APPENDIX B

Table A1: Review of selected articles

	Title, Reference; Type of Study	Focus/Objectives	Underlying Technology	Main Findings	Other Findings	Insights and Comments
1.	Disease Diagnosis System (Biswas & Bairagi, 2011); Conceptual	Creation of expert system (ES) for medical diagnosis based on prototyping of patient cases. Literature and human experts served as knowledge basis	MATLAB production rules; MS Excel and Visual Basic	System leverages on 3 modules and able to proceed from general examination and previous consultations (connection with available database) to generate future diagnosis	System is designed for use by experts. Diagnosis made by system is evaluated by a human expert to identify errors	System is expert-dependent, unable to function independently. A ***physician-machine-patient*** system is created
2.	Rule Based Expert System for Diagnosis of Neuromuscular Disorders (Borgohain & Sanyal, 2012); Empirical	Rule based ES for medical diagnosis; employs pattern matching for knowledge-base search for useful information on likely diagnosis based on user-supplied information	Java Expert System Shell (JESS) and RETE pattern-matching algorithm; diagnostic process implements decision tree	System is able to make accurate diagnosis. It is a ***machine-patient*** system that employs a GUI that uses textual input/output procedure	Knowledge base development employed experts; user is restricted to fixed answer options (yes/no)	User must have basic computer literacy as well as training on how to use the system. System can be deployed on selected platforms.
3.	Symptom-Diagnosis-Care: A Framework for a Collaborative Medical Chat Bot (M Fischer, 2016); Empirical	Design and evaluation of a symptom-diagnosis-care framework for training medical chat bots using information from the "American Medical Association Family Medical Guide" book	Chat bot interface was created with jQuery, Bootstrap, and HTML, flow chart with interact.js; system server written in Node.JS with a Postgres database	Framework deployed on mobile phone. Follows the yes/no question and answer procedure to arrive at diagnosis. A ***machine-patient*** system is created. System employs a GUI on which the user can click or type; uses crowd workers rather than experts for system training	Procedure is in line with script theory as employed by medical experts in diagnosis. Design constrains user to pre-defined responses; limited error but also limited application	Further studies to address possibility of links to patients' medical history and (possibly wearable) devices that can create seamless access to other information required in the diagnostic process (e.g. patient vitals)
4.	From Books to Bots: Using Medical Literature to Create a Chat Bot (Michael Fischer & Lam, 2016); Empirical					

5.	Rule-Based ES for the Diagnosis of Memory Loss (Holel & Gulhane, 2014); review	Proposes rule- and case-based reasoning for the design of expert system for medical diagnosis	-	Designed as a patient support system in the absence of professional medical service or as first aid procedure	Common ailments are addressed. Implementation and evaluation of proposal reported elsewhere	Access to medical databases for system training, patient privacy, data security & confidentiality are noted for future studies
6.	Knowledge discovery in medical systems using differential diagnosis, LAMSTAR & k-NN (Isola et al., 2012);	Design, development and evaluation of a diagnosis system employing an algorithm based on the integration of factors from neural networks, LAMSTAR, k-NN and DD. System is built on the store of available medical record to support history-based diagnosis by computing the probability of occurrence of an ailment using data mining.	3-tier workflow pattern including symptom matching, mining of medical records & differential diagnosis followed by weighting using LAMSTAR. Prototype developed with PHP, MySQL and AJAX. System employs SOA	Emulates differential diagnosis (DD) process; singularizes underlying variables through smart pattern matching with k-NN classification technique and the next probable diseases by performing DD using Hopfield neural networks and LAMSTAR. When linked with medical history, the probability of occurrence of a disease can be calculated.	Evaluation of system shows high degree of accuracy. Outputs are presented as tables ad graphs that depicts the probability of the different diagnostic possibilities. However, pilot study employed manual data entry	System is able to serve as a complement rather than a substitute for the doctor. It is a physician-system-patient design that is meant to support the doctor and reduce the risk of misdiagnosis, system still requires intensive learning to be useful. The challenge of the human doctor as the know-all in medical practice in spite of his/her dangerous limitations remains strong.
7.	Rule Based Expert System for Viral Infection Diagnosis (Patel et al., 2013)	Design, implementation and evaluation of a rule based ES application for viral infection diagnosis. Testing phase system diagnostic performance against human doctor diagnosis	ES deployed on dual web server with a Tomcat container for request-response cycle processing and MySQL database as knowledge base	System performance was 90% as effective as human doctor evaluation. Room for improvement is indicated as codes are yet to be optimized	User must possess domain knowledge; data input is complex, requiring advanced search techniques	Data security, privacy, confidentiality and ambiguity are subjects for further research.

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8.	Designing Useful Virtual Standardized Patient Encounters (Talbot et al., 2012)	Discuss approaches to creation of dialogue-based conversational agents as virtual standardized patients (VSP); propose a theoretical model based on synthesis of educational approaches; recommend strategy for acceptable VSP experience	Artificially intelligent statistical matching dialogue system with multiple choice state machine-based sub-conversations	Virtual human natural language dialogue AI, VSP authoring and robust assessment are crucial in building VSP for medical practice	A simple Educator-friendly case editor is an important concept required to make a VSP acceptable tool for medical education	While the cost implication of learning in medical practice will reduce significantly, the quality will improve with the use of virtual standardized patients.
9.	MediAssistEdge – Simplifying diagnosis procedure & Improving patient-doctor connectivity (Tripathy & Carvalho, 2015)	Design, development, and evaluation of a dual-part remote diagnosis system to address access to healthcare in underserved populations; system focus is to provide second opinion to experts during diagnosis or provide basic diagnosis of diseases at first aid level (requiring no prescriptions).	2-part system: MediConnect provides remote diagnosis using videoconferencing with extended capability through electronic stethoscope (Stetho) and diagnosis camera (DiagnoCam). DocBot was built with PHP, MySQL and AIML.	The system can facilitate patient to doctor interaction; MediConnect for real doctor-to-patient interaction and DocBot to diagnose patients using an AI engine	The MediConnect subsystem has a video conferencing module to help the doctor to examine the patients with higher efficiency	For a service to be deployed in a developing nation, concerns for internet access and quality (for videoconferencing) are key concerns. Adding other basic equipment (thermometer, sphygmomamometer, etc.) can improve service tremendously
10.	Health Care in the Year 2050 (Wowk, 2013)	Discusses possibilities in healthcare by 2050.	-	Advances in AI, big data, microelectronics, chatbot technology, etc. will multiply possibilities. System miniaturization will increase parallel processing capacities. With AI, future possibilities are almost incomprehensible.	To position medicine into the realm of what is possible by 2050, it is helpful to view health care in three parts: Information, intelligence, and intervention.	Wearable medical devices and mobile data on health status; doctor bots operating across great digital divides, performing the most accurate diagnosis/care, interacting in natural language, processing tonnes of information in moments and rendering humans truly irrelevant

11.	Artificial Superintelligence: A Futuristic Approach (Yampolskiy, 2015)	Discusses artificial superintelligence, and AI safety engineering as way to prepare for the potential dangers to humanity in the future. Robot rights	N/A	Human-level AI may be achieved in the future, this pose potential dangers; from economic hardship to the complete extinction of humankind, though the benefits are enormous.	AI-Completeness theory can be used to checkmate the closeness of artificial intelligent agent to human level intelligence	The concept of robot rights, implying the personhood of intelligent machines holding equal rights and privileges with humans is a scary notion that may be the beginning of the end of the human race. Caution must be exercised in whatever is done as progress is made in AI and super-intelligent machines in every field including healthcare.

LAMSTAR: Large Memory Storage and Retrieval; *k*-NN: k number of nearest neighbours; SOA: Service-Oriented Architecture

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