

# Decision Support for Mental Health: Towards the Information-based Psychiatry

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## ABSTRACT

*Decision support systems represent an important tool offering assistance with the decision making process in a variety of applications. This paper starts with recalling the basic principles and structure of decision support systems in medicine from a general perspective. Their effect in terms of both potential and limitations for finding the diagnosis, prognosis and therapy are overviewed from the points of view of health care effectiveness and patient safety. The authors are particularly interested in the specialty field of psychiatry. They discuss its specific challenges and analyze the slower penetration of telemedicine tools to psychiatry compared to other clinical fields. Finally, they claim that the development of decision support systems play a key role in the development of the concept of information-based medicine in general as well as to the particular context of information-based psychiatry.*

*Keywords:*     *Big Data, Classification Rule, Decision Support Systems, E-Health, Mental Health Care*

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## INTRODUCTION

The objective of this paper is to describe general principles of decision support systems and to compare their potential and limitations with the perspective from the particular point of view of psychiatry. We discuss our experience with the design, implementation and validation stages and we stress that clinical decision support systems may bring new unexpected sources of errors which must be anticipated. While the modern technology undergoing a dynamic progress allows a more effective diagnosis and therapy, the increase in effectivity does not necessarily imply a higher safety of patients and the criteria of effectiveness and safety must be considered jointly. While decision support systems are generally acknowledged as potential for increasing the quality of health care, they have not penetrated to a routine usage in psychiatry. Based on a literature research over very recent references, we discuss distinctive challenges for the development of telemental health care tools. We believe that decision support systems contribute to the shift of clinical practice to the ideals which we describe as information-based medicine. Within

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psychiatry, there will be a need to overcome specific and rather serious barriers before the mental health care can reach the ideals of the information-based psychiatry.

## GENERAL PRINCIPLES OF CLINICAL DECISION SUPPORT

Medical decision making can be described as a process of selecting an activity or series of activities among several alternatives integrates uncertainty as one of the aspects with an influence on the outcome. Medical decision making is one of concepts of  $e_3$ -health (Zvárová & Zvára, 2011). In medicine, the physician solves the task of medical decision making based on data and knowledge connected to the cognition and determination of diagnosis, therapy and prognosis.

Decision support systems are very complicated systems offering assistance with the decision making process. Using data and knowledge as main sources to obtain information (Zvárová, Veselý & Vajda, 2009), they are capable to solve a variety of complex tasks, to analyze different information components, to extract information of different types, and deduce conclusions from them. In medicine, they compare different possibilities for the diagnosis, therapy or prognosis in terms of their risk. They represent an inherent tool of e-health technologies for diagnostic and prognostic purposes capable to help during the therapy. The search for the appropriate therapy is very complex and depends on many factors and only a few decision support systems aiming at therapy have been sufficiently evaluated up to now. In practice there exist specialized decision support systems for diagnosis and therapy in individual medicine fields and also specialized prescribing decision support systems. There has been less attention paid to decision support systems for prognosis, while there are still obstacles to apply decision support systems in healthcare routinely, although diagnostics and therapy would greatly benefit from reliable interdisciplinary and multidisciplinary systems.

Decision support systems have acquired an established place in healthcare with a certified ability to assist physicians with the decision making. Several studies proved that decision support systems can be useful for improving the quality of provided care, preventing errors, reducing financial costs and saving human resources (Kawamoto et al., 2005). The system may bring the physician more comfort, a higher effectivity and more time for the patient and also a reduction of errors. It saves also significant financial costs. It may be especially favorable during stress or for treating complicated patients. Particularly (but not only) a less experienced physician may benefit from using a decision support system, which exploits the level of knowledge reflecting the latest developments even in a narrow domain of medicine (Kalina et al., 2013).

## DESIGN AND IMPLEMENTATION OF DECISION SUPPORT SYSTEMS

Constructing a decision support system is a very complex and expensive process. The usage of decision support systems is strongly dependent on factors of legal, social, technical, economical and ethical environment. Organizational processes must be considered when creating the procedural knowledge, which can be used by a decision support system for process validation, simulation or verification of practical execution (Gachet & Haettenschwiler, 2003). This requires that the decision support system must be accommodated to the user, tailor-made to meet the needs of the particular hospital or physician. Such decision support system requires the interoperability with the electronic health record. The communication platform between the electronic health record and decision support system is a necessity also because each hospital or physician uses a different version of the electronic health record.

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