ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

# COMPREHENSIVE RESEARCH MAP ON MEDICAL DECISION SUPPORT SYSTEMS (MDSS) – HISTORICAL EVOLUTION REVIEW

**Raghu Babu Korrapati** *

* Department of Computer Science, Rayalaseema University, India

**DOI**: 10.5281/zenodo.573546

## ABSTRACT

Medical Decision Support System (MDSS) plays an increasingly crucial role in medical practices as it assists physicians to make clinical decisions and thus MDSS are expected to improve the overall quality of medical care. Research in the field of MDSS has suggested the there is a rising need to understand and discuss various developments in the field and how they have enhanced the medical and healthcare sector. This paper will provide a research roadmap to various developments over the years in the field of MDSS.

**KEYWORDS**: Medical Decision Support System (MDSS), Research Roadmap, Historical Evolution

## INTRODUCTION and RESEARCH MAP

Research in the field of MDSS has suggested the there is a rising need to understand and discuss various developments in the field and how they have enhanced the medical and healthcare sector. This section will provide a roadmap to various developments over the years in the field of MDSS. The first research article dealing with medicine and computers appeared in late 1950s (Ledley & Lusted, 1959). Artificial intelligence has been proposed as a reasoning tool to support clinical decision-making since the earliest days of computing (Ledley & Lusted, 1959). Later an experimental prototype appeared in the early 60s (Warner et al., 1964). At that time limited capabilities of computer did not allow it to be a part of medical domain. However, in these early years three advisory systems: de Dombal's system for diagnosis of abdominal pain (de Dombal et al., 1972), Shortliffe's MYCIN system for antibiotics selection (Shortliffe, 1976), and HELP system for medical alerts delivery (Haug et al., 1994) were considered the most significant.

de Dombal's system for diagnosis of abdominal pain (1972) provides a comparison of human diagnosis as opposed to computer aided diagnosis of patients suffering from acute abdominal pain. The results showed that system accuracy was significantly higher than those of even extremely senior and experienced clinical team. Shortliffe's MYCIN used backward chaining through its rule base to collect information to identify the organism causing bacteremia or meningitis in patients. A large number of rule-based MDDS systems have been developed over the years, but most rule-based MDDS systems have been devoted to narrow application areas, due to the extreme complexity of maintaining rule-based systems with more than a few thousand rules (Miller, 1994).

HELP has the ability to generate alerts when abnormalities in the patient record are noted, and its impact on the development of the field has been immense, with applications and methodologies that span nearly the full range of activities in biomedical informatics (Haug et al., 1994). The HELP hospital information system has been used to explore computerized interventions into the medical decision making process. By their nature these interventions imply a computer-directed interaction with the physicians, nurses, and therapists involved in delivering care.

The 1990s and 2000s witnessed a large-scale shift from administrative systems to clinical decision support systems. Study by Forgionne in 1991 discuss the cost related problems in the approach to prepaid medical care management. Bayesian Networks has been successfully used in MDSS (Korrapati, 2000a, Korrapati, 2000b). The study aims to identify the problems and suggest how decision support systems are used to overcome and design cost-efficient and market effective health plans. In 2009, Übeyli conducted a thorough research in the area of medical support system, which shows that there are several machine learning techniques that can be used to predict susceptibility of chronic diseases. Diagnosis expert systems have been developed in order to help predict and diagnose certain kinds of diseases. Following Figure 1 shows the historical evolution of MDSS.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

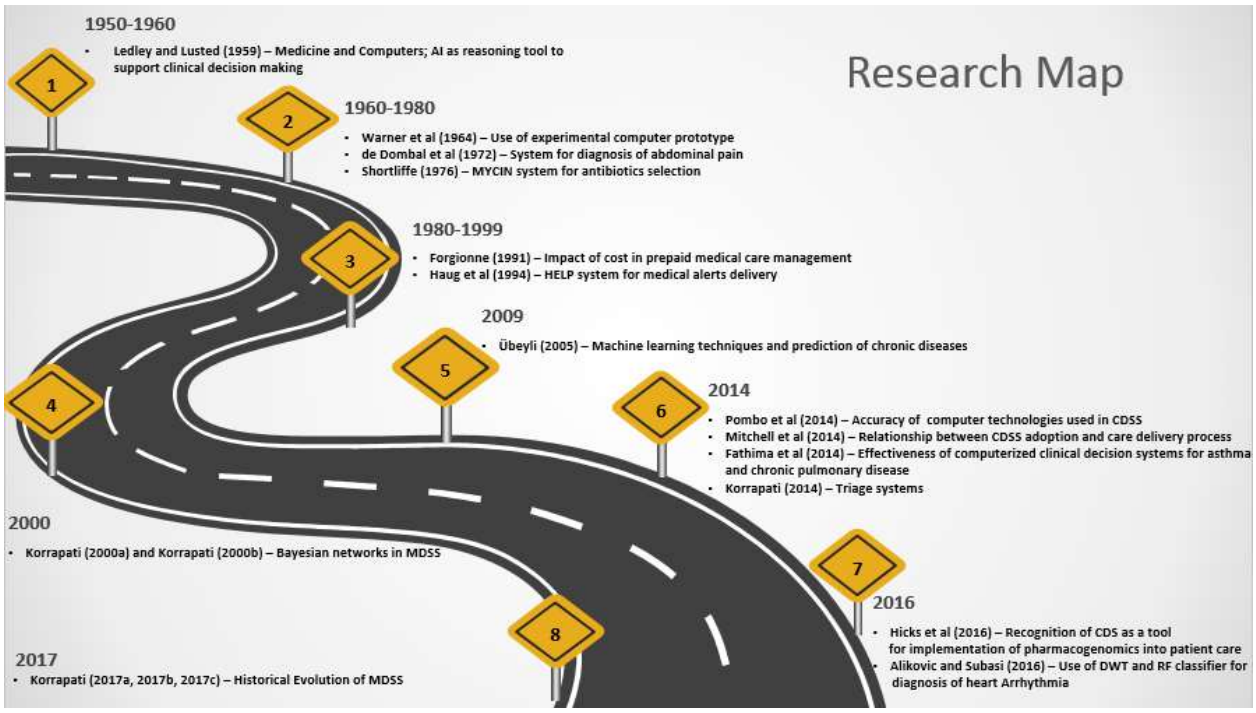


***Figure 1 – Research Map showing various developments and historical evolution over the years in the field of MDSS.***

In the year 2014, Pombo et al. conducted a study to describe CDSSs (also known as MDSS) that are applied to pain management with focus on computer technologies as well as on medical conditions, clinical settings, main decisions, and system accessibility. It also attempts to understand the overall accuracy of the computer technologies used in CDSSs that have been applied to pain. In the same year, Mitchell et al. conducted a study to understand the relationship between the adoption of CDSSs, the delivery of care process measures and defined outcomes for patients with heart failure. The results of this research suggest hospitals with full CDSS adoption are statistically prone to be members of a centralized system, have over 150 beds, hold not for profit status, have Joint Commission accreditation, be non-teaching facilities and dwell in metropolitan areas. The findings also suggest that full CDSS adoption can lead to a more reliable care delivery process and that clinical reminders may be purposeful for non-clinically related care, such as smoking cessation counseling. This research presented that hospitals with no CDSS adoption had higher 30-day readmission rates as opposed to institutions with some or full CDSS adoption. Similar studies were also conducted to evaluate the effectiveness of computerized clinical decision systems in care for people suffering with asthma and chronic obstructive pulmonary disease (Fathima et al. 2014) and also developed Hospital Triage Systems (Korrapati, 2014).

In a more recent study by Hicks et al. (2016), Clinical decision support (CDS) has been recognized as important tool for the implementation of pharmacogenomics into routine patient care. The study describes existing pharmacogenomic informatics models, identifies key implementation steps, and discusses emerging resources that can facilitate the development of pharmacogenomic CDS in the electronic health record. Alickovic and Subasi (2016) conducted a study on medical decision support system for diagnosis of heart Arrhythmia using DWT and Random Forest (RF) Classifier. The study shows that RF classifiers achieve superior performance compared to other decision tree methods.

## SUMMARY

The future for MDSS and its application appears extremely bright and if fully embraced then there is scope for tremendous growth and evolution. Schwartz (1970), predicted that by the year 2000 computers would `have an entirely new role in medicine, acting as a powerful extension of the physician's intellect'. While this prediction is not too far from being realized, there is still a long way to go.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

## REFERENCES

1. Alickovic, E., & Subasi, A. (2016). Medical decision support system for diagnosis of heart arrhythmia using dwt and random forests classifier. Journal of medical systems, 40(4), 1-12.
2. De Dombal, F. T., Leaper, D. J., Staniland, J. R., McCann, A. P., & Horrocks, J. C. (1972). Computer-aided diagnosis of acute abdominal pain. Br Med J, 2(5804), 9-13.
3. Fathima, M., Peiris, D., Naik-Panvelkar, P., Saini, B., & Armour, C. L. (2014). Effectiveness of computerized clinical decision support systems for asthma and chronic obstructive pulmonary disease in primary care: a systematic review. BMC pulmonary medicine, 14(1), 1.
4. Haug, P. J., Gardner, R. M., Tate, K. E., Evans, R. S., East, T. D., Kuperman, G., ... & Warner, H. R. (1994). Decision support in medicine: examples from the HELP system. Computers and Biomedical Research, 27(5), 396-418.
5. Hicks, J. K., Dunnenberger, H. M., Gumpper, K. F., Haidar, C. E., & Hoffman, J. M. (2016). Integrating pharmacogenomics into electronic health records with clinical decision support. American Journal of Health-System Pharmacy, 73(23).
6. Korrapati. R. B. (2000a). A Bayesian Framework to Determine Patient Compliance in Glaucoma Cases. Doctoral dissertation. Nova Southeastern University. Retrieved from NSUWorks, Graduate School of Computer and Information Sciences. http://nsuworks.nova.edu/gscis_etd/643.
7. Korrapati, R., Mukherjee, S., & Chalam, K. V. (2000b). A Bayesian Framework to Determine Patient Compliance in Glaucoma Cases. Proceedings of the AMIA Symposium, 1050.
8. Korrapati, Raghu Babu. (2014). Post-Doctoral Dissertation in Computer Science and Engineering, "A study on Medical decision support systems with reference to Artificial Intelligence based Hospital patient disposition system", Jawaharlal Nehru Technological University Kakinada, AP, India.
9. Ledley, R. S., & Lusted, L. B. (1959). The use of electronic computers to aid in medical diagnosis. Proceedings of the IRE, 47(11), 1970-1977.
10. Miller, R. A. (1994). Medical diagnostic decision support systems—past, present, and future. Journal of the American Medical Informatics Association, 1(1), 8-27.
11. Pombo, N., Araújo, P., & Viana, J. (2014). Applied computer technologies in clinical decision support systems for pain management: A systematic review. Journal of Intelligent & Fuzzy Systems, 26(5), 2411-2425.
12. Schwartz, W. B. 1970). Medicine and the computer: the promise and problems of change. New Engl. J. Med., 283, 1257±1264
13. Shortliffe, E. H. (1976). Computer-based medical consultations.
14. Übeyli, E.D. (2009), Adaptive Neuro-Fuzzy Inference Systems for Automatic Detection of Breast Cancer, J Med Syst 33: 353. doi:10.1007/s10916-008-9197-x
15. Warner, H. R., Toronto, A. F., & Veasy, L. G. (1964). Experience with Baye's theorem for computer diagnosis of congenital heart disease. Annals of the New York Academy of Sciences, 115(1), 558-567.

CITE AN ARTICLE

**Korrapati , R. B. (2017). COMPREHENSIVE RESEARCH MAP ON MEDICAL DECISION SUPPORT SYSTEMS (MDSS) – HISTORICAL EVOLUTION REVIEW. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, *6*(5), 399-401. doi:10.5281/zenodo.573546**