insufficient diagnosis of diseases and prediction of the results of their treatment. Quality care requires collaborative communication, information sharing, and coordinated decision-making between physicians and patients. Complete and accurate patient and patient data are especially important when using big data to build clinical decision support tools and inform precision medicine initiatives. However, systematically missing data can distort these tools and threaten their effectiveness.[1,6] Discrimination leads to a decrease in the patient's trust and her/his willingness to share information with her/his doctor. This, in turn, has important implications for the quality of data available for medical decision-making and healthcare delivery. Patients who experience data discrimination may be disadvantaged by the systematic absence of data in their medical records. We covered this problem in more detail using the example of pathomorphology.[7]

Thus, the global integration of practical health-care systems cannot be implemented directly at present.

The paper by Palvia et al.[2] concludes that the idea of finding one educational model that is suitable for everyone clearly did not work. The right combination of localization, adaptation to cultural diversity and technology including learning management systems is needed in the context of resource and infrastructure shortages in certain parts of the world.

## 3. Conclusions

1. The creation of a single integrated health-care system on a global scale appears to be unpromising today. We can only talk about the issue of harmonization of the relevant systems.

2. The constant avalanche-like growth of data determines the continuous growth of data management problems. At the same time, the right combination of localization, adaptation to cultural diversity and technologies, in the context of sufficient resources and adequate infrastructure in specific countries, is extremely necessary.

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