Insights of Medical Practitioners on Utilizing Artificial Intelligence Technology for Diagnosing Respiratory Diseases

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ABSTRACT

Although the utilization of artificial intelligence (AI) in respiratory diseases care has been growing, there seems still many implementation issues. The purpose of this research is to investigate how medical professionals feel about the use of AI tools, as well as to investigate the many difficulties associated with putting these tools into practise in the context of diagnosing and treating respiratory disorders in tertiary care settings. At Tamil Nadu's tertiary care hospitals, a mixed method of research was carried out with 104 medical practitioners chosen randomly. The quantitative data were gathered using a semi-structured schedule. The two narrowly focused group talks executed for brainstorming (FGD) and analysed using the descriptive and qualitative statistical measures. Among all, 67.3 % concurred that AI can be applied in respiratory medicine, and 69.4% perceived AI implementation hurdles.

Keywords—Artificial Intelligence, deep learning, machine learning, X-Ray, Respiratory Medicine.

I INTRODUCTION

Many recent advances in technology, such as AI, have benefited the healthcare industry (AI). 1 AI, or artificial intelligence, is the emulation of human intelligence in machines through the application of machine and deep learning techniques and algorithms to achieve the same results. AI includes subsets of techniques such as Machine learning (ML) and deep learning (DL) that contribute implement AI intensively. 2

Machine learning (ML) is an advanced version of artificial intelligence (AI) which helps the systems to automatically learn from experience without complex programme. 2 Deep learning (DL) helps ML works better contributed with neural networks. Algorithm is very important for any application of learning (ML) which is used in various fields. An algorithm is a set of rules given to a machine that uses AI software, neural network to aid in its autonomous learning. The foundation of AI is constructed with well-designed algorithms. 3

Numerous industries employ AI for their convenient communication with customers. Chatbots are used for conversations via chat, e-commerce, and banking. Intelligent virtual assistant for workplace communication, human resource management, logistics and supply chain, the sports betting industry, transportation, and healthcare. 4,5 AI will soon alter the healthcare industry and how corporations use it. Regarding quality and patient safety in health care industries, AI increases dependability, predictability, and consistency. 6

Although the use of AI in pulmonary medicine has been growing, there are still implementation issues. 7,8 More research is necessary to pinpoint algorithmic bias themes, lessen brittleness and increase generalizability, and provide strategies for a seamless AI implementation. 9,10 This research will therefore seek to ascertain the opinions of healthcare providers on the use of AI tools.

II AIM & OBJECTIVE

To investigate medical practitioners' opinions of using AI technologies, as well as the different hurdles associated with using these techniques in diagnosing respiratory disorders in health care services.

III MATERIAL AND METHODS

This cross-sectional type of study used the combination of qualitative and quantitative methodologies. Both public and commercial tertiary care hospitals in Salem, Tamilnadu, were considered for this project. The total duration of the project was three months which includes planning to report writing. Firstly, quantitative portion, 104 medical physicians were chosen using the Convenience Sample approach. Views on AI in heath, knowledge on AI, advantages, and downsides of technology, how AI may be utilised in medical and surgical care, risks of AI, implementation challenges, and alternative methods in implementing AI dominated the discussions. The interviews with doctors were conducted using pretested schedule. Based on the findings, the qualitative data collection using the saturation coverage method, two FGDs were held in two different institutions.

From the literature research and quantitative study, we were able to compile a list of potential topics for the FGDs. A schedule was created to collect data based on the FGDs' input. A general view of AI, the benefits and drawbacks of AI, its use in medical care and the treatment of respiratory diseases, the difficulties associated with implementing AI in health care settings, and potential solutions to those difficulties were covered. Preliminary testing of the instrument led to the finalisation of a Linkert's scale of agreement. To further categorise your responses, we have created five distinct options for each overarching category: Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. Prior to use, the tool was pretested in a closed setting.

People interested in joining the focus group preliminarily filled out the necessary consent paperwork. Prior to starting the study, institutional approval was sought, and a quiet location was carefully selected. The FGDs begin with the moderator's opening introduction. Every participant had an equal opportunity to win, and there was sufficient time for them to contemplate and respond to the question. Without skipping a beat, the full sessions were recorded for transcription.

IV METHOD OF DATA COLLECTION

In order to conduct a quantitative investigation, individual consent forms were developed. The quantitative data was gathered in under two months using a semi-structured schedule. The answers were gathered both online and in person. Trained staff collected the data using online and offline forms. The FGDs were recorded and transcribed in relevant format for analysis.

V ANALYSIS

The acquired quantitative data was entered into an MS Excel spreadsheet and examined with Epi info. Statistical measures of descriptive nature, such as means and standard deviations, were used. Likert ratings between 1.2 and 2.60 were regarded as low, between 2.6 and 3.40 as moderate, and between 3.41 and 5 as high. Transcripts of focus group discussions recorded on digital voice recorders were evaluated with the qualitative research platform MAXQDA.

VI ETHICS

Institutional Ethics Committee at VMKV Medical College in Salem gave its consent to the study.

VII RESULTS

In the beginning, there were two focus group discussions held in Salem's two medical colleges and hospitals. The participants for two FGS comprise nine and ten participants respectively. With 60% men and 40% women participating in the FGD, several specialist doctors were represented. The quantitative research was carried out at the same sites with the same number of participants, 104. Among participants, 54% came from of general medicine, 28 % respiratory medicine, and the rest were from other departments. The participants' average age was 33, with men (75%) being 48 and women (25%) being 16

years old. 37 respondents (or 77%) of the total heard about AI. Most of them had prior knowledge about this from the Internet (50%), meetings and seminars (28%), chatbots (12%) and friends (10%).

Table 2 presents participants' perspectives of challenges and difficulties in using AI for medical care. " Can't work based on the need of different patients.," was given as one AI drawback. high mean of 3.12 (SD 2.37), while the top scored item was a moderate response to " AI is expensive to develop and adopt," with a mean score of 4.66 (SD 2.38). "Incredulous Data and Privacy issue" rated last with a mean of 3.99 (SD 2.45) and the highest-ranked item was a moderate reaction to " AI law should be there " with a mean of 4.58. (SD 2.64). Many people, to a considerable extent, concur that AI may be used in hospitals following capacity building and the establishment of specific rules.

Regarding the uses of AI in medical care and, specifically, its function in respiratory disease care, the responses from respondents are given in Table 3. Overall, 68% of respondents felt that AI would be helpful in medical care, with 79% of those citing respiratory care services. The belief that " AI is usable in screening, diagnosis, treatment and follow-up " came in first with a high level of acceptance (mean 4.24, SD 2.15), while " AI can do wonder in medical services " came in last with a mean of 3.91 (SD 2.08), which is a moderate level on the Likert scale for health care use. The response, "Electronic health records automation" received a high score (mean 4.51, standard deviation 2.32), while "Mechanical ventilation Assessment" received a middling grade (mean 3.92, SD 2.38). A mean of 3.72 (SD 2.29) received Positive AI responses and a mean of 4.32 as negative AI responses, which is considered to be moderate responses (SD 2.12). Overall, the response was moderate (3.98 SD) for AI in health and high (4.01 mean) for AI use in respiratory care (SD 2.50).

VIII FINDINGS FROM QUALITATIVE STUDY

Respondents were already used some of the gadgets that used AI principles such as BMI calculator, ECG machines, Growth monitoring charts, Vaccine reminder, medicine reminders, etc. The respondents were concerned about the inception of several algorithms without or minimal guidance from of medical experts and with less or insufficient data. They preferred that medical professionals oversee the monitoring of AI results. AI was unable to identify any patient cues. While AI can assist doctors, it cannot fully replace them. AI can be used as an alternative to verify a doctor's diagnosis.

IX DISCUSSION

Some common applications that use AI or automated results are used by the respondent. These include ECG machine with automatic reading, a BMI calculator, GFR, growth monitoring, vaccine reminders, and various prescription reminders. The participants were more concerned about the inception of several algorithms without the proper inputs of medical experts and insufficient data sets to develop AI system. They also wish that medical professionals should oversee the monitoring of AI results. AI was unable to identify any patient cues. While AI can assist doctors, it cannot fully replace them. AI can be used as an alternative to verify a doctor's diagnosis.

Some people continue to have a negative attitude toward medical AI for a various reason, including lack of faith in tools of AI and the absence of a humanistic care aspect. The additional challenges include bias in AI, lack of labelling, security, feasibility, high dimensionality, heterogeneity, many algorithms for one domain, sparsity, time dependency, irregularity, poor reliability, interpretability, and scalability for wider use or clinical. (9) Most respondents in a Saudi Arabian study (14,15) were clueless about the benefits and typical hurdles presented by AI applications in the healthcare industry, highlighting the importance of education. 16 Cybersecurity, ethical issues, cost, safety and effectiveness, privacy, data security, legal issues, transparency, intellectual property legislation concerns, liability, standardization issue, and evaluation are a few of the difficulties. 17,18

The practitioner might be in a better position to diagnose patients more quickly and accurately by integrating AI in to imaging instruments. Clinical productivity may be significantly impacted by AI. 19,20 In health care setting, AI tool for patient care services, collaboration and supply are crucial for successful implementation of industry-developed AI. After clinical review, healthcare institutions need human and material resources for intramural AI systems. 21, 22 Recent developments in artificial intelligence offer a fascinating chance to advance healthcare such as IBM, Microsoft, Google's, TenCent chronic in areas like disease treatment, cancer treatment, cancer therapy, and medical services respectively. The different organizations are come forward in artificial intelligence algorithms development in different domain.4

The National digital health mission (Ayushman Bharat Digital Mission) started to support the integrated digital health infrastructure and help to resolve the challenges in the implementation of AI. India's National Health Policy 2017 calls for the

adoption of new technologies like artificial intelligence, Blockchain, the internet of things (IoT), and the cloud. So, the country's government has launched the National Digital Health Mission (NDHM). 23 A National Digital Health Blueprint was created with the goal of digitizing healthcare in India. 24 NDHM Sandbox helps the users can test the development version of applications of AI. 25 This will support the creation of various AI tools and their application.

X CONCLUSION

Although there are benefits to using artificial intelligence in respiratory care, there is still some opposition among medical professionals. Even if AI makes reaching conclusions regarding illnesses easier and quicker, healthcare providers still believe that training, exposure to AI, and laws are required to put into place. AI algorithms are not widely available and are expensive, which limits their potential for usage.

XI RECOMMENDATION

It is possible to build a small-scale algorithm for respiratory conditions using a multidisciplinary participatory approach, and then deploy it in hospitals after educating the personnel who offer medical care.

XII LIMITATIONS OF THE STUDY

The study's small sample size and restricted number of locations prevent it from extending to the entire state of Tamil Nadu.

XIII RELEVANCE OF THE STUDY

Although it is a rapidly developing topic in healthcare, few institutes now apply artificial intelligence especially respiratory disease care. This study examined how medical practitioners felt about AI. This is useful information for any AI tools which is developed for health care services.

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Tables:

Table 1: Advantages and Perceptions of AI among participants

Rank	General Perspective on AI in Health Sector	η	Mean	SD	Agreement Rate (%)	Level of Agreement

1	AI supports faster decision making for the diagnosis of diseases	102	4.12	2.52	65.95	High
2	AI conquers the challenges of human intelligence	104	3.76	2.56	55.16	Moderate

3	AI cut down the cost of the treatment	104	3.75	2.55	57.72	Moderate
4	AI could supplant doctors shortly	103	2.87	2.54	37.36	Low
5	AI tool are limited for wider use	104	3.70	2.36	58.61	Moderate
6	Practitioners are ready to welcome AI	103	3.56	2.33	51.28	Moderate
Rank	**Advantages of AI in Medicine**	**η**	**Mean**	**SD**	**Agreement Rate** (%)	**Level of Agreement**
1	AI can fasten the treatment cycle	103	4.12	2.24	65.02	High
2	AI brings real time high-quality, clinically relevant, big data	103	4.33	2.26	72.56	High
3	AI brings significant benefit to doctor and Patients	103	4.05	2.28	62.11	Moderate
4	AI supports minimize the number of medical errors	104	4.21	2.31	68.11	Moderate
3	AI has no space-time limitation	103	4.22	2.33	71.32	High
5	AI has no physical limitation or emotional exhaustion	103	4.41	2.31	76.55	High
6	Training issues	103	4.23	2.32	69.78	High

Table 2: Challenges in adopting AI and its disadvantages

Rank	**Disadvantages of adopting AI**	**η**	**Mean**	**SD**	**Agreement Rate** (%)	**Level of Agreement**
1	AI is expensive to develop and adopt	100	4.66	2.38	78.48	High
2	Safety issues or regulatory concerns Of AI technology is enormous	102	4.46	2.36	73.11	High
3	Limited use to give opinion or work in unexpected situations	102	4.06	2.37	62.54	Moderate
4	Can't work based on the need of different patients.	104	3.12	2.37	43.68	Moderate
5	Hard to help in controversial matters	104	3.91	2.12	61.85	Moderate
6	Less ability to sympathize and emotional well-being of the patient	104	4.14	2.12	66.22	High

7	AI developers have less clinical exposure	103	3.87	2.05	57.57	Moderate
8	AI lessen the patient- physician relationship	103	4.13	2.08	66.73	High

Rank	Challenges in adopting AI	η	Mean	SD	Agreement Rate (%)	Level of Agreement
1	Implantation issues or practical aspects of AI	103	4.44	2.52	72.95	High
2	Further research is needed for special circumstances use	104	4.32	2.45	72.75	High
3	Assessment criteria of AI	104	4.32	2.55	72.23	High
4	AI law should be there	103	4.58	2.64	75.88	High
5	Incredulous Data and Privacy issue	103	3.99	2.45	62.32	Moderate
6	Ethical challenges	102	4.28	1.95	67.78	High
7	Less acceptability by the providers	103	4.13	0.78	64.52	Moderate
8	Organizational support will be considered	101	4.18	0.69	67.20	High
Rank	Go Forward	**η**	Mean	SD	**Agreement Rate** (%)	**Level of Agreement**
1	AI protocol by the concerned authority	100	3.89	0.11	58.52	Moderate
2	Inclusion of AI in medical syllabus	104	4.04	0.11	64.37	Moderate
3	Govt. shall come up with open-source AI	104	3.82	0.14	58.31	Moderate
4	Collaborative with public and private sector for AI development	104	3.84	0.07	58.17	Moderate

Table 3: The AI adoption in medical care and respiratory diseases care

Rank	The AI adoption in medical care	Mean	SD	Agreement Rate (%)	Level of Agreement
1	AI can do wonder in medical services	3.91	2.08	59.71	Moderate
2	AI has high impact on patient treatment journey and outcome	4.04	2.14	63.47	Moderate

3	AI is usable in screening, diagnosis, treatment and follow-up	4.24	2.15	70.96	High
4	This replaces or additional service in the	3.96	2.21	62.84	Moderate

	current patient care				
Rank	AI's role in respiratory disease care	Mean	SD	**Agreement Rate** (%)	**Level of Agreement**
1	Triage of X ray and CT scan to diagnose respiratory diseases	4.01	2.28	65.28	High
2	AFB testing/reading support	4.12	2.32	65.65	High
3	AI help adherence of treatment	4.23	2.25	68.33	High
4	Risk analytics of respiratory disease	4.15	2.31	65.98	High
5	Electronic health records automation	4.51	2.32	75.91	High
6	Mechanical ventilation Assessment	3.92	2.38	59.91	Moderate
7	Analytics in Surgery, Robotic surgery	4.08	2.35	63.55	Moderate
8	PFT Assessment	4.44	2.38	74.14	High

Table 4: Findings from FGD -Positive and negative aspects, adaptation challenges and uses in healthcare

Positive aspects of AI	**Negative aspects of AI**
"AI shall be used for Triaging, Screening, First aid room, Rural health centers or primary health care" "It helps the doctors to arrive the diagnosis and save times" "Human error shall be minimized if used the proper AI." "The monitoring or follow-up will be assisted" "This reduce the whitecoat fear mainly children" "AI Machines can do complex calculation easily." "It can give timely updates to health care system" "AI driven Robots can help to do microsurgeries/ robotic surgeries."	"We may lose patient- doctor relationship" "AI can give differential diagnosis. But finding out the exact diagnosis will not be clear." "Doctor only able to give advice or counseling." "Machines can't do needed physical examination as desired to arrive the diagnoses." "The patients may not trust the machines because of possible errors" "The empathy component is limited in the machine." "Finding multiple risk factor is difficult by machines."
Adaptation Challenges	**Uses of AI in Respiratory Care Medicine**
"The Practitioner's knowledge and exposure on AI is less and people awareness is also low." "There is no open-source algorithm available widely"	"AI can be used in many areas of healthcare especially respiratory Medicine." "We may able to identify the source of allergy by using AI."

"Cost for the development of AI is high." "Each disease has different algorithm. If buy more algorithm cost will be high and treatment cost is also high." "Challenge of monitoring and update." "Needs technical knowledge to run AI." "AI should be user friendly." "No standardizing mechanisms and government regulations." "There should be some mechanism to keep the data privately" "Electricity backup is needed" "Medical curriculum should include AI."	"We can use AI for having reminders so adherence can be ensured" "AI in heavy air polluted places to assess the lung condition" "In ICU, it can be used to reduce the workload of the Health care satff for constant monitoring of parameters of the patients." "Useful in reading X Ray, CT/MRI,ECG or USG automatically" "It can be used for bronchoscopy, cancer screening and detection in different breath sounds, cardiac sounds" "It can be used in cardiac autonomic neuropathy"

Biography of Principal author

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She is currently working as Professor and Head in the Department of Community Medicine at VMKVMCH, Salem, Tamil Nadu, India. She was an Assistant professor in Vinayaka Mission's Medical College,Salem and Associate Professor in Annapoorna medical college,Salem, India. She was selected as Professor and HOD of Community Medicine Department at ESIC Medical College, Chennai and she worked for a period of 1year in Chennai. She completed MBBS from Bangalore Medical College, Bangalore, Karnataka, India in 2001,with gold medal in ENT and Master degree(MD) in Community Medicine from Karnataka Institute of Medical Sciences , Hubli, Karnataka, India in 2006,with state 2nd rank in MD exams. She is interested in Reproductive & Child Health Programme, Artificial Intelligence, Communicable diseases, Non Communicable diseases and Nutrition. She attended as an invited speaker, to share her research experience on ''Community based study on Reproductive Tract Infections among women'' in an International Conference of

Gynaecology and Obstetrics (ICGO-2013),under 1st Annual Global Health Conference, held at Dalian, China from Oct 11th-Oct 15th 2013. She has won best paper presentation award as PG in KACH (Karnataka Association of Community Health) conference and in Indian Association of Public Health conference, Cochin, Kerala, India as a faculty. She has been also awarded Dr APJ Abdul Kalam award for teaching excellence in 2017 by Marina Labs Research and Development, "Dr. Sonaji Jogadand Prize" award in the category of "Occupation/Environmental Health" for her oral presentation in 22nd Annual Maharashtra State Joint Conference of IAPSM & IPHA – 2021 and Best Researcher award 2021 by VMKVMCH, Salem.

She has the credit of conducting an Integrated National Public Health Conference, first time in India, as an Organizing Secretary at VMKV Medical College, Salem, Tamil Nadu on Dec 2nd and 3rd 2017. She is an Editor in Chief for University VMRF (DU) News Letter – VINSAGA. She has 22 published papers in National indexed journals and 10 papers in International indexed journals.

DISCLAIMER

This chapter is an extended version of the article published by the same author(s) in the following journal.

Journal name: National Journal of Basic Medical Science Jul-Sep 2021; 12 (1):1-13