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Study of Role and Use of Information Technology in Clinical Research in the Medical Colleges in Mumbai

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Abstract—This research aims at finding out the level of awareness and the extent of use of Information Technology (IT) when performing Clinical Research in the Medical domains of Ayurveda, Homeopathy and Medicine. Healthcare professionals are engaged in performing clinical research but are not keen in using IT for the same because of several issues which were addressed in this paper.

Index Terms— Healthcare, Information Technology (IT).

1 Introduction

Information Technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise. Several industries are associated with information technology, including computer hardware, software, electronics, semi-conductors, internet, telecom equipment, engineering, healthcare, e-commerce and computer services is used in every sector.

Healthcare professionals are engaged in Clinical Research which determines the safety and effectiveness (efficacy) of medications, devices, diagnostic products and treatment regimens intended for human use. These may be used for prevention, treatment, diagnosis or for relieving symptoms of a disease.

Many developed countries have announced initiatives to modernize their health care systems with investments in health information technology (IT). The goal of these initiatives is to use technology to improve the health care system by reducing costs, increasing patient safety and improving quality of care. Improving health care is a common goal for these countries, but there are wide disparities in the success with which nations have pursued this goal [1].

"Clinical research is a component of medical and health research intended to produce knowledge valuable for understanding human disease, preventing and treating illness, and promoting health. Clinical research embraces a continuum of studies involving interactions with patients, diagnostic clinical materials or data, or populations in a number of categories including: disease mechanisms; translational research; clinical knowledge, detection, diagnosis and natural history of disease; therapeutic interventions including clinical trials; prevention and health promotion; behavioral research; epidemiology; and community-based and managed care-based research." [2]

Information Technology plays very important role in performing clinical research. Healthcare professionals must need to know the data handling, integrating the data, analyzing the data through statistical software etc.

Information Technology makes it very easy to gather the data, disseminate the information collected from data and performing some research on the available data.

Using information Technology in Clinical research improves the overall quality, safety and efficiency of the research which may in turn provide,

- Increase health care productivity or efficiency;
- Prevent medical errors and increase health care accuracy and procedural correctness;
- Reduce health care costs;
- Increase administrative efficiencies and healthcare work processes;
- Decrease paperwork and unproductive or idle work time;
- Extend real-time communications of health informatics among health care professionals; and
- Expand access to affordable care.

Information Technology in healthcare is primararily implemented in the areas of Health and Education, Health Research, Health Management Systems and Health Data Management Systems.

The research paper focuses on the role and use of Information Technology in clinical research in the medical colleges in Mumbai.

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2 Aims and Objectives

This research aims at finding out the level of awareness and the extent of use of Information Technology when performing Clinical Research in the Medical domains of Allopathy, Ayurveda and Homeopathy.

Objectives of the research:

1. To study the level of research happening at Medical colleges.

2. To study the awareness and extent of use of Information Technology when performing Clinical Research.
3. To study the hindrances when leveraging IT in Clinical Research.
4. To suggest relevant alternatives to encourage Clinical Research and use of IT in Clinical Research.

3 Review of Literature

Health care is becoming an increasingly data-intensive field as doctors and researchers generate gigabytes of medical data on patients and their illnesses. While a patient visiting the doctor 20 years ago may have only generated a few data points—basic information such as weight, blood pressure, and symptoms—a medical encounter today may leave a long trail of digital data from the use of high-definition medical imaging to implantable or wearable medical devices such as heart monitors. More importantly, as doctors and hospitals transition away from paper medical records, this data is increasingly being collected and made available in an electronic format. The availability of large data sets of digital medical information has made possible the use of informatics to improve health care and medical research. Today, informatics is being applied at every stage of health care from basic research to care delivery and includes many specializations such as bioinformatics, medical informatics, and biomedical informatics. [3]

Informatics has also had a major impact on the field of systems biology. Systems biology uses computer modeling and mathematical simulations to predict how complex biological systems will behave. For example, researchers have created models to simulate tumor growths. Through the application of computer models researchers can gain a better and more comprehensive understanding of how diseases affect an entire biological system in addition to the effects on individual components [4].

It is technologically possible to incorporate IT enhancements for clinical research into advanced clinical information systems (CIS) and other high-priority applications developed to support clinical care. Clinicians and clinical researchers all depend upon access to complete, consistent, and comprehensive patient data, but they require different functionalities. Clinicians require access to data on an individual patient. Clinical researchers often need to group and compare information from many records that may involve multiple sites. [2]

There is no shortage of technology. Over time, clinical research organizations will employ more and more of it. The issue is not the technology, but the interest and ability of organizations to evolve their current processes. The check a company writes to a technology supplier can be dwarfed by the cost of implementation, to say nothing of the inertia that needs to be overcome. Most clinical research professionals are already pressed to the limit, so it's not easy to generate enthusiasm for the guarantee of more work today that might eventually generate a payoff down the road. [5]

Since the development of the computer and the evolution of the Internet, Information Technology (IT) has had a positive impact on health care delivery systems worldwide, particularly in the areas of disease control, diagnosis, patient management and teaching [8-10].

The computer and IT offer the physician the ability to store and retrieve patient clinical and socio demographic information, laboratory results and preparation of referral notes. It also aids the preparation of discharge summaries, clinic letters and financial statements of the hospital, as well as delivery of laboratory results [11].

The Internet provides opportunities to retrieve up-to-date information on different aspects of diseases, interact with colleagues via videoconferencing, and enhance communication amongst colleagues in different continents. Free access to Medline, medical journals, textbooks and the latest information on breakthroughs in medicine also encourages learning and research.

Clinical informatics aims to improve patient care by the intelligent application of technology and hopes to increase the effectiveness and efficiency of care, as well as patient safety [13, 14]. Informatics can fulfill its promises in developing countries only if health care professionals are trained in basic computing skills and IT. Designing such training will necessitate an assessment of baseline knowledge and the utilization patterns of all personnel involved in health care delivery which is the major thrust of this survey.

4 Methodology

The miniscule research makes an attempt to study the level of Clinical Research happening in Medical colleges in the city of Mumbai in India. The research also focuses on the awareness and use of IT when performing Clinical Research by the students of the Medical colleges under study.

Questionnaire and Face-to-face Interviews were conducted to get appropriate information from the respondents. The views of health professionals from allopathy, ayurveda and homeopathy stream were collected. The relevant sample size was calculated. Since the research is study of role of Information Technology in Clinical Research in the Medical Colleges in Mumbai, respondents from different medical colleges from allopathy, ayurveda and homeopathy were selected.

The study used Descriptive methodology which involved the survey of 138 Medical students at the Post Graduate level and Professors who were involved in clinical research.

A well designed pretested questionnaire was administered amongst the respondents so as to gather knowledge, role of IT in Clinical Research. The Questionnaire had majorly objective responses. Only 138 respondents were able to submit information by answering the questionnaire.

In India Medicine is practiced under three predominant domains of Ayurveda, Homeopathy and Allpathy. Each of these domains is unique in itself in curing diseases. Research in the form of Thesis submission and Projects is done at the Post Graduate level. The Post Graduate students of all the three domains – Ayurveda, Homeopathy and Allopathy have to submit a Thesis on research in their area of specialization. The Thesis (research) work is done over a span of 18 months and the students are encouraged to present their work at National and International Conferences and can also be published in recognized research Journals or relevance. During the study it was found that numbers of students at the Post Graduate were less in number. The sample respondents are thus classified as:

TABLE 1
Sample Respondents from three domains

Sr. No.	Domain	Number of Post Graduate respondents
1	Allopathy	41
2	Homeopathy	5
3	Ayurveda	92
	Total	138

4.1 Limitations of the Study

Though research is a mandatory requirement at all the three courses of Medical domain at the Post Graduate level i.e. Ayurved, Homeopathy and Allopathy, the number of respondents were less. Also, the use of Information Technology was very limited by the respondents. Hence, it was difficult to get the right number of respondent with relevant responses.

5 Result and Discussion

If you are using Word, use either the Microsoft Equation Editor or the MathType add-on (http://www.mathtype.com) for equations in your paper (Insert | Object | Create New | Microsoft Equation or MathType Equation). "Float over text" should not be selected.

A study was conducted at various medical colleges across Mumbai City. A view of 138 doctors was taken from three streams Allopathy, Ayurveda and Homeopathy to conduct this study of role and use of Information Technology in Clinical Research through questionnaire. A total of 92doctors from allopathy, 41 doctors from ayurveda and only 5 doctors from homeopathy were surveyed. It was found from the survey that everyone is involved in research and approximately everyone is using IT for Clinical Research. It was found from the study that in allopathy, 91% doctors were involved in Research out of which 82% doctors were using IT for their research. Study depicts, in ayurveda, 95% doctors were involved in research and 88% of them are using IT for their research. In homeopathy, all the doctors performing research are using IT.

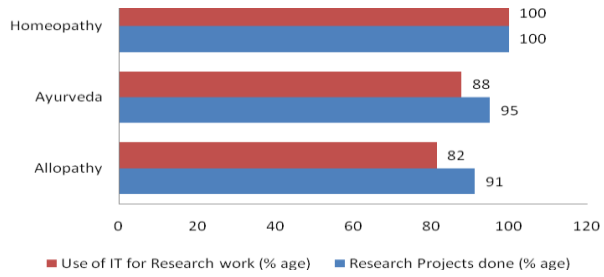

Fig. 1. Doctors involved in Research and Use of IT by Doctors in performing Research

It has been observed from the study that most of the doctors are using IT for surfing Information on the Internet, data entry, creating graphs and statistical analysis etc. Approximately 60% doctors from all the three streams are using IT for surfing information on internet, data entry, creating graphs, statistical analysis. Very few doctors are using IT for pharmacovigilance research compliance, research budgeting etc. As shown in fig. 2, it was found that, approximately 60% of allopathy and ayurveda doctors are using IT for statistical analysis, only 20% doctors are using IT for the same. It was also found from the fig.2 that as compared to allopathy and ayurveda, very few doctors from homeopathy are using IT for statistical analysis, creating graphs, data entry etc.

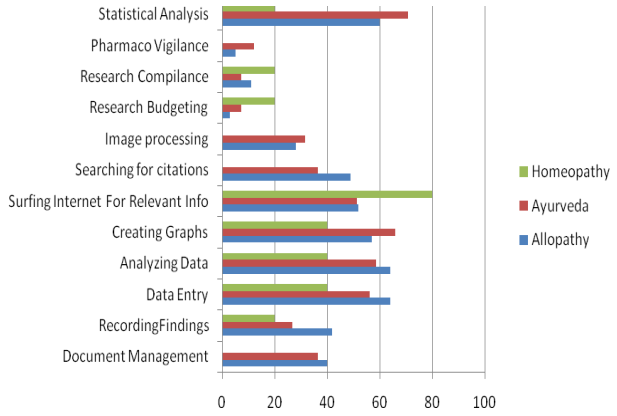

Fig. 2. Use of IT in various activities in performing research

The study also states that none of the doctors from homeopathy are using IT for data management and for electronic data capture. As shown in fig. 3, approximately, 45% of the doctors from allopathy and 40% of the doctors from ayurveda are using IT for data management and for electronic data capture.

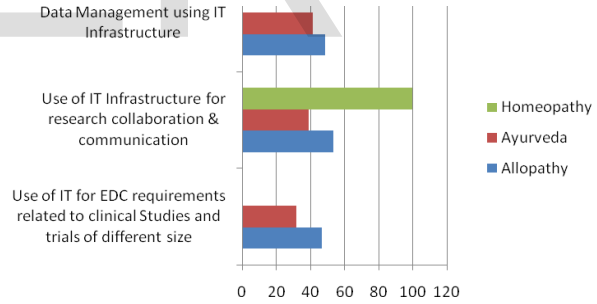

Fig. 3. Use of IT infrastructure while doing research

The use of IT amongst doctors from various streams was found very low (below 20%) because of various factors like,

1. Lack of provision of Research and Development lab facilities,
2. Low level of Computer literacy among investigators,
3. Non-familiarity with the user interface and difficulty in using the UI interface,
4. Delay in set-up of IT infrastructure,
5. Difficulty of Information System support to investigators,
6. Hardware and Software costs etc.

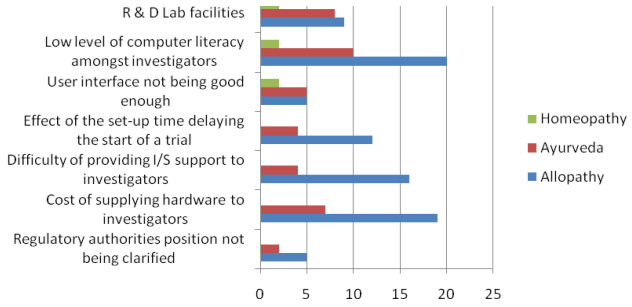

Fig. 4. Factors lagged in use of IT for Clinical research

As shown in the Fig. 5, it has been observed that approximately, 90% and above doctors are using Internet for research and only 45% from allopathy, 37% from ayurveda and 80% from homeopathy are aware of open source software for clinical research.

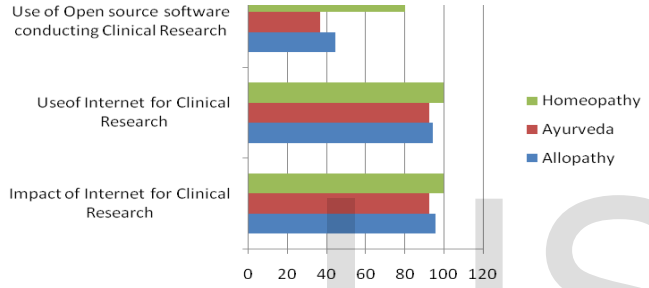

Fig. 5. Use of IT Internet and Open Source Technologies

Healthcare professionals are not aware about the IT applications that allow them to share, analyze, integrate and visualize large data sets. Approximately only 20% doctors are using IT for Clinical Decision Support System [Fig. 6]. In view of these it is very important to make healthcare professional aware about the IT application used for sharing, analyzing, integrating and visualizing large data sets along with the use of Clinical Decision Support System.

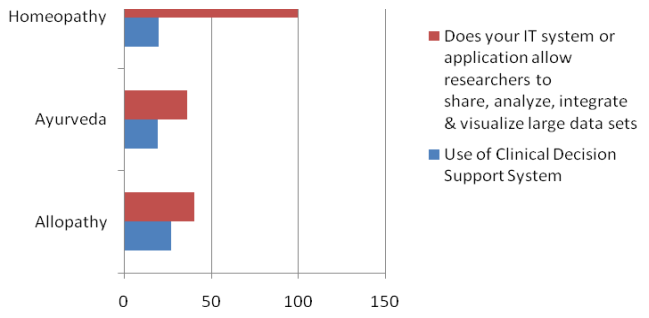

Fig. 6. Use of IT applications in research

As shown in Fig. 7, it was found that the very less number of healthcare professionals are using Clinical Information System because of concerns like security, confidentiality, privacy reliability of data etc.

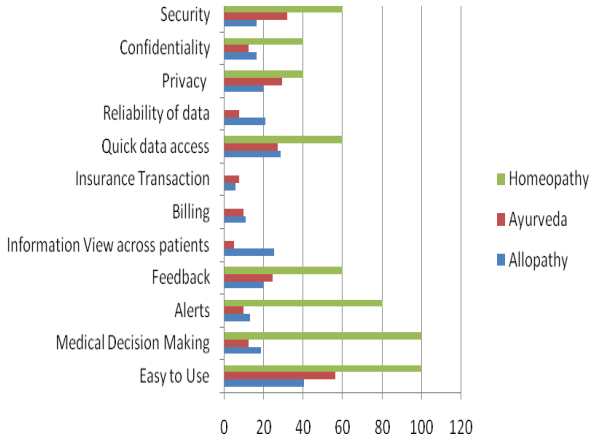

Fig. 7. Use of Clinical Information System

6 Conclusion and Suggestions

In today's world research plays a major role in not only aiding the understanding of a particular concept but also in discovering new ideas, theory or models that can assist in solving current or forecasted medical issues. Information Technology helps to make research work more organized and improves the level of understanding of various concepts under study. It is thus vital to leverage IT in Clinical Research. However, the findings of the study indicate that the level of awareness of IT in Clinical Research is sparse. This requires dedicated efforts at the Educational system level so as to encourage young Clinical researchers and Medical Professionals (Doctors) to be research oriented.

The research finding indicates the healthcare professionals are using Information Technology for doing research, but only for searching related information on the Internet. Healthcare Professionals are not familiar with the IT applications, their benefits, data management etc. Further they are not aware of open source softwares available for doing clinical research. In order to increase the use of IT in Clinical Research by Healthcare professionals it is suggested that positive steps need to be taken to introduce and implement the usage of Information Technology performing the research.

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