



KNOWLEDGE, ATTITUDE AND PERCEPTION ON THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN DIAGNOSTIC SERVICES AMONG HEALTH CARE WORKERS OF VARIOUS CITIES IN SOUTH INDIA

Presented by Dibyaloson Rabha

MBA-HM24

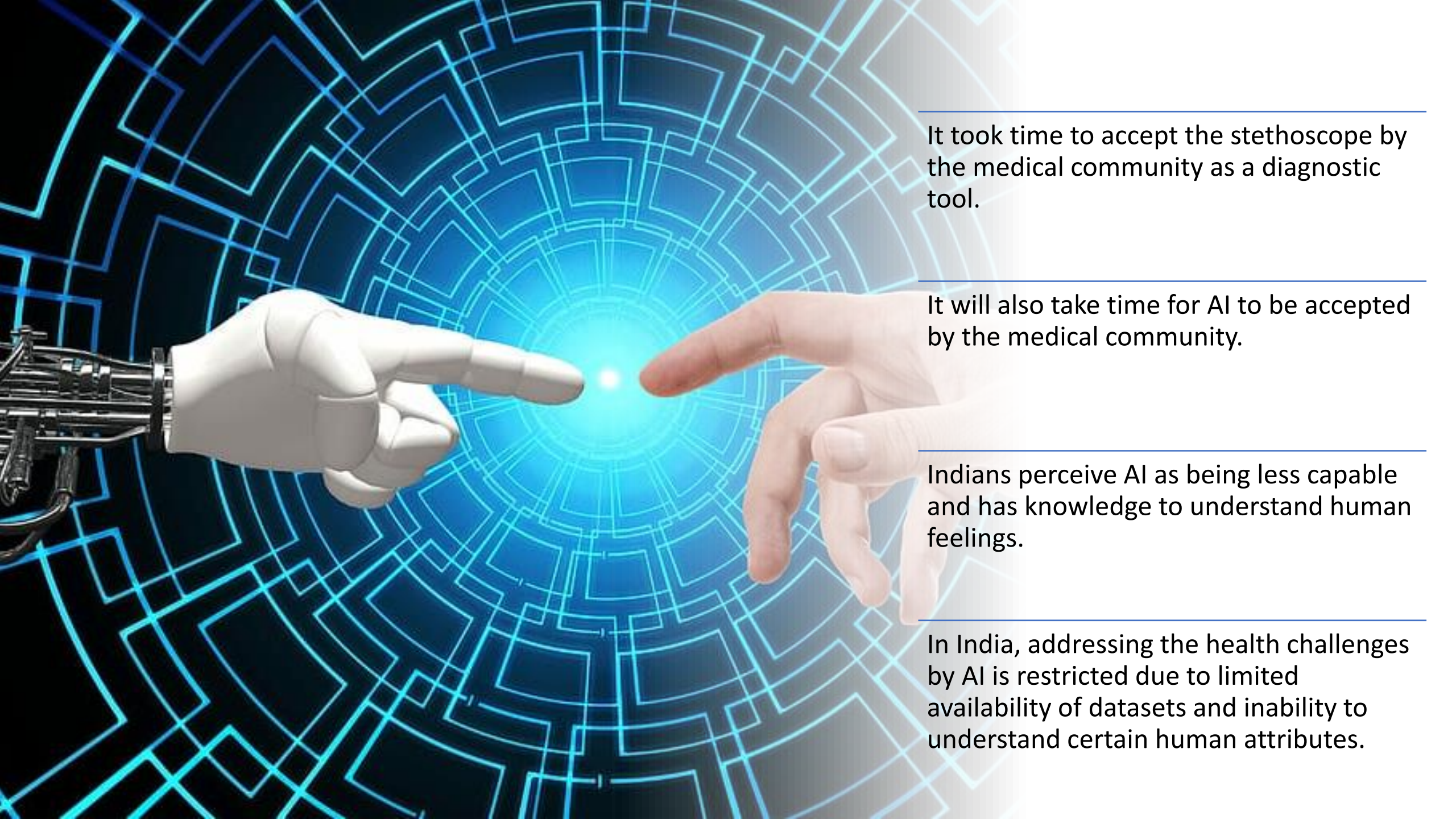
Under the guidance of faculty mentor

Dr. Sheenu Jain



INTRODUCTION

- In 1956, John McCarthy coined the term “Artificial Intelligence” for the first time
- AI is playing a crucial role in medicine and health care due to its advance computing power.
- A report by NITI Aayog stated that AI market will increase at the rate of 1.3% in India.
- Computer-aided endoscopic system used to detect cancers showed 94% sensitivity, 74% specificity and 86% accuracy.



It took time to accept the stethoscope by the medical community as a diagnostic tool.

It will also take time for AI to be accepted by the medical community.

Indians perceive AI as being less capable and has knowledge to understand human feelings.

In India, addressing the health challenges by AI is restricted due to limited availability of datasets and inability to understand certain human attributes.



VentureBeat

- Robotic-assisted surgery-estimated value is \$40 billion
- Virtual nursing assistant \$20 billion
- Administrative workflow assistance \$18 billion.
- Heartlander-designed to perform heart surgery with minimal damage to the heart.
- AI can also be used to detect tumors, gait disorders and fall prediction,
- to detect diabetes or conducting speech analysis of emotional state and psychiatric disorders.

Challenges of AI application

- Limited datasets to create a robust machine learning algorithm
- The data training sets require more and more images to improve the accuracy, sensitivity, and specificity.
- Different countries and different regions use different examination/diagnostic equipment.
- There is a lack of explanation capacity in diagnosing diseases in Machine Learning techniques.
- There is a gap in diagnosis of rare diseases.
- Financial issues.
- The rural areas lack the infrastructure to set up the Artificial Intelligence system due to issues in internet, electricity, and so on.
- Training and professional issues.

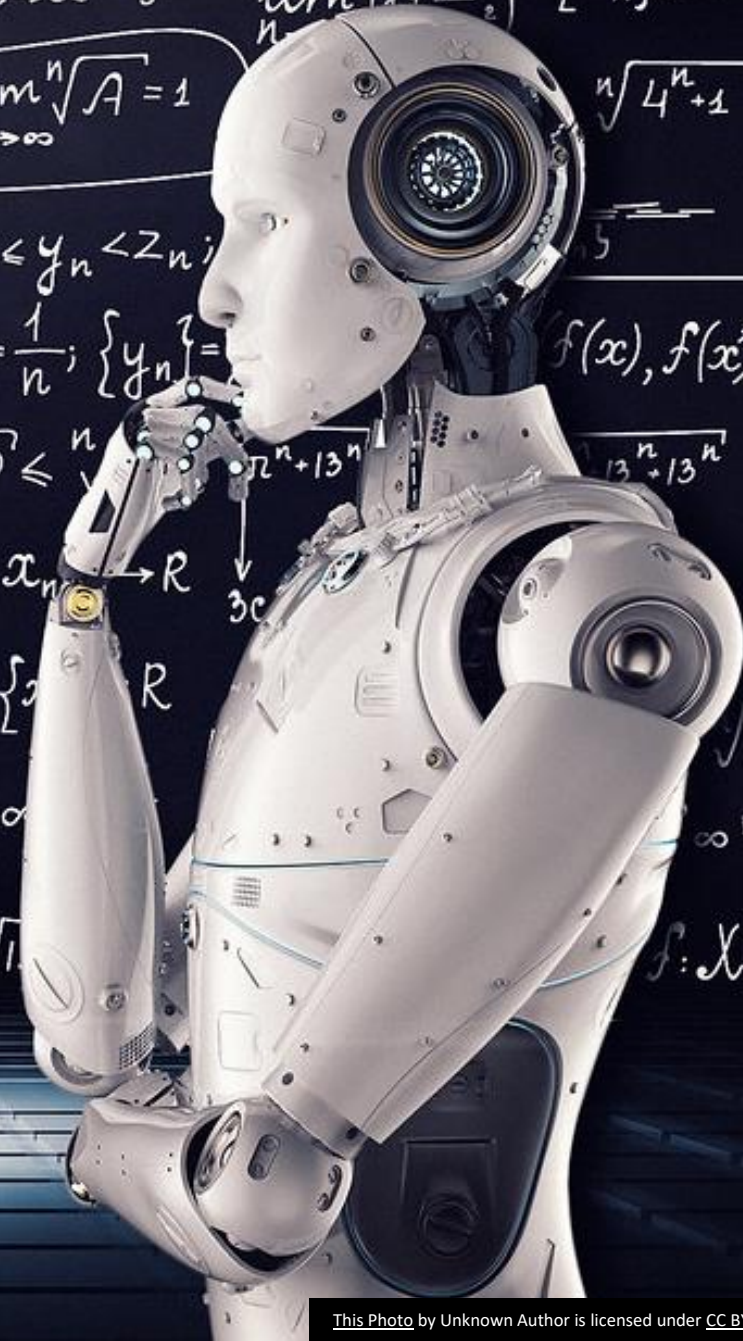
METHODOLOGY



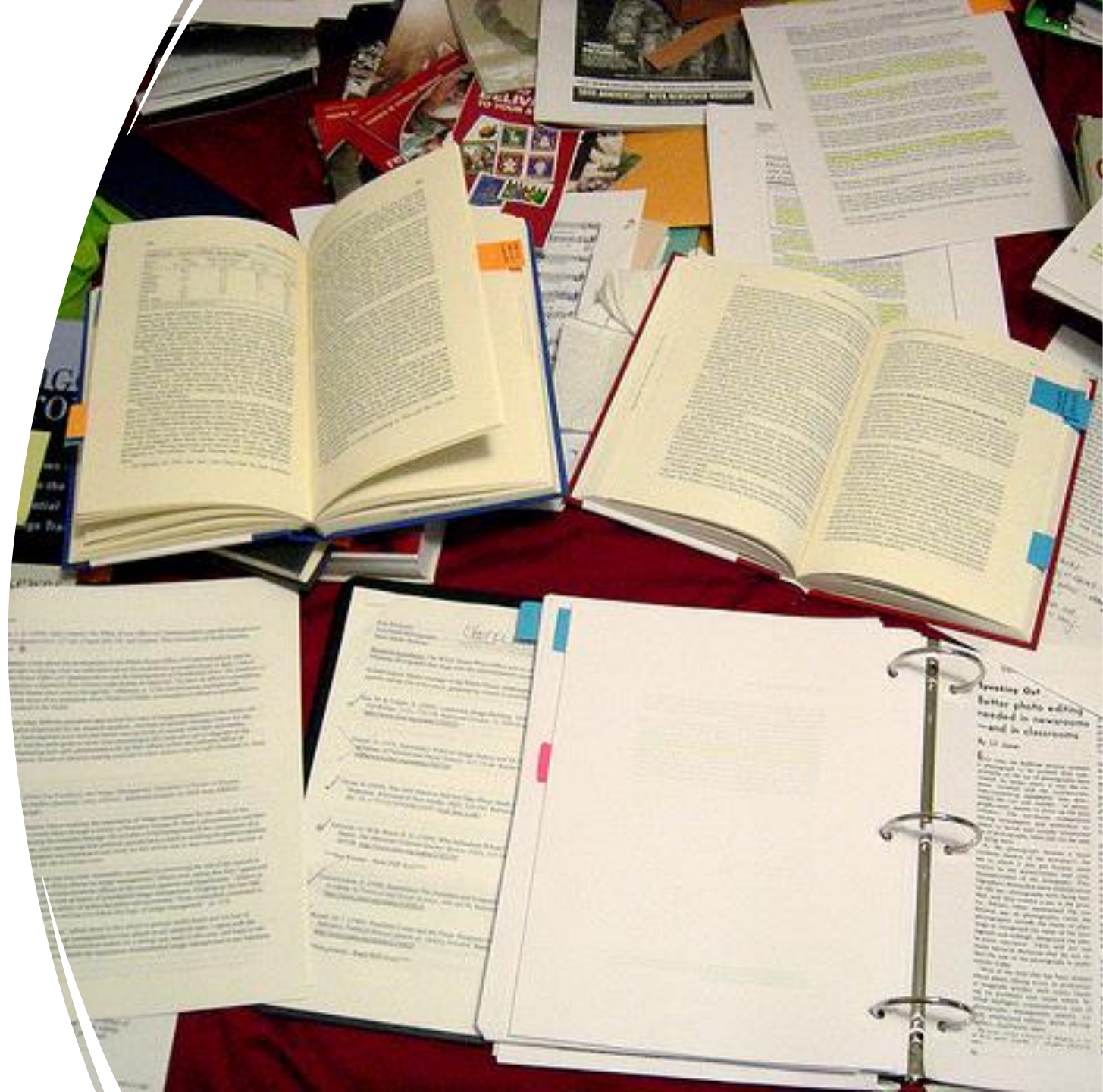
- Study design: Descriptive Analytical cross-sectional study
- Study population: Health care workers working in Radiology, Cardiology and Pathology department
- Sample size: 45
- Study area: various cities of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and Telangana
- Sampling technique: Snowball sampling
- Data analysis and visualization tool: MS Excel
- Study tool: Semi-structured questionnaire

Research Question?

Will the study participants accept AI as a full-fledged diagnostic tool?



LITERATURE REVIEW



Sl No	Title	Author	Year	Findings
1	"Artificial" or otherwise	Asa p. Ruskin	1986	The "Thinking" , machines are capable of only two responses to fire and not to fire unlike prototypical neuron. This is the building blocks of the thinking machines. This response can be made after summation of thousands of inputs. The ability of these robots to do "behaviour" allows them to perform incredibly complicated activities that may be on the same level in human terms as the creation of a termite colony.
2	"Artificial intelligence in radiology: decision support systems. Radiographics"	Kahn CE Jr.	1994	The future of AI depends on integration of previously collected radiologic studies. These studies need to be selected, analysed properly as these things share distinct elements of knowledge.
3	"Biological versus artificial intelligence: a critical approach"	W L Sanvito	1995	The authors mentioned that intelligence is purely a matter of physical symbol manipulation. The philosophers believed that computer-machines can follow rules which are like arithmetic or grammar but they cannot understand what these things would mean to them. They termed them as syntax and semantics..

4	“The coming of age of artificial intelligence in medicine”	Patel et al. (2009).	2009	The machine learning techniques will be the future in diagnostics since the future medicine is becoming more data-driven with the use of EMR(Electronic Medical Records).
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5	“Artificial Intelligence and medical informatics”	Bruce Blam,	2009	The scope of artificial intelligence define a boundary. What is well understood by us is excluded and what is not understood is included.
6	“Large scale deep learning for computer aided detection of mammographic lesions”	Kooi et al.	2017	To detect breast cancer lesions, the authors compared a traditional state-of-the-art in mammography Computer Aided Detection (CAD) system based on a manually built feature set with a DL Convolutional Neural Network (CNN) method. Around 45,000 photos were used in the system and the results showed that Convolutional Neural Network outperformed the standard Computer Aided Detection system.

7	“Artificial Intelligence is the Stethoscope of the 21st Century”	Bertalen Mesko,	2017	The medical community will take time to accept AI in diagnosis as a “full fledge diagnostic tool”, like it took time to accept stethoscope.
8	“Big Data and Machine Learning-Strategies for Driving This Bus: A Summary of the 2016 Intersociety Summer Conference”	Krustkal et al.	2017	The emerging technologies would help the radiologists to improve the quality of care they provide to the patients..
9	“Deep Learning for Brain MRI Segmentation: State of the Art and Future Directions”	Akkus et el.	2017	A Deep Learning technique was used in quantitative brain MRI and it has given impressive results, but it is still not easy to design an algorithm that could cover all types of brain MRI images taken from different MRI scanners by different institutions.

10	“Artificial Intelligence: Threat or Boon to Radiologists?”	Recht and Bryan	2017	AI will become routine part of radiologist as the Machine Learning and Artificial Intelligence are getting more integrated towards the clinical practice. These techniques will be a boon to the radiologists as it can make their work more efficient and accurate.
11	“Machine Learning of Three-dimensional Right Ventricular Motion Enables outcome Prediction in Pulmonary Hypertension: A cardiac MR imaging Study”	Dawes et al.	2017	A machine learning approach was developed by the authors that allowed them to accurately predict the fate of individuals with pulmonary hypertension. A total of 250 patients' medical records were used in the research. The authors stated “the ML techniques improved survival prediction irrespective of conventional risk factors in patients with newly diagnosed pulmonary hypertension,”
12	“The 3 most valuable applications of AI in health care”	Zaidi	2018	The author highlighted certain areas of the use of AI that looks promising, such as cognitive- assisted robotics that replaces large incisions with series of quarter inch incisions making it a minimally invasive surgery. These robots use miniature surgical instruments

13	“Will Doctors Fear Being Replaced by AI in the Hospital Settling?”	<u>Raghav</u> <u>Bharadwaj</u>	2018	Managing of huge amounts of administrative and clinical data is causing burnout among the physicians. The application of AI in this area can help solve the issue in this regard. One of the risk that has been identified is the poor data quality or “bad quality” that could lead to inaccurate clinical data.
14	“The future of radiology augmented with Artificial Intelligence: A strategy for success”	Liew (2018).	2018	AI and ML can provide support to the radiologists in decision making that can improve delivery of care to the patients. The Deep Learning algorithms can assist in identifying and classifying the disease patterns from images and helping the radiologists suggest suitable care pathways for the patient in consultations.
15	“Artificial Intelligence and Radiology: What will the future hold”	King Jr	2018	The future of radiology will not be new scanner coming to place but it will be in a way that AI utilising the imaging data already available from MRI, CT scan and PET scan. AI can do auto-segmentation of various structure within CT and MR images which will be helpful in analysing in a very short time period.

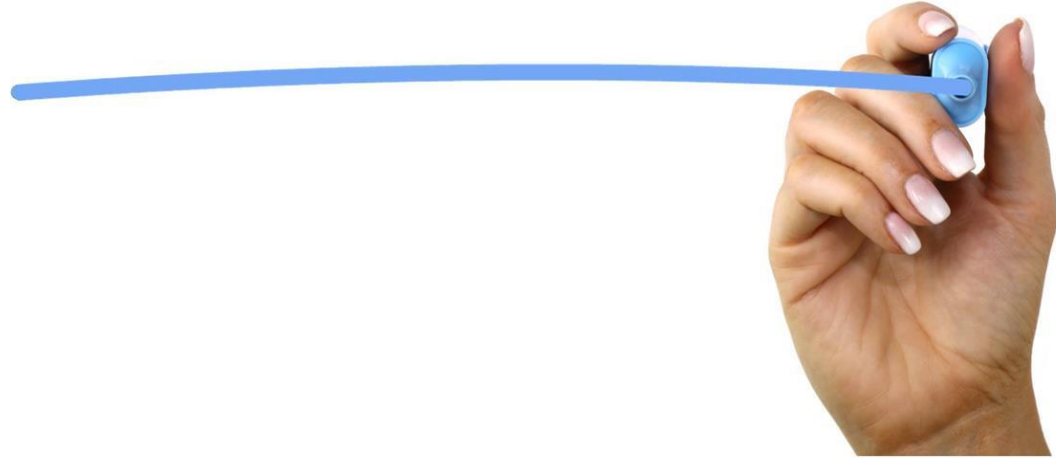
16	“Your future Doctor may not be human”	Abby Norman	2018	AI has its place in medicine but what is not known to us is its value. We should consider how the accuracies of AI and human are being checked? We should also consider how AI can contribute in medicine?
17	“Artificial Intelligence in retina”	Schmidt-Erfurth et al	2018	AI has previously been applied in medicine. An early form of AI, expert systems, attempted to codify physician choices into a set of rules that computers could follow. Considering the complex nature of medicine and the diversity of diseases, it was impossible to create an algorithm for all clinical circumstances.
18	“Artificial Intelligence as an emerging technology in the current care of neurological disorders.”	Urvish K Patel et al.	2019	“Apart from helping analyse medical data in disease prevention, diagnosis, patient monitoring and development of new protocols, it can also assist clinicians in dealing with voluminous data in a more accurate and efficient manner.”

19	“Insights into the growing popularity of artificial intelligence in ophthalmology”	Dutt S et al.	2020	The risks and rewards associated with replacement of physicians by AI are as follows: Risks Capability of AI to process larger amounts of data at a faster rate than human Capability of AI to achieve a higher level of accuracy without burnout. Rewards AI predictive models that are trained on large datasets are capable of predicting accurate patient outcome. AI may reduce the administrative work of the physicians and help them to spend quality time with the patients and other clinical staffs. AI will not be able to behave and do decision-making like a human and there will still be the need of human expertise to interpret data.
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20	“Artificial Intelligence Solutions for Analysis of X-ray Images”	Scott J Adams,	2020	AI algorithms have been developed using large datasets to analyse radiographs which demonstrates accuracy equivalent to radiologists.
21	“Artificial Intelligence in oral and maxillofacial radiology: what is currently possible?”	Min-Suk Heo et al.,	2020	There is a need for huge datasets and OMF radiologists to make get accurate results which is a time-consuming tasks. In order to make AI in full practice a lot of problems need to be addressed. Building up of huge datasets is time-consuming task, understanding the judgements criteria of Artificial Intelligence is still not known by everyone and solve the hacking threats.

22	“Artificial Intelligence for anterior segment diseases: Emerging applications in ophthalmology”	Darren Shu Jeng et al.,	2020	There are many evidences available to demonstrate that Artificial Intelligence. Can be applied to diagnosis and manage various ophthalmic conditions related to anterior segments.
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OBJECTIVES

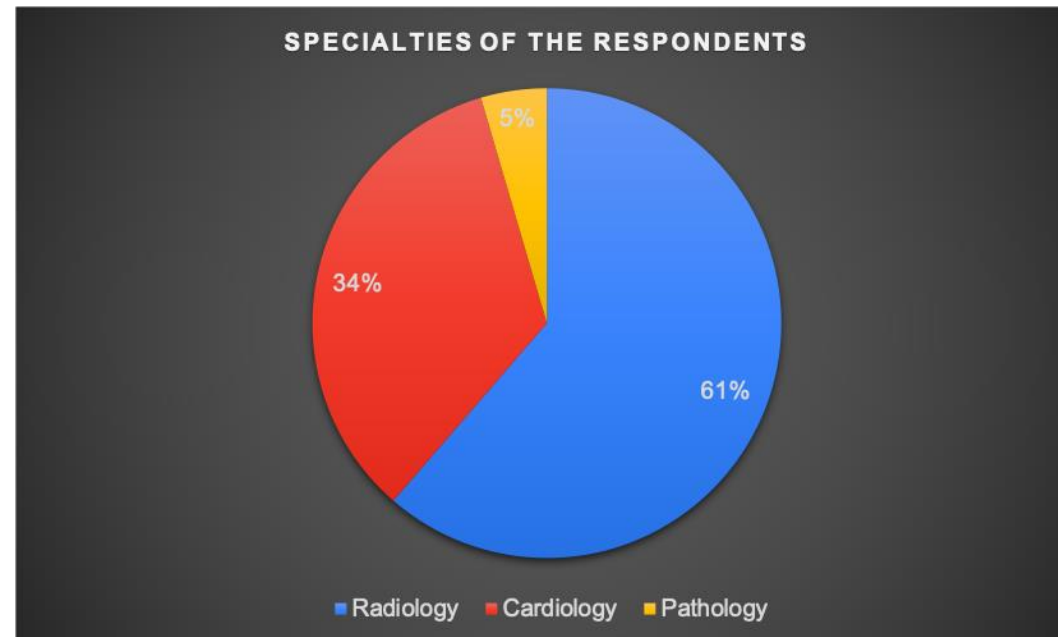


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- To assess the awareness of AI in medical diagnosis
 - To assess the attitude towards the application of AI in medical diagnosis



RESULTS

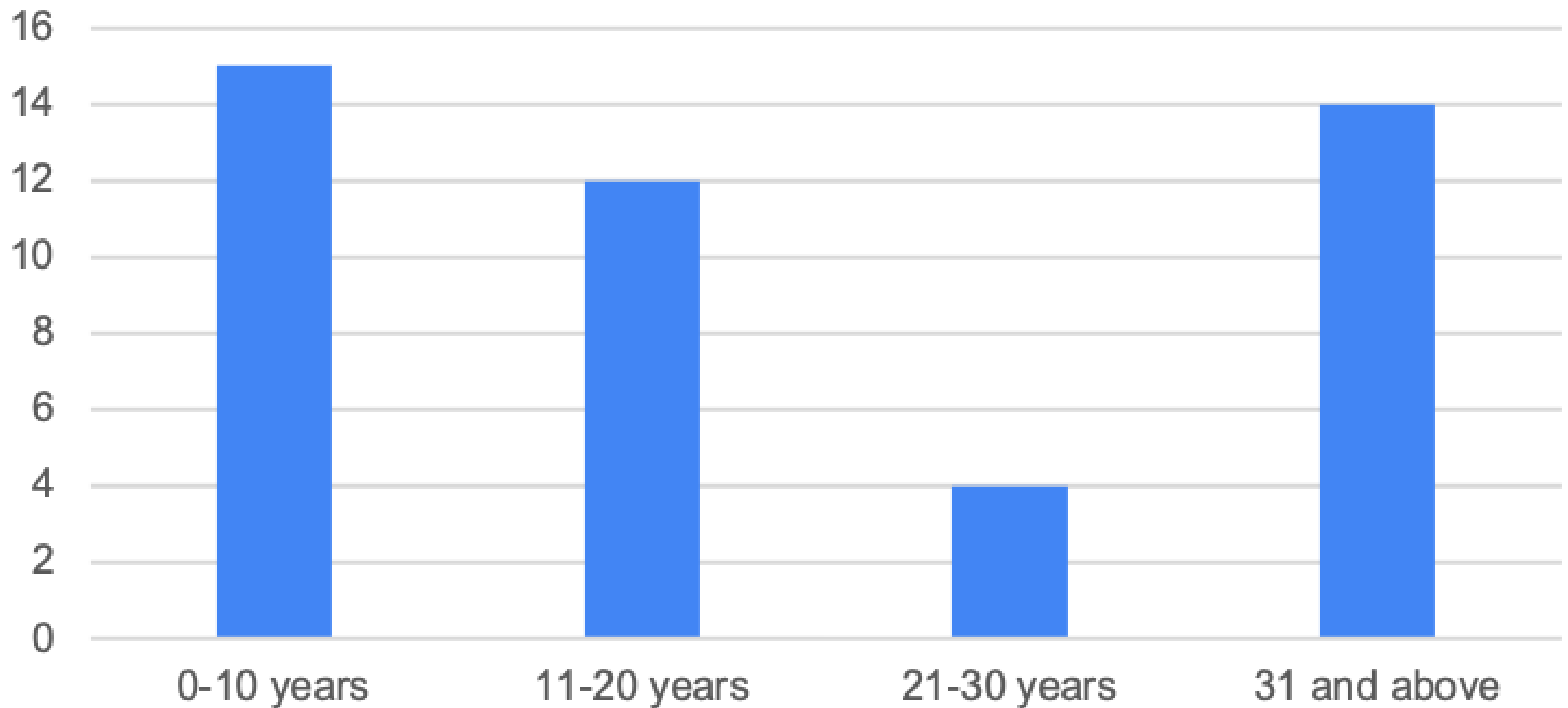
RESULTS AND DISCUSSIONS



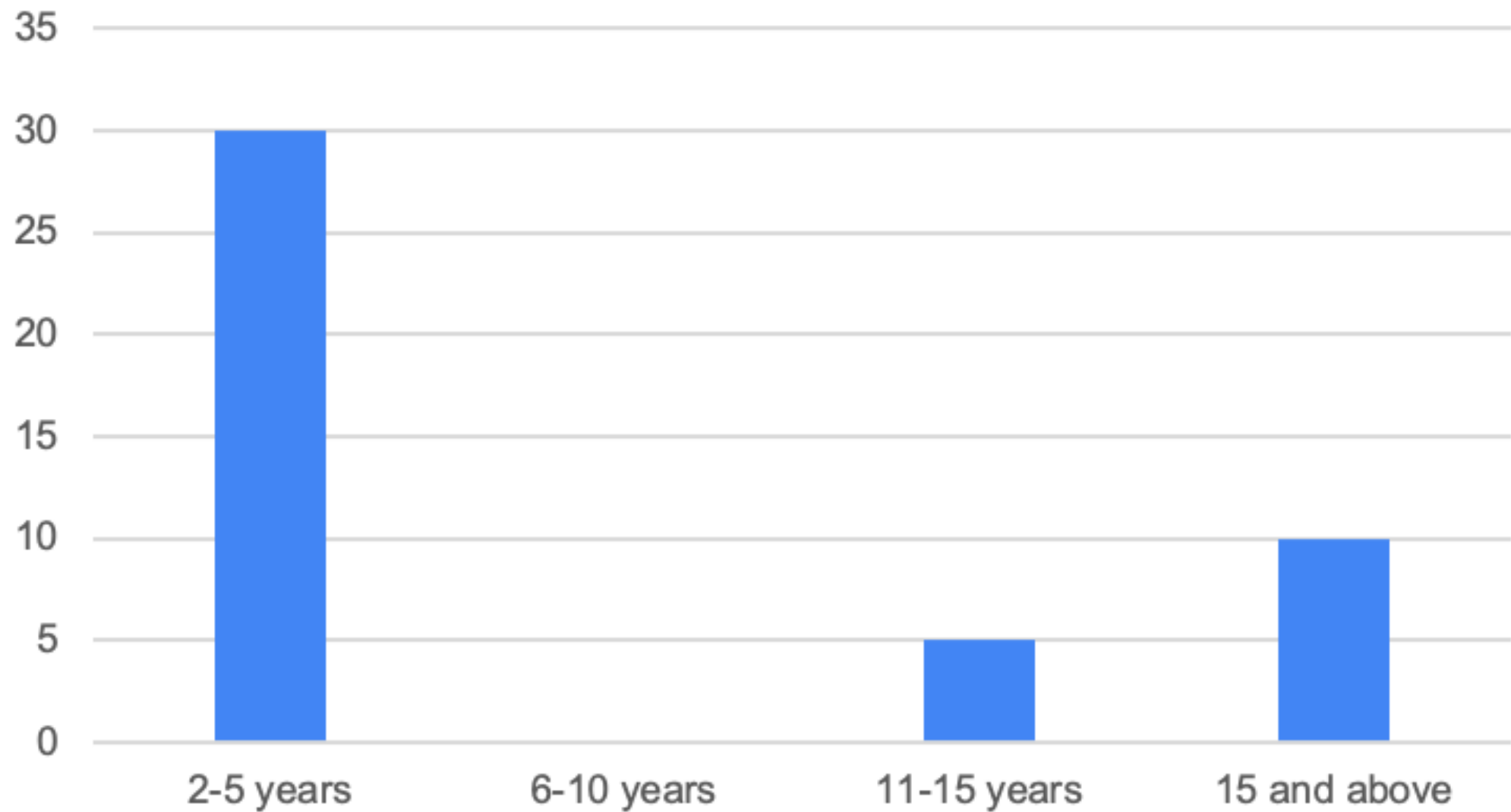
TOTAL NO. OF
RESPONDENTS
ACCORDING
TO STATES

S. No.	State	Total
1	Karnataka	26
2	Kerala	6
3	Tamil Nadu	7
4	Andhra Pradesh	4
5	Telangana	2
Total		45

HOW OLD IS THE HOSPITAL?

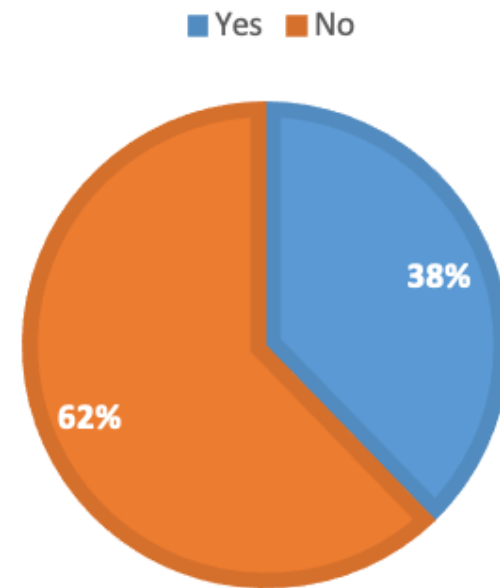


YEARS OF EXPERIENCE OF THE RESPONDENTS



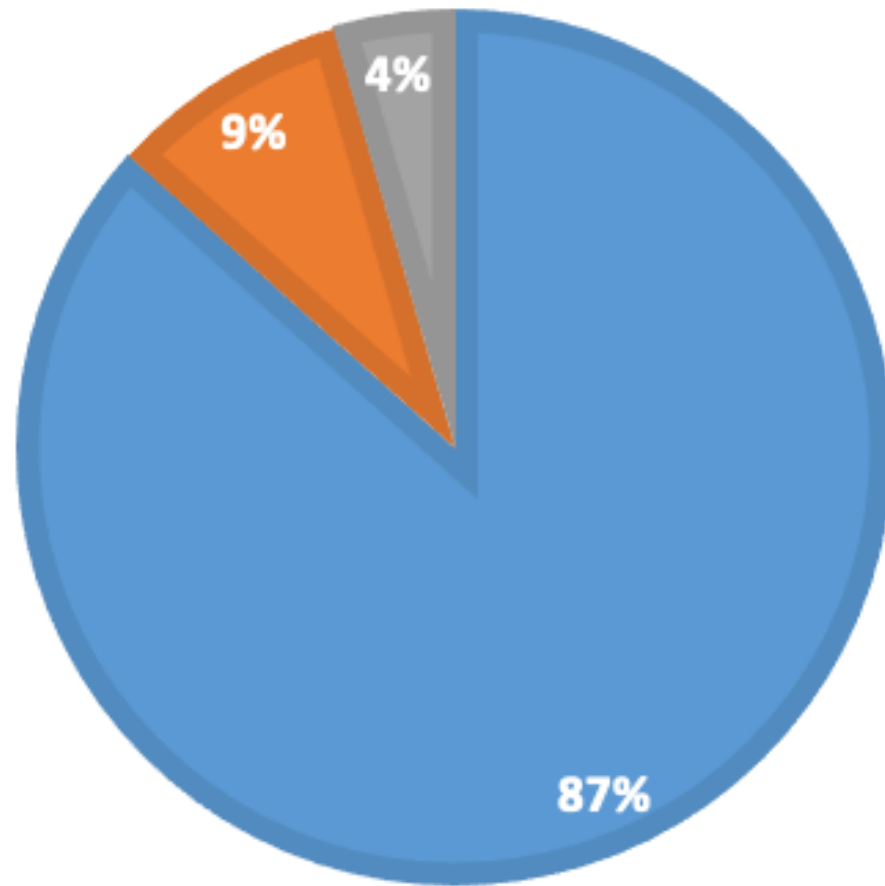
KNOWLEDGE

KNOWLEDGE ON PROGRAMMING LANGUAGE



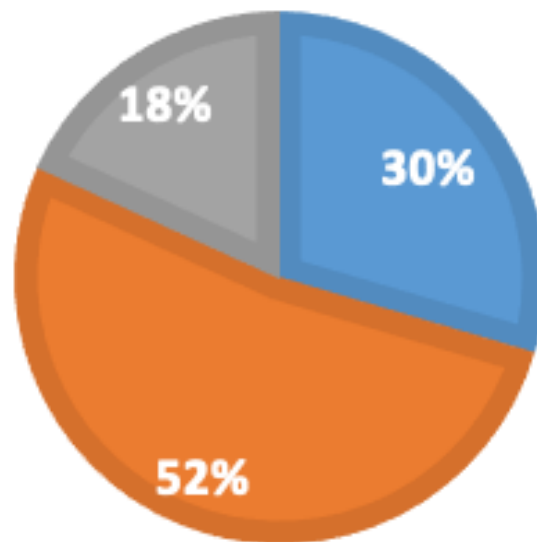
KNOWLEDGE ON AI APPLICATIONS IN DIAGNOSTIC SERVICES

■ Yes ■ No ■ Maybe

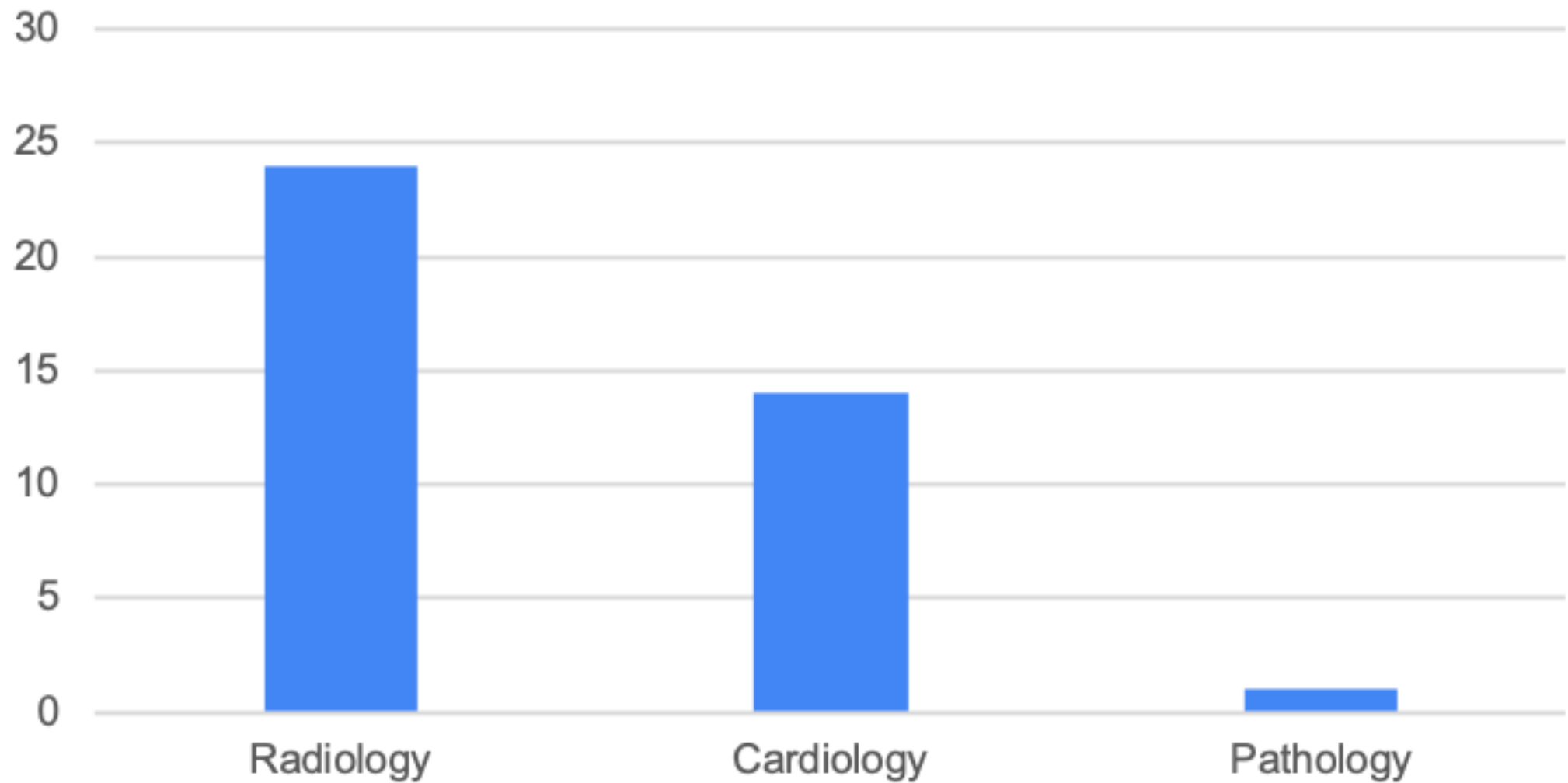


KNOWLEDGE ON AI APPLICATION IN THEIR HOSPITALS

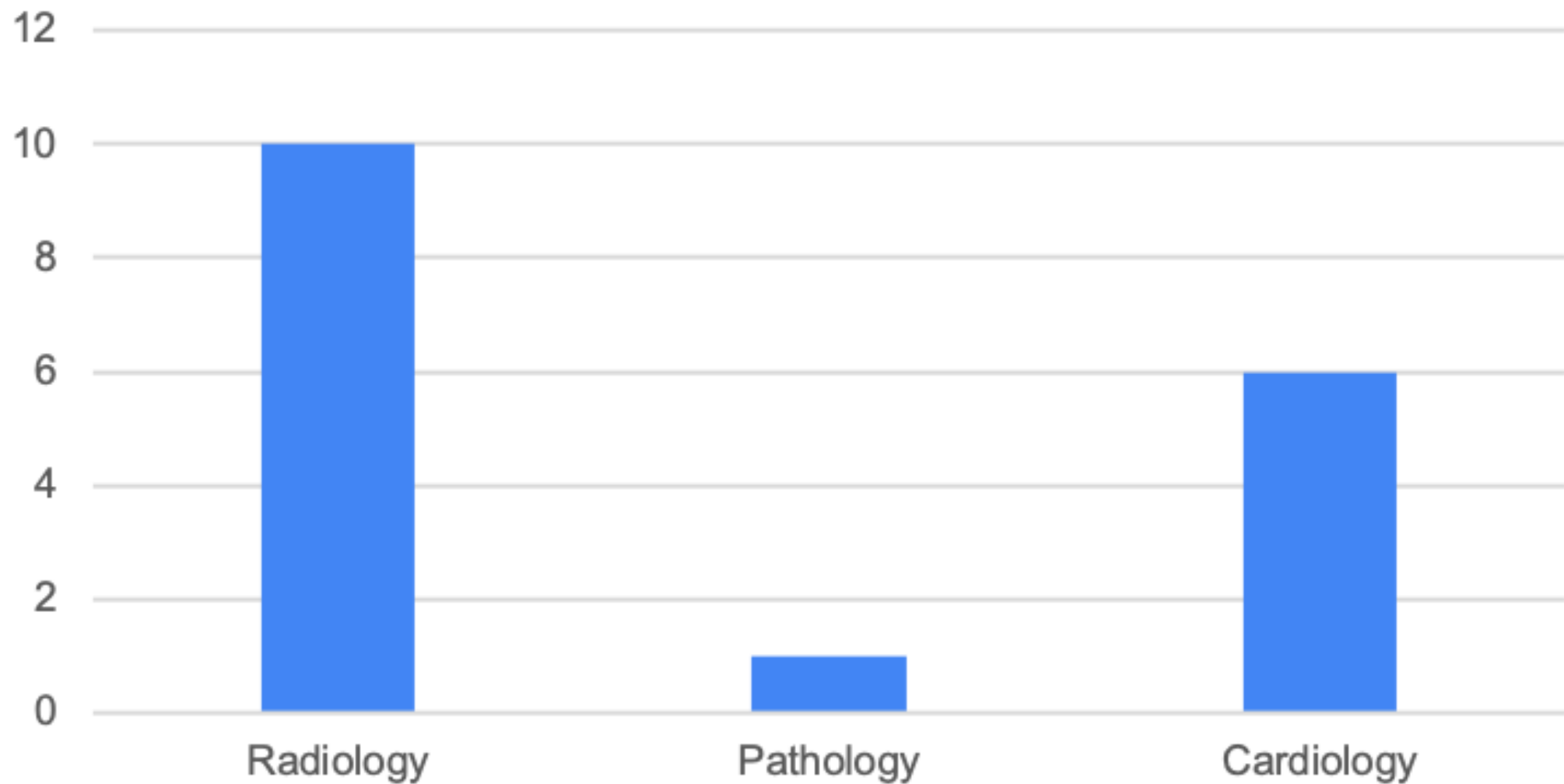
■ Yes ■ No ■ Maybe



KNOWLEDGE ON AI APPLICATIONS BY SPECIALTY

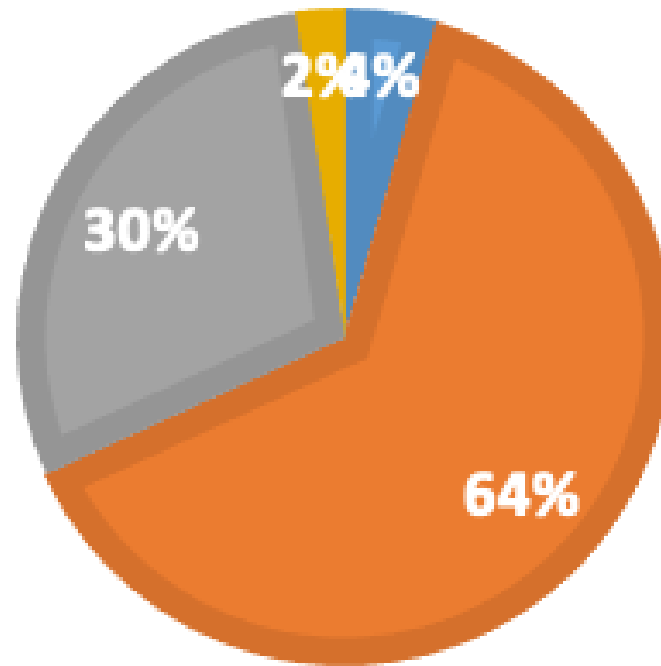


KNOWLEDGE ON PROGRAMMING LANGUAGE BY SPECIALTY



SOURCES OF KNOWLEDGE

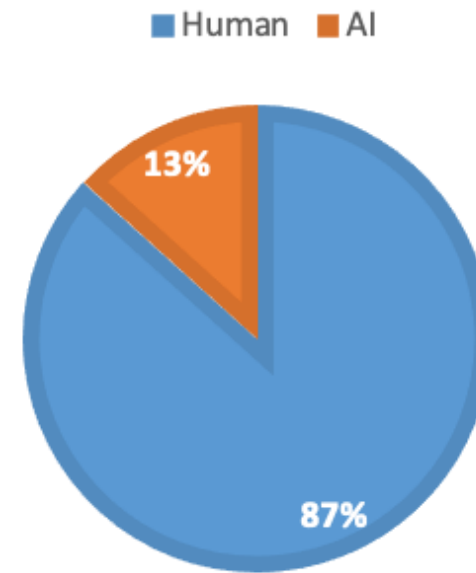
■ Friends ■ Internet ■ Colleagues ■ Academics



Sl No.	Which are the field of medicine that AI can be used more precisely?	Total
1	Direct decision making in treatment	8
2	Diagnosing the diseases	23
3	Assist the physician in decision making	13
4	Any other please specify	Where radiation is more
	Total	45

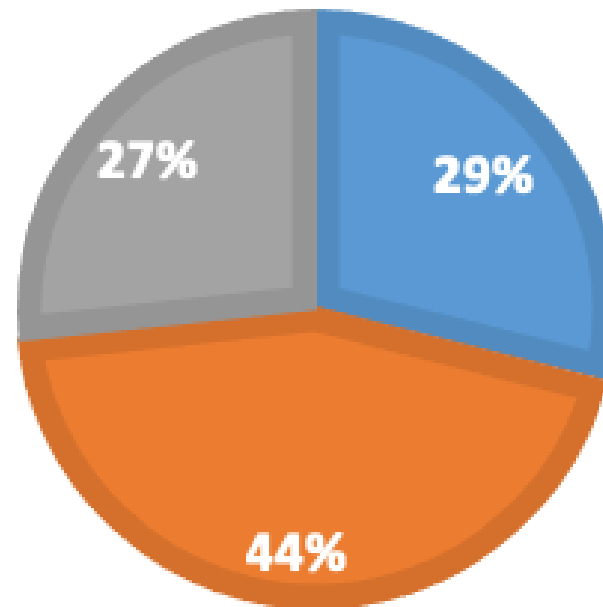
ATTITUDE

WHOSE DECISION IS MORE TRUST?



ACCEPTANCE OF AI AS A FULL-FLEDGED DIAGNOSTIC TOOL

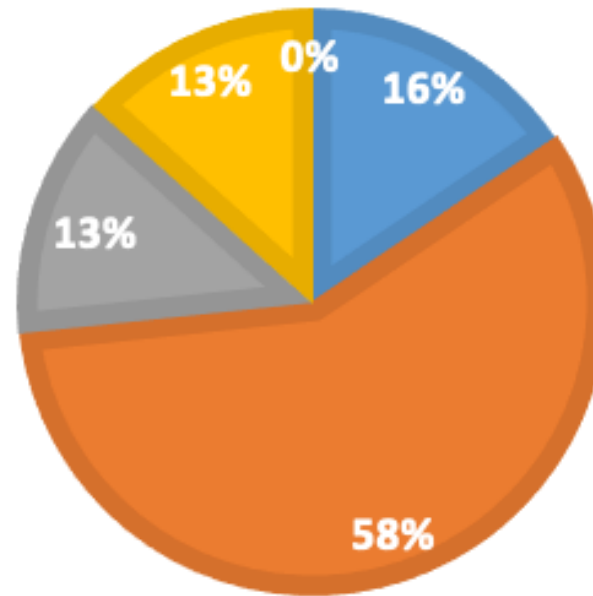
■ Yes ■ No ■ Maybe



PERCEPTION

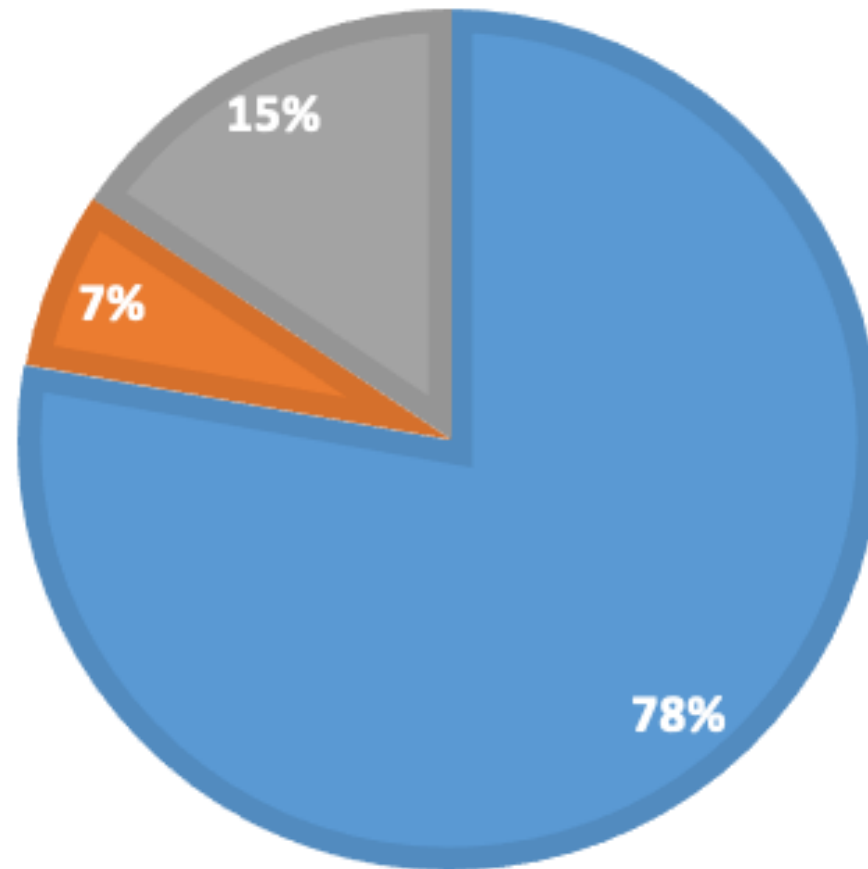
SPEED UP PROCESS OF DECISION MAKING

■ Strongly agree ■ Agree ■ Neutral ■ Strongly disagree ■ Disagree



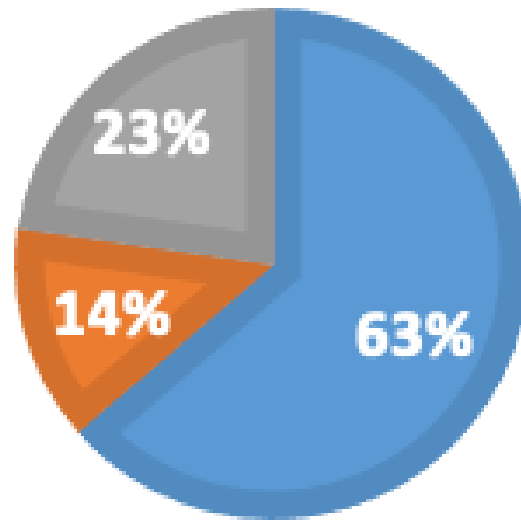
NEED FOR REGULATORY STANDARDS

■ Yes ■ No ■ Maybe



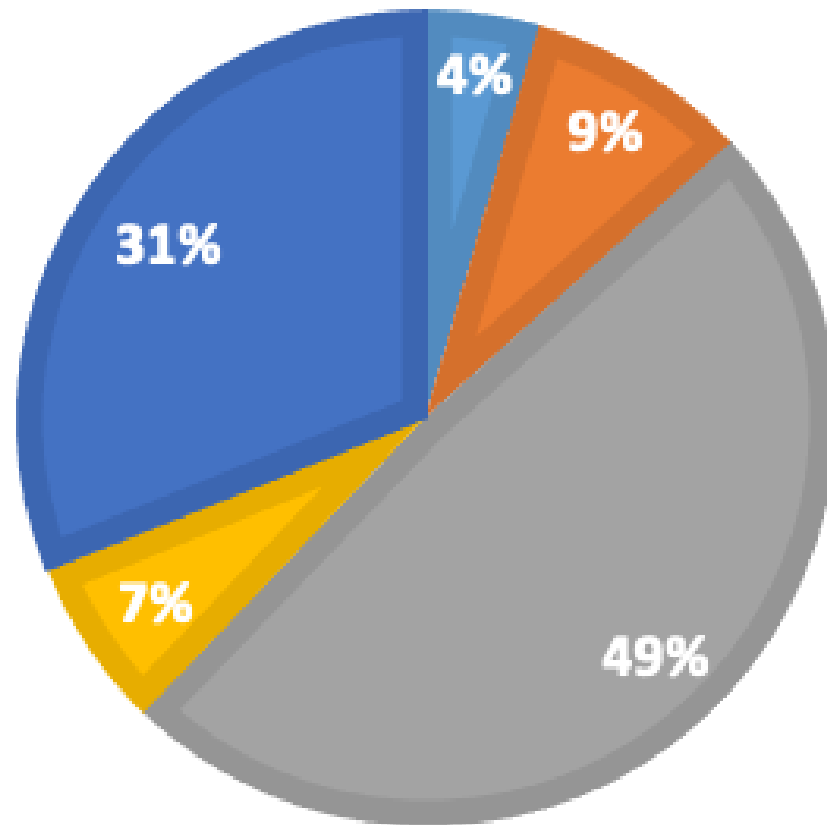
WILL AI REDUCE MANPOWER?

■ Yes ■ No ■ Maybe



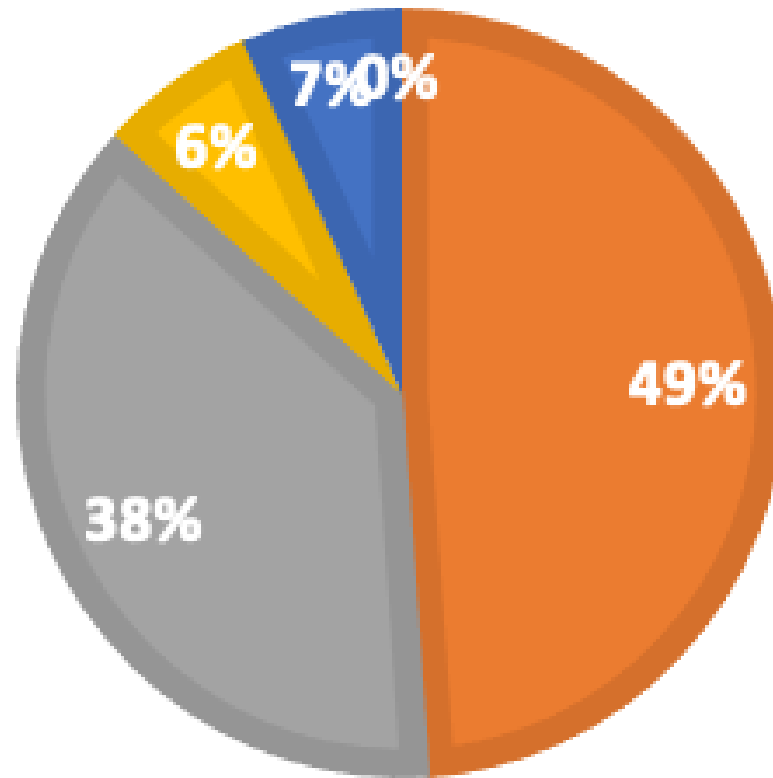
CAN WE ALWAYS TRUST AI?

Strongly agree Agree Neutral Strongly disagree Disagree



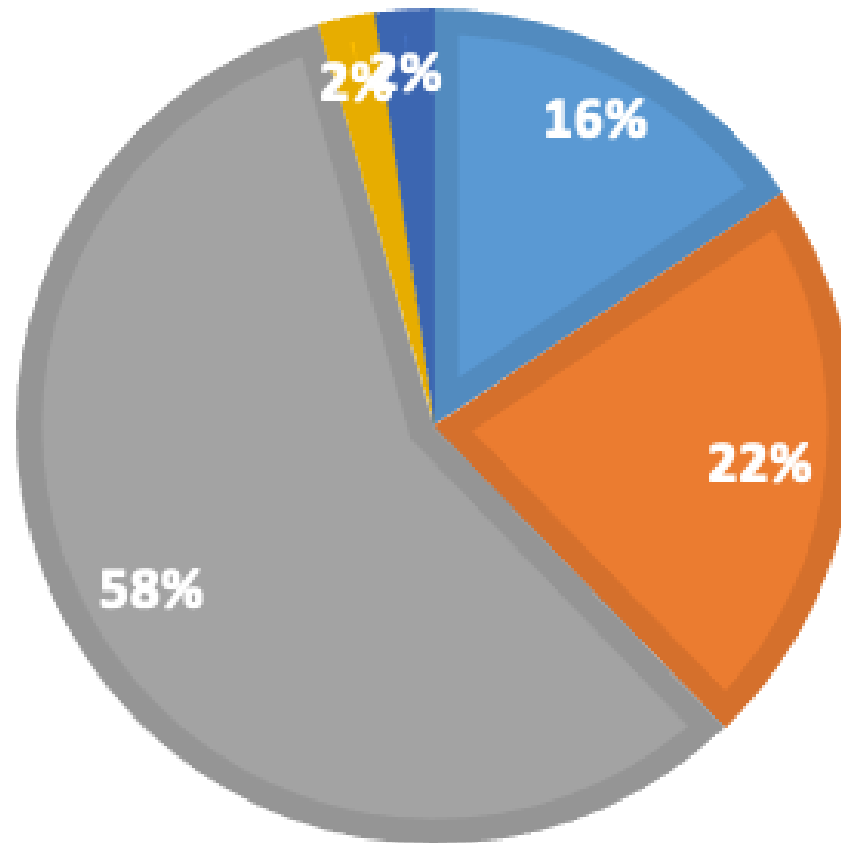
AI CAN DIAGNOSE DISEASES PRECISELY

■ Strongly agree ■ Agree ■ Neutral ■ Strongly disagree ■ Disagree



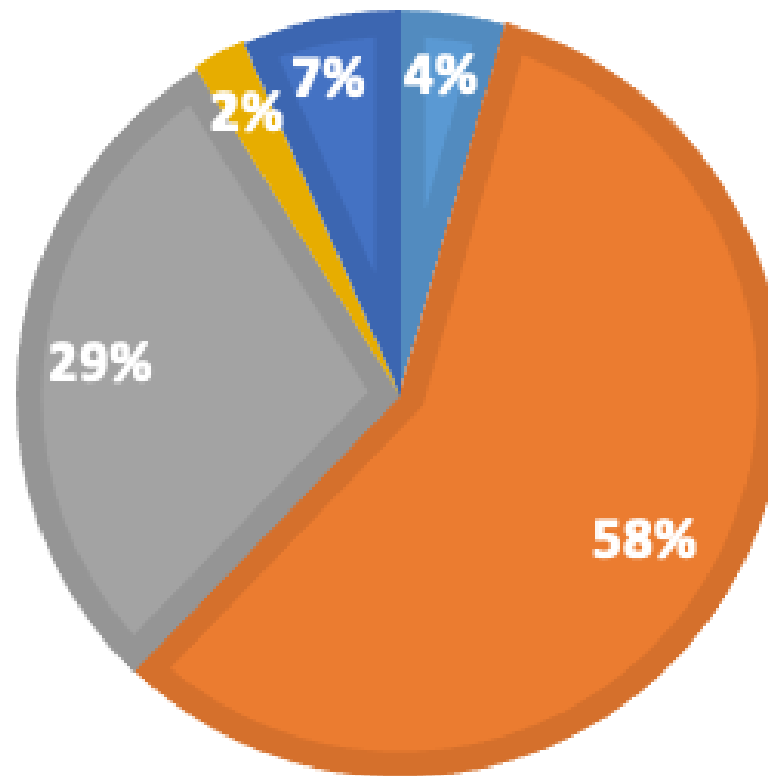
AI CAN CAUSE BREACH OF DATA

Strongly agree Agree Neutral Strongly disagree Disagree



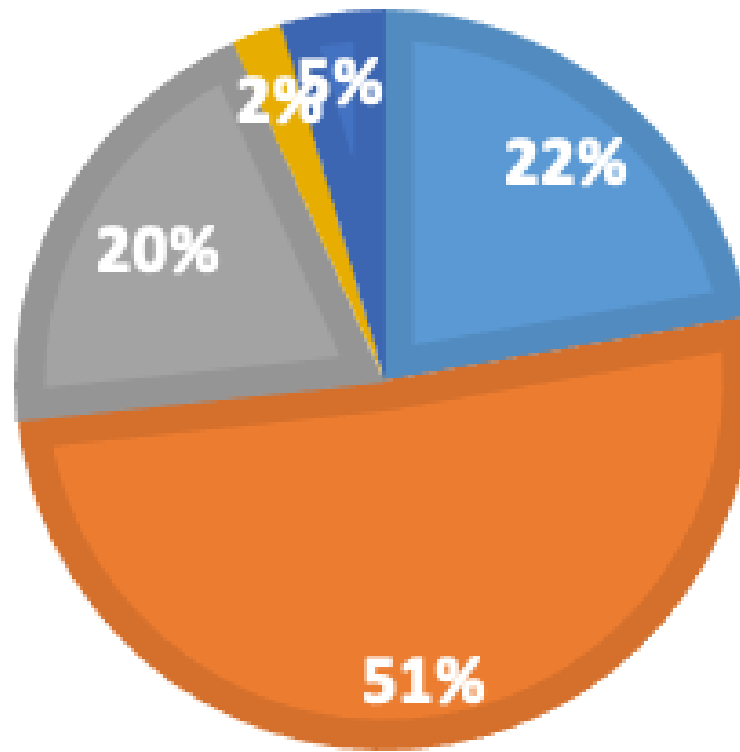
AI FUTURE OF DIAGNOSTIC

Strongly agree Agree Neutral Strongly disagree Disagree



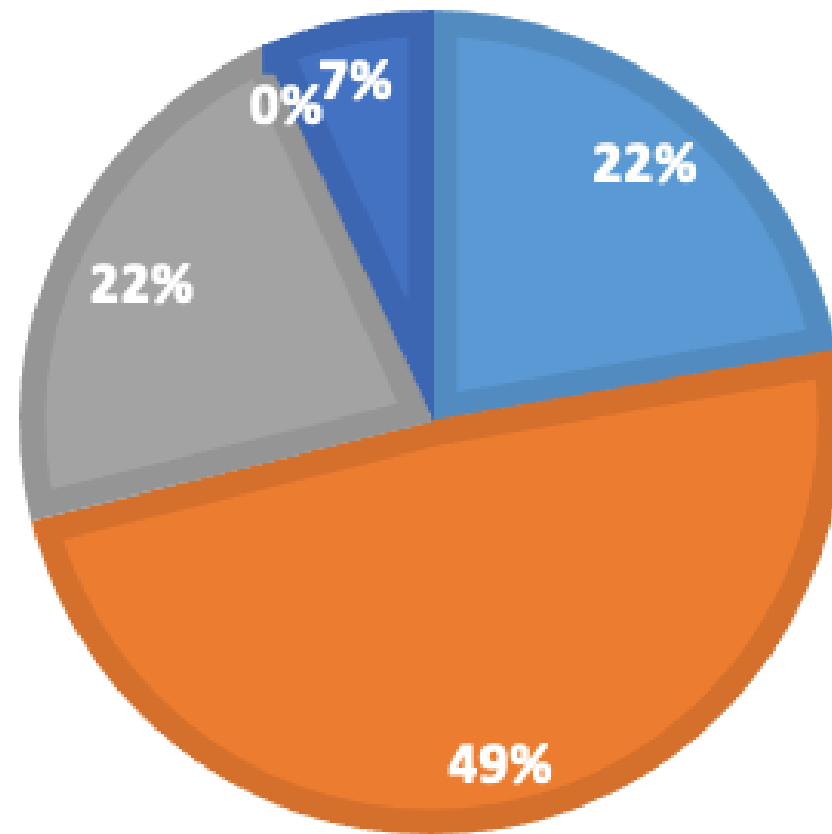
AI WILL RESULT IN TECHNOLOGICAL DEPENDENCIES

■ Strongly agree ■ Agree ■ Neutral ■ Strongly disagree ■ Disagree



AI COMES WITH HIGH COST AND MONEY

Strongly agree Agree Neutral Strongly disagree Disagree





ANALYSIS

- Data was collected in MS Excel extracted from google form.
- MS Excel was used to analyze and visualize the data.
- The location of the facility were checked one by one and segregated according to the state.
- For the question with multiple responses, filter function was used to filter out the response and each response was counted and put it in the table
- Chi-square test using MS Excel with 95% confidence interval was used to check the factors associated with the acceptance of AI as a full-fledged diagnostic tool
- P-value $<0.05\%$ was considered statistically significant

RESULTS

This Photo by Unknown Author is licensed under CC BY-SA

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- The knowledge on programming language gave a p-value of 0.88($p > 0.05$) which is not statistically significant.
 - Medical professionals who are working in the hospital that are using AI in their hospitals gave a p-value of 0.71($p > 0.05$) which is also not statistically significant.
 - The respondents who knew application of AI as a full-fledged diagnostic tool gave p-value of 0.0000019($p < 0.05$) which is statistically significant

DISCUSSION

- The primary school children are now getting coding classes.
- But the medical students lack have coding skills.
- Coding lessons are required by the medical students to engage in developing innovative technologies.
- SPIRIT-AI (Standard Protocol Items: Recommendations for Interventional Trials-AI) is new guideline protocol to evaluate clinical trials involving AI.
- 58% of the study participants are neutral to their response.

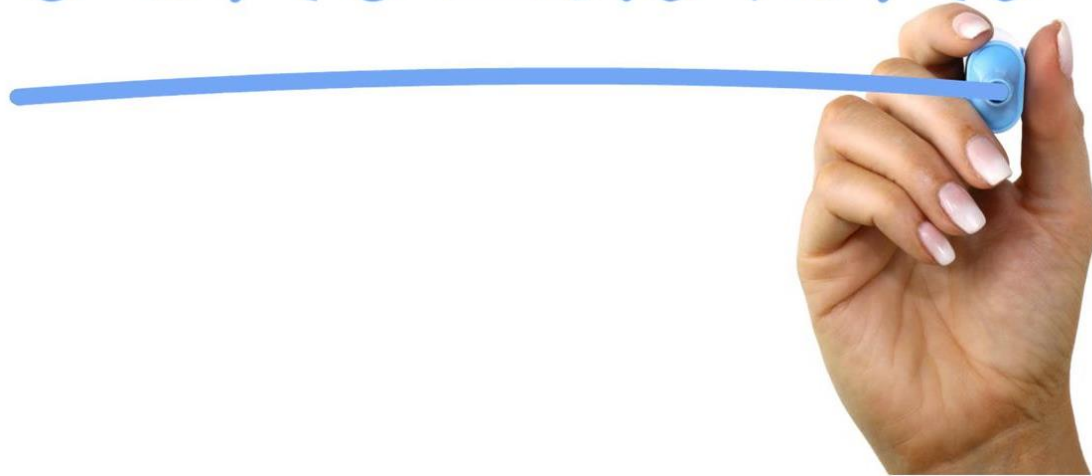
- The study shows that 58% of the respondents agreed that AI is the future of diagnostics, but only 4% strongly agree with the statement
- A comparative study of Chest radiographs interpretation between AI algorithm and Radiology residents was conducted by Joy T. Wu et al. The results showed no statistical difference in sensitivity between the AI algorithm and the radiology residents.
- (Fei Jiang et al, 2017) The authors believed that Artificial Intelligence is not going to replace human physicians but instead it is going to assist the physicians in making better clinical decisions.





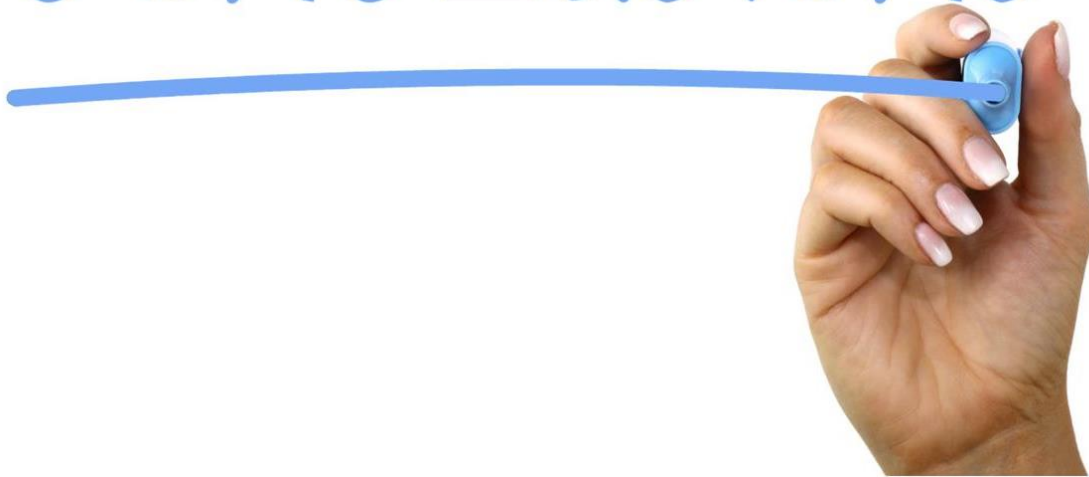
- The access to powerful technologies for extracting, analysing and managing heterogeneous medical records coupled with patient lifestyle information, will boost the PM (Personalised Medicine) paradigm shift with significant ethical and societal implications.
- The systems that are already in use in clinical laboratories need to be documented, evaluated and regulated properly
- It is a time consuming task to build an AI algorithm that could cover most of the aspects of diseases.

CONCLUSIONS



- Larger sample size was required to make the study more robust.
- The study showed that the paramedical staff who are working in the radiology department and cardiology department do not accept Artificial Intelligence as a full-fledged diagnostic tool.
- The attitude towards AI is that they still trust human decision more.
- AI application need to be restricted only to certain areas of medicine.
- AI should be used to assist the clinician rather than asking AI to take the decision.
- One respondent told that AI can be applied in places where radiation is more such as cath-lab.
- People with the knowledge of AI is going to accept it as a full-fledged diagnostic tool.
- AI should have proper regulatory standards that can deal with complex mathematical algorithms

CONCLUSIONS



- The knowledge on programming language gave a p-value of 0.88($p > 0.05$) which is not statistically significant.
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RECOMMENDATIONS

- The study participants need to be trained in programming language.
- The medical personnel also need to maintain the privacy and confidentiality of the data they are sharing with others
- Engage every medical as well as paramedical staffs of the respective departments in the use of AI

LIMITATION



- Due to time constraints and the ongoing pandemic hit, it was hard to reach the health care workers resulting in a less sample size. The biases in the study could not be ruled out due to low sample size and being purposive sampling technique.

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Thank You