

## Mobile Medicine and General Trends in Medical Informatics

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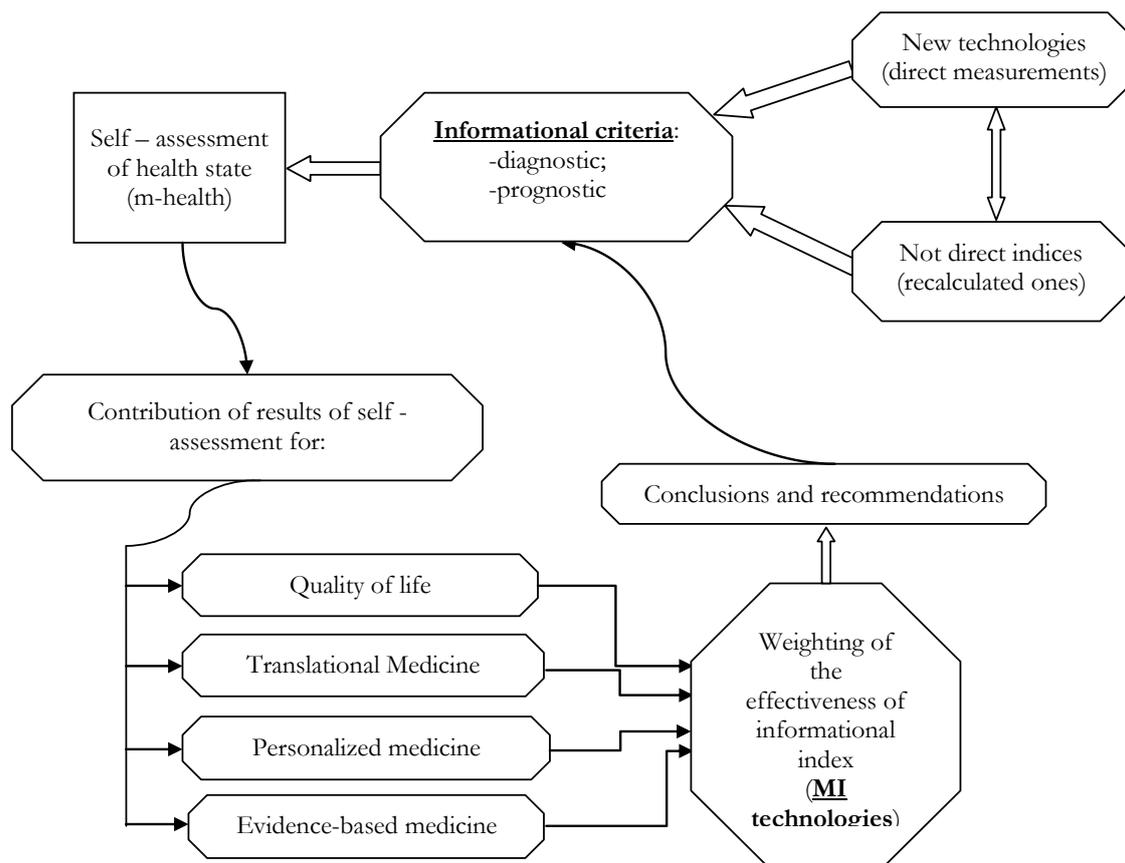
New challenges in medicine gained systemic character along with the accumulation of new data on links between functional units in human body; most of them, starting from the genetic level, are able to impact different disciplines at some earlier unimaginable stages of their development. That is why a counterpart activity, which is purposed to vanquish them, must also have a systemic character. With this respect, medical informatics (MI) is the first line reserve among others. From MI we get the most explicit response to urgent demands in health care via constructive multidisciplinary dialogue [1,2]. MI contributes to all medical disciplines; its development led to newest concepts such as personalized medicine, m-health, evidence-based medicine, etc.

The question is what are those intrinsic relationships between the impact caused by MI and the consequences, which might be explored in order to accelerate the MI evolution? Should there be a backward-directed facilitation of MI self-perpetuating and enforced development?

Hence, today's progressive development of informational technologies in health care is tightly connected with and is pushed forward by medical workers' armament with newly developed informational indices / criteria of quick and reliable diagnostics of diseases, rising of effectiveness of individual and population prognostic value (Figure 1). Remarkably, the feeling of significance of informational criteria stream, which is flowing into the health care system, justifies the label "biomarkers" application to bioelectrogenesis [3]. All branches of comprehensive medicine and most prominent diagnostic achievements are grounded in the usage of such criteria coming both from new technologies (oncomarkers, for example) and integrated criteria, which are not possible to measure directly, and which are presented mainly as a result of ratio between certain measurements, and / or mathematical modeling. Complex genetics, genomics, proteomics and metabolomics technologies developed by OMICS create the basis for the leadership in the field of new indices / biomarkers for risk estimation and diagnostics discovering [4].

What should be the most effective management approach to the enrichment process of diagnostic and prognostic basis of medicine?

Taking into consideration a huge deployment of MI facilities, appearance of mobile medical applications on the market along with FDA activity in that field [5], it looks like appearance of new prospects of patient's involvement in medical measurements with more active exploration of proper informational indices. Hence, such a recruitment of customers in their health state measurements using effective tools embedded in friendly constructed software represents the way of multiplication of sources of reliable information [6]. Patients and volunteers have a chance to become active partners of medical workers, while the concept of "multicentral" medical investigations is expected to be converted into "multiperson" or "personalized" investigations in evidence-based medicine as a result. A more rapid development of contemporary branches of medicine is strongly expected (Figure 1).



**Figure 1.** Informative indices on health state as an instrumentation for acceleration of medical electronic environment establishing / renovation.

Medical applications (apps) revealed “revolutionary stage” of health care system development [7]. Translation of medical practice to convenient handheld device along with cloud technologies make this stage more convincing and attractive for the medical society [8,9]. Thus the total of 37,246 m-Health apps (iOS, 32,614; Android, 4,632) in the categories Medical and Health & Fitness have been registered at the end of 2014 [10]. Less than two years earlier – on April 2013 mHealth Apps dedicated to the eight most prevalent health conditions by the latest update (2004) of the Global Burden of Disease (GBD) of the WHO revealed the presence of more than 3,673 apps with most frequently used for diabetes, asthma and depression [11]. It should be stressed that only 2.03 % pertained to the total number of all downloaded apps determined by July 2015 were medical oriented ones [12].

On the way of widening of the scope of medical apps another challenge – estimation of harm risk caused by apps exploration should be taken into account [13]. This risk is minimized and controlled in the course of comprehension of FDA regulation on apps [5]. Nevertheless, there still is a room for “not actively regulated” by FDA [14] which includes apps that help users to self-manage their disease or condition without providing specific treatment or recommendations on treatment; apps that provide patients with simple tool to organize and track their health information, and some others. No clear clinical benefits proved in regards of using information apps and tools that do not adhere to accepted medical practice [15].

Minimal demands for apps include safety, reliability, accessibility and affordability, particularly to those in low-resource settings [16,17]. To avoid interference with work flow the design of user interface relies on homogeneity, hierarchy, and indexicality principles to prevent an increase in data acquisition errors [17]. Simplification and unification of interface serves for friendly use by customers might be illustrated by results on the analysis of apps for diabetics [18]: the presence of documentation or analysis function resulted in significantly lower usability scores. Offering small

range of functions increases usability; data on health state transmission to physicians also have perspectives for wider usage.

Traditionally, overcoming of disadvantages of both MI and apps such as interference with workflow of medical staff, poor or absence of compatibility / interoperability with existing MI systems, poor protection from third person access as well as increasing impact from ergonomics should be put in the first place. The effective avenue for informative indices exploration is expected as a result of adequate answer for existing challenges.

Hence, informative indices, which are valid as prognostic and diagnostic ones, are regarded as a first-line absorptive material for MI technologies. Being modified by contemporary MI technologies informative indices are proposed to patients and physicians for resolving health problems with the shortest life-span from the moment of invention of those indices. More intensive medical information turnover is inevitable with the acceleration of gathering, analysis and storage of correct medical information, and discovering advantages of personalized medicine. Strengthening the partnership between patients and medical staff as most significant among others consequences of new mobile medical technologies implementation is also expected.

### **Conflict of Interest**

The authors declare that they have no conflict of interest.

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