

Issues and Challenges of Online Healthcare: An Ethical Analysis

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ABSTRACT

Over the years, online healthcare has become a crucial part of the healthcare sector as there is growing interest amongst people for using the Internet to access health-related information and services. In spite of many benefits of online healthcare, its quality is a cause of concern as the consequences of inaccurate and misleading information could be dangerous. With the advancement in information technology, online health information and services continue to grow at unprecedented speed and volume. This rapid pace in technology poses great challenges for the ethical use of online health information and services. The purpose of this paper is to provide an ethical analysis of the issues and challenges of online healthcare by utilizing relevant examples of contemporary ethical issues. The paper discusses about various ethical codes of online healthcare and identifies some of their loopholes. With the help of ethical theories and meta-ethical analysis, the paper suggests implementing a universal ethical code for online healthcare which cater to the contemporary ethical issues.

Keywords

Online health information; Ethics; Ethical analysis

1. INTRODUCTION

Healthcare sector has undergone a paradigm shift with the invention of technologies. Years ago, the only source of Information on health-related matters was to approach doctors. Now, with the Internet at fingertips, people are much more likely to be informed about their health even before going to the doctors. Many see the Internet as a means to increase individual participation in disease prevention and health promotion [1]. Rapid growth of information technology in healthcare has changed the delivery of healthcare information and services. Online healthcare can assist people to better understand health and disease, and to provide them with feasible explanations for symptoms. However, even though online healthcare is gaining importance in recent years, its quality is a major cause of concern, as the consequences of inaccurate and misleading information could pose potential communication misnomers.

As online healthcare has the potential both to improve health and to do harm, organizations and individuals that provide online healthcare services have obligations to be trustworthy, provide high quality content, protect users' privacy and adhere to standards of best practices [2]. Thus, with the exponential growth of online healthcare, it has become increasingly important to consider the new challenges and threats which give rise to various ethical issues.

There are many ethical codes that have been set up to ensure that any health information that is put up on the Internet is accurate and not misleading [3]. The e-Health Code of Ethics

produced by Internet Healthcare Coalition, The Health On the Net (HON) foundation and American Medical Association guidelines (AMA) are some of the examples of ethical codes for online healthcare. These ethical codes try to ensure the quality of online healthcare by setting certain guidelines. However, the major question arises that whether these ethical codes are able to solve the major

conflicting and ambiguous ethical issues involved in online healthcare? With the growing technology, there arise many social and political factors like consumerism of health on the Web, media influence and advertising/selling of medicine without prescription. As these issues can lead to different observable manifestations and can in turn cause potential harm to both consumers and healthcare organizations, it is crucial to investigate whether the ethical codes help in solving the ethical issues involved. Hence, a deeper understanding of the issues of ethics is needed in the context of online healthcare.

The main objective of this paper is to investigate the ethical issues of online healthcare and to analyze these issues using various ethical codes and theories.

2. PARADIGM SHIFT IN HEALTHCARE

The paradigm in healthcare seems to be shifting towards a belief in personal responsibility for one's health and away from the attitude that physicians can use therapy, advanced surgical techniques, or modern technology to "fix" any health problems that arise [4]. Patients in the present are not like the passive and submissive patients of the past.

Today's healthcare system reflects the rapid rate of technological innovations in the last few decades. The benefits of advanced healthcare technologies are apparent: more accurate and quicker diagnoses, effective treatment modalities, and increased life expectancy [5]. Advancements in healthcare technology have occurred throughout this century, but the pace of development in the last few decades has been phenomenal especially in the delivery of healthcare information.

People mainly use online healthcare for retrieving healthcare information, buying online drugs and participating in health discussion groups. People find online healthcare information as an immediate source to get their queries answered. Along with the speed and ease of access for information, they find it as a cost-effective means of getting access to health information which otherwise is very expensive through hospitals and physicians. Online healthcare has come as a boon to people for accessing healthcare services (information, online purchase of medicine and other health related services) at a low cost. The Internet has enabled new forms of healthcare interactions through websites, discussion forums and e-commerce of medicine. Internet has thus become a catalyst for a paradigm shift in healthcare services.

In the past, the only source of healthcare information was physicians and hospitals. Now, with the Internet, people can access healthcare information in minutes, at any time and from the comfort of their own houses – a situation which is totally different to a visit to casualty or even to a busy general practice. In a recent survey on a doctors-only discussion board on WebMD's (a healthcare Web portal) network, 91% of the doctors said that Internet health information was at least somewhat helpful for their patients [6]. This is because the "10-minute office visit" is the reality of today's patient care; the Internet could not have come at a better time.

By searching for symptoms, exploring possible treatments and learning what can be done to keep healthy, people can make the most of the limited time they have with the doctors. The healthcare industry has become one of the most information intensive industries with highly distributed participants (healthcare providers, suppliers and consumers) who exchange a large amount of information on a frequent basis.

The continuous diffusion and availability of online health information represents a huge potential for citizens to participate and collaborate with medical personnel, health institutions and pharmaceutical companies [7]. People are becoming more technology savvy and are increasingly going online to search for healthcare information.

The popularization of the Internet and its opportunities and challenges has a significant impact on society. In the healthcare field, access to online resources has a major impact on its stake-holders, users, providers, and institutions [8]. The paradigm shift in healthcare is that the Internet brings about the power of information to the patient. Norms and values that were long taken for granted seem to be changing. The authoritative doctor who is supposed to make all medical decisions takes gradually place for a model of shared decision making by physicians and patients together. The technological developments are mainly targeted towards fulfilling the needs and creating better life for its citizens. However, technologies also create problems. Next section explains about the issues and challenges of online healthcare.

3. ISSUES OF CHALLENGES OF ONLINE HEALTHCARE

The abundant source of medical information in the World Wide Web has enabled people to become more proactive in managing their health. As quality of online healthcare is a big concern, many studies in medical community have been conducted about the unreliability and poor quality of Web content. Studies have shown that, although 8 in 10 American adults have searched for healthcare information online, 75% refrain from checking key quality indicators such as the validity of the source and the creation date of medical information [9]. Numbers of studies have suggested that much of the healthcare information available online on the Internet is, to varying degrees, incomplete, inaccurate, oversimplified, and/or misleading [10-12]. Without an adequate medical background, consumers who rely on the Web for health information may seize on misleading, incorrect information that can be potentially harmful to them.

Online healthcare information can be obtained through specific healthcare portals or through generic health queries given in a search engine. Though healthcare portals promise to deliver quality healthcare information, as most of them are not hosted and maintained by medical experts, quality is still a big concern. From users' point of view, web search engines need to provide relevant and useful results in response to some user

input, typically a query. Web search engines use dozens of factors in determining how to score relevance and to rank the retrieved results. Typically, the user has no idea what factors lead to a particular result being retrieved and ranked. People come to look at search engines as question-answering machines. If a patient searches the Web for "headache", he may get abundant information about the links which are associated with the search criteria, some of which may direct the patient to "Neurological Disorders and Stroke". This could lead to search on topics such as "Neurological Disorders treatment". This is just an example to show how online healthcare information can mislead consumers. There are many such similar examples where either online healthcare information misleads consumers with inaccurate information or consumers misinterpret the information provided. This could put them at a risk of self-diagnosis and self-treatment.

Due to the wide spread reach of the Internet, companies have used this means of communication, to let a large number of people know about their products. Though this kind of advertising of healthcare products has started with the idea of self-help in healthcare, it has now created consumerism in healthcare and needs where there has none before. One of the major dangers of health consumerism on the Web is online prescription of drugs. Unlike other products sold online, the drugs sold online involves risk. Even though the advertisements caution the users about consulting their doctors before starting the suggested drugs, not all the patients approach doctors before taking the suggested drug.

These issues and challenges of online healthcare have given rise to many ethical questions. As an example, this paper lists some of them according to the contexts discussed above. There could be many such ethical questions in different online healthcare contexts:

1. Do authorities have a responsibility to control the over communication of healthcare information?
2. Do search engine developers have a responsibility to improve the probability and likelihood of the search results for better health content?
3. Do healthcare websites that advertise healthcare products and services have a responsibility to make clear distinction between advertising and health awareness/education?
4. Are consumers able to on their own to effectively distinguish between reliable and unreliable healthcare information?
5. What is the likelihood that patients who use the Web to obtain treatment information will delay or fail to consult their physician?

This paper focuses on the above five ethical questions to analyze how ethical codes and theories help in solving them. Next section discusses about ethics in detail.

4. ETHICS: A PHILOSOPHICAL DISCOURSE

Ethics is the philosophical study of morality, a rational examination into people's moral beliefs and behavior [13]. It is the study of what is morally right and what is not. The field of ethics involves systemizing, defending and recommending concepts of right and wrong behavior [14]. The study of ethics has been practiced since ancient times. Since then, ethical principles have been conceptualized, debated and developed by many philosophers. Ethics is not the study of what is legal or what is socially accepted; it is the study of what is right and

what is wrong; in the sense of trying to discover reasonable general principles that will help us decide what we ought to do and what we ought not to do in all cases. According to philosopher James Moor’s core values, virtually everyone values life, happiness, and the ability to accomplish goals. There is nothing virtuous if we act in accord with our core values. Even evil people seek these things for themselves. To move from a selfish point of view to the ethical point of view, we must decide that other people’s core values are worthy of our respect as well [15].

The study of ethics in online information context is very important right now, especially in the healthcare sector. As discussed in the previous section, there are some potential problems in online healthcare which has given rise to numerous ethical questions. With the growing technology, it is certain that people encounter more problems. Hence, it is needed to decide which activities are “good”, which are “neutral” and which are “bad”. Study of ethics helps in answering these questions.

Philosophers today usually divide ethical theories into three general subject areas: Applied ethics, normative ethics and meta-ethics. Applied ethics involves examining issues in domain specific areas. In healthcare context, various ethical codes set for online healthcare belongs to applied ethics. Normative ethics deals with substantial ethical issues, such as, the duties one should follow, or the consequences of our behaviors on others. Basically, it deals with issues such as “What is intrinsically good?” and “What moral obligations we have?” Ethical theories provide substantial guidelines for answering such questions. Meta-ethics deals with the philosophical issues about the nature of ethics and moral reasoning. It is a generic name for inquiries about the source of moral judgments as well as about how such judgments are to be justified [16]. Positioning in this way, meta-ethics is not about isolated individual judgments concerning whether certain actions are right or wrong. Instead it questions the assumptions behind the ethical codes, the way they are built and to what extent they help to solve the ethical issues. This means, meta-ethics reflects about the scope and limits of ethics itself. For example, questions like “What is ethical goodness?”, “What are the characteristics of an acceptable ethical theory?”, “How do we know or recognize that something is/is not ethically good?”, “Can there be universal ethics?” can be analyzed using meta-ethical analysis.

4.1 Applied Ethics: Ethical Codes in Online Healthcare

A number of organizations have provided ethical codes or high-level ethical guidelines for provision of consumer health information on the Web. These codes refer mostly to the way the information should be presented [17].

- The HONCode [18] was developed under the umbrella of the Health on the Net Foundation. Websites can indicate their commitment to stick to the code by publishing the HONcode logo. The code consists of eight ethical principles. However, the accuracy and appropriateness of content are not part of the review process and thus HON approved website can still present inaccurate content [17].
- The eHealth Code of Ethics was developed on an international workshop sponsored by Internet Healthcare Coalition [19]. This is a more elaborated code than HON Code.
- The Hi-Ethics Code of conduct [20] consisting of 14 principles, was developed by a group of leading for-profit consumer health information websites.

The list of various ethical principles of the above three ethical codes are given in Table 1.

Though these ethical codes have a common objective of ensuring quality of online healthcare, they do not answer all the ethical questions discussed in the previous section (given in Table 1). For example, all the three codes do not answer ethical questions pertaining to over-communication (ethical question #1) and about the probability and likelihood of the search results in search engines (ethical question #2). This poses some important questions about these ethical codes like “Whether these ethical codes are designed to assess the quality of online healthcare on its face validity?” and “Do they ignore online health consumerism, media influence and many such social issues which causes indirect problems to quality of online healthcare?”

This is an era of rapid growth of technology and this growth is seen mostly in the recent decade. A number of factors such as increasing sophistication in the use of information technology and the increased demand for online healthcare are increasing the amount of online health information. So do the ethical codes created fifteen years before cater to the new kinds of current ethical issues? A deeper understanding of ethics is needed to answer these questions.

Table 1. Ethical principles of the three ethical codes

Code	Principles	Satisfy ethical questions?				
		1	2	3	4	5
HONcode	1. Authoritative – Indicates the qualifications of the authors	×	×	√	√	√
	2. Complementary – Information should support, not replace the doctor patient Relationship					
	3. Privacy – Respect the privacy and confidentiality of personal data submitted to the site by the visitor.					
	4. Attribution – Cite the source(s) of published information, date and medical and health pages					

	<p>5. Justifiability – Site must back up claims relating to benefits and performance</p> <p>6. Transparency – Accessible presentation, accurate email contact</p> <p>7. Financial disclosure - Identify funding Sources</p> <p>8. Advertising policy - Clearly distinguish advertising from editorial content</p>						
eHealth Code of Ethics	<p>1. Candor – Disclose information</p> <p>2. Honesty – Be truthful and not deceptive</p> <p>3. Quality – Accurate, easy to understand and up-to-date information</p> <p>4. Informed consent – Respect users’ right to determine whether or how their personal data may be collected, used or Shared</p> <p>5. Privacy – Respect the obligations to protect users’ privacy</p> <p>6. Professionalism in online healthcare – Respect fundamental ethical obligations to patients and clients</p> <p>7. Responsible partnering – Ensure that organizations and sites with which they affiliate are trustworthy</p> <p>8. Accountability – Provide meaningful opportunity for users to give feedback to the site</p>	x	x	√	√	x	
HI-Ethics Code of Conduct	<p>1. Privacy policies</p> <p>2. Enhanced privacy protection for health related personal information</p> <p>3. Safeguarding consumers’ privacy in relationships with third parties</p> <p>4. Disclosure of ownership and financial Sponsorship</p> <p>5. Identifying advertising and health information content sponsored by third Parties</p> <p>6. Promotional offers, rebates and free items or services</p> <p>7. Quality of healthcare information Content</p> <p>8. Authorship and accountability</p> <p>9. Disclosure of source and validation for self-assessment</p> <p>10. Professionalism</p> <p>11. Qualifications</p> <p>12. Transparency of interactions</p> <p>13. Disclosure of limitations</p> <p>14. Mechanism for consumer feedback</p>	x	x	√	√	x	

4.2 Normative Ethics: An Overview of Ethical Theories

The formal study of ethics goes back at least 2,400 years, to the Greek philosopher Socrates. Socrates did not put any of his philosophy in writing, but his student Plato did [13]. In the past two millennia, philosophers have proposed many ethical theories. Ethical theories are the basis of ethical analysis through which guidance can be obtained along the pathway to a decision. These theories emphasize different aspects of an ethical dilemma and lead to the most ethically correct resolution. Each theory emphasizes different viewpoints such as some theories prioritize duty and some emphasize consequences to reach an ethically correct decision. Sometimes different judgments lead people to contradicting conclusions. As Quinn [13] says, the source of different value judgments is the use of different ethical theories to evaluate the problem. Hence, it is important to have a basic understanding of the most popular ethical theories.

Broadly, the modern ethical theories can be divided into two categories; Deontological and Consequential. Basically, these two ethical approaches differ in their ethical reasoning. Deontological theories concentrate on the actions and Consequential theories concentrate on the consequences of the actions.

4.2.1 Deontological Ethical Theory

Deontological theory states that people should adhere to their obligations and duties when analyzing an ethical dilemma. This implies that a person will follow his/her obligations to another individual or society because upholding one's duty is what is considered ethically correct [21]. Normally, consistent decisions are produced by those who follow this theory as it is based on set of duties. The philosopher associated with deontological theory is Immanuel Kant (1724-1804) and Kantianism is the name given to his ethical theory. Kant believed that people's actions ought to be guided by moral laws and that these laws are universal. He held that in order to apply to all the rational beings, any supreme principle of morality must itself be based on reason [13] untainted by experience [22]. According to Kant, one of the features of an ethics that makes rights and duties paramount and subordinates consequences is that moral assessment must focus on motives for actions, instead of their consequences [22]. Kant's principles are called as categorical imperative.

In Kantianism, all persons are treated as moral equals by providing an ethical framework to combat discrimination. Kantianism produces universal moral guidelines to allow clear moral judgments. Also, Kantianism is based on the premise that rational beings can use logic to explain the "why" behind their solutions to ethical problems [13]. Though these are some positive attributes of Kantianism, it also contains number of flaws. The main weakness is that every action is motivated from a rule. However, in reality, sometimes no single rule fully characterizes an action. Another weakness is that it doesn't provide any guidance when one enters a complex situation, in which there are conflicting obligations. This means that Kantianism does not provide us a way to put moral laws in order of importance and hence it does not provide a practical way to solve ethical problems when there is a conflict between moral rules [13].

4.2.2 Consequential Ethical Theory

The English philosophers Jeremy Bentham (1748-1832) and John Stuart Mill (1806-1873) proposed a theory that is in sharp contrast to Kantianism. According to them, an action is good if

it benefits someone; an action is bad if it harms someone [13]. Their ethical theory is based on the principle of utility and hence called as utilitarianism. Utilitarianism is also called as a consequentialist theory, as it focuses on the consequences of an action. There are two categories in utilitarianism; act utilitarianism and rule utilitarianism.

Act utilitarianism is the ethical theory which says that an action is good if its net effect is to produce more happiness than unhappiness. As it focuses on happiness, act utilitarianism fits the intuition of many people that the purpose of life is to be happy. By grounding everything in terms of happiness and unhappiness, it seems more practical than Kantian ethics. However, when performing the act utilitarianism, it is not clear where to draw the line, yet where we draw the line can change the outcome of our evaluation [13]. Also, critics comment that act utilitarianism ignores the innate sense of duty.

Rule utilitarianism was developed considering the weakness of act utilitarianism. It holds that we ought to adopt those moral rules which, if followed by everyone, will lead to the greatest increase in total happiness. An action is justifiable if allowing that action as would, as a rule, bring about greater net happiness than forbidding that action [13]. This implies that a rule utilitarian applies the principle of utility to moral rules, while an act utilitarian applies the principle of utility to individual moral actions.

Though both rule utilitarianism and Kantianism are focused on rules, these two ethical theories derive a moral rule in completely different ways. A rule utilitarian chooses to follow a moral rule because its universal adoption would result in the greatest happiness where as a Kantian follows a moral rule because it is in accord with the Categorical Imperative [13].

Though the ethical theories listed above are not perfect, they are objective and give a rational explanation on why a particular action is right or wrong. Thus, ethical theories are helpful in decision making process. Though each theory has its own flaws, they can be used in combination in order to achieve the most ethically correct answer possible for each scenario. Hence, it is important to understand each individual theory, including its strengths and weaknesses, to make a wise decision when trying achieve an ethically correct answer to a dilemma.

4.2.3 Evaluating Online Healthcare Issues Using Ethical Theories

The following two scenarios of online healthcare will be evaluated using the three ethical theories discussed above.

Scenario 1: A healthcare portal gives all the details about "head ache". In order to educate people about this ailment, the portal lists out all the causes of head ache. The causes range from simple migraine, dengue fever, to high blood pressure, brain tumor and finally MRI. Some health anxious people who go to this portal in search of the causes and consequences of head ache may start believing that they have some serious illness. Is the action of the portal displaying all the information about head ache morally justifiable? This issue is related to ethical questions #1 and #2 listed in the previous section.

From a Kantian point of view, the health portal had a good intention in educating people about the head ache. Thus, a proposed moral rule might be: "to provide all the information about all possible causes of head ache". Though it had negative consequences (increased anxiety in consumers), the intention of the portal was not bad. According to

Kant, a harmful act done with the best of intentions and the right motives may be morally praiseworthy. Kantian analysis of

this moral problem focuses on the will behind the action ignoring the consequences. As the will was good, the action is considered as justifiable.

As per to act utilitarianism, health anxious people are affected though the portal's intention was not bad. As the consequences produce more unhappiness than happiness, the action of the portal is considered wrong.

As per to rule utilitarianism, moral rule is to inform the patients/consumers about the ailment (head ache). However, health anxious people are affected which is a negative consequence. As the harms caused appear to outweigh the benefits, the action is considered morally wrong.

Scenario 2: One of the major issues in online healthcare is online pharmacies dispensing medication without prescription. As discussed before, this can lead to potentially dangerous self-medication for people who mistakenly believe they have a certain disease. In this context, whether the action of dispensing medication without prescription by online pharmacies is morally justifiable? This issue is related to ethical question #5 listed in the previous section.

From a Kantian point of view, by dispensing medication without prescription, online pharmacies treated people as a means to increase their business. In order to increase their profits, they deceived people by giving wrong information about the need to buy drugs. Instead of doing this, online pharmacies can sell drugs with proper prescriptions from physicians or they can communicate with people about the pros and cons of the drug. Hence, the action is not morally justifiable.

As per act utilitarianism, the consequences of dispensing medication without prescription caused more harm than benefits and hence this action is not morally justifiable.

As per to rule utilitarianism, there is no moral rule in this case as the intention of the online pharmacy is to make profit. And the consequences are also bad. Hence the action itself is considered morally wrong.

4.3 A Meta-Ethical Analysis

There is a contrasting view of morality between Kantianism and Utilitarianism. Kantianism ignores the consequences of the actions and thus it cannot capture all the ethical problems. For this reason, Kant's theory in its original form is considered unrealistic to many practical situations. While this objection points out the weakness with Kantianism, the theory does support moral decision making based on the logical reasoning from facts and commonly held values [13]. Hence, it is considered as a workable ethical theory and used in evaluating moral problems.

In Utilitarianism, the boundary which determines right or wrong is via the consequences of that action. A deed is considered moral if it would produce net happiness. Performing cost/benefit analysis is crucial to utilitarian approach. But what if it helps major portion of people and harms a small group of people? Will it be considered moral? In the above two scenarios given in the previous section, what if the data of people who have gained is given? If this number is greater than the number of people who are affected, then utilitarian evaluation would have been different. In the healthcare context, acceptable ethical theory would be the one which considers duty and consequences both. A moral rule which does not yield positive consequences or an action which benefits majority of people harming a minority cannot be considered. Though none of these theories are perfect, they can be used in combination in order to

obtain the most ethically correct answer possible for each scenario. By using ethical theories in combination, one is able to use a variety of ways to analyze a situation in order to reach the most ethically correct decision possible [23].

Coming to online healthcare ethical codes, it is observed that the ethical codes do not provide a holistic guidance to consumers about the accuracy and comprehensiveness of the information they are gathering from the Web. One of the major problems with these codes is its relevance over time. As technology is changing rapidly, olden ethical codes may not always fit into the current situation and hence the codes need to be refined often to cater to new kinds of problems arise with time. Another problem with these ethical codes is that they fail to look at the bigger picture. Social issues like health consumerism on the Web and its influence on consumers are often ignored. Hence, it is needed to build a universal ethical code for online healthcare which considers a holistic picture about the issues and challenges. But the main question here is that whether it is possible for people of different philosophical world to agree upon the same code? It definitely seems difficult to generate single normative code which would contain standards which everyone would agree. Though there is a universal access to healthcare information and services, there are many differences in online healthcare delivery and interpretation. According to philosophical ethical theory of relativism, there are no universal moral norms of right and wrong [13]. Different individuals or groups of people can have completely opposite views of a moral problem, and both can be right. However, this theory may not be applied to online healthcare information context because ethical codes in online healthcare information should be based on logical reasoning based on facts and commonly held values, and not on people's different views. Hence, though difficult, it is important to have a blended worldview on online healthcare information ethics. Research in online healthcare needs to look into developing such guidelines. Next section discusses about how research in online healthcare should look into developing universal ethical code for online healthcare.

5. RESEARCH IN ONLINE HEALTHCARE ETHICS

Information theory [24] considers communication between a sender and a receiver via a communication channel. Noise interference is introduced into information transmission in the noise channel model. According to the theory, noise can be generated at any level – sender, receiver, message and the channel. In this paper, it has been discussed about the current ethical codes for online healthcare which focuses mainly on the issues like quality of information and privacy ignoring the holistic picture. Now to understand the holistic picture, it is essential to consider the reasons for noise at each level of online healthcare information and delivery. An ontology of noise model will be helpful in determining the noise and ethical issues that would be raised at each level.

Based on the Information theory [24], Zhou and Zang [25] have come up with an ontology supported misinformation model. This paper modifies their model to fit into online healthcare context and proposes a new model to characterize the noise with seven properties; type, motivation, sender, receiver, communication channel, content, last updated date and access date.

1. Type: Information manipulation theory [26] suggests that conversed information should meet the expectations about its quality, quantity, relation and manner. As per the characteristics of information, Information should adhere

to these criteria – Timeliness, freedom from bias, reliable, right amount, relevance, complete, accurate, current, appropriate and clarity. If it does not fall into these categories, then it will be considered as a type of noise.

2. Motivation: The noise in online healthcare can be motivated by malicious intent, privacy breach, consumerism and advertising of health and so on.
3. Sender: Mainly the type of source – generic search engines, specific healthcare portals and online health service providers.
4. Receiver: Receiver's profile. Demographic features such as gender, age and cultural profile can have an impact on noise in healthcare.
5. Communication Channel: Internet in this case. Representing how noise is encoded (e.g., in text, audio, video, image or any of their combinations).
6. Content: The content of noise is not limited to text but also includes content in other modalities such as audio and video.
7. Last updated date and access date: They denote the last updated and accessed dates of information. Significant clue theory [27] suggests that accurate interpretation of information is highly dependent on location and time. Thus, noise must be placed in certain temporal context for it to be interpreted accordingly [25].

The above proposed model can identify noise at different levels of online healthcare communication. Research in online healthcare ethics should build an ethical code which considers the ethical issues that would be raised at each level of this model.

6. CONCLUSION

From an industrial society, we have shifted to an information centered society, and increases in technology will continue its impact globally. Also, there is no doubt that technology use in healthcare will continue to escalate. As it does, so will the potential for ethical issues arising from such use. Hence, ethics in online healthcare information must be an ever-increasing focus of online healthcare research. By analyzing the online healthcare ethical issues with major ethical theories, this paper has highlighted some of the major loopholes of the current online healthcare ethical codes. Further, the paper recommends a universal ethical code for online healthcare. An ontology for recognizing noise in online healthcare information is built using which a new ethical code could be developed catering to the noise rising from each level of the model.

As per Kuhn [28], "scientific advancement is not evolutionary, but rather is a series of peaceful interludes punctuated by intellectually violent revolutions and in those revolutions one conceptual world view is replaced by another". This paradigm shift what he described is a change from one thinking to another. It just does not happen, but it is driven by agents of change. Internet in healthcare information delivery is a catalyst for a paradigm shift in healthcare sector. Paradigms gain status because they are more successful than their competitors at solving pressing problems [28]. However, they also can impede scientific progress by protecting inconsistent findings until a crisis point is reached; these crisis points lead to scientific revolutions [29]. Applying this to healthcare context, with the development of technology, though there is a paradigm shift in the healthcare sector, the persistent problems caused due to the technology needs solutions. We should not be blinded by the

existing paradigm. Research in online healthcare information should look for new paradigms for understanding these problems.

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