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Research Article

Ethical Dilemmas in Using Electronic Medical Records

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Abstract

Background: The dawn of this digital age fueled the development of electronic patient records which have drastically improved the quality of many healthcare activities like medication management, integration of patients' data, biomedical research and many other aspects. But this advancement has come at a cost of several socioeconomic, legal and ethical problems. Here in this article, we will mainly focus on different ethical issues regarding EPR usage which is increasingly becoming more difficult to address.

Methodology: The database search yielded 624 articles and only 29 articles were found eligible to be included in the study. The articles which were in English language and described actual ethical concerns instead of just stating the importance of considering ethical values while using EPR technology were included in the study.

Results: Sixteen studies were eligible for inclusion and among them, fourteen studies (87.5 percent) were found to have sufficient and complete data to enable systematic review. Nine of these studies (64 percent) showed a significant improvement in examination scores and skills. Four (28.5 percent) of these studies indicated an increased level of motivation and confidence in the practical field. Out of all these, there is only one study that showed no important change between the PAL section and the control section.

Conclusion: EHR is just like a medicine or a drug having side effects. We know it has certain drawbacks but we still choose to use it because the overall benefits outweigh the risks. This digitization is still a new business especially for some developing countries so there may be some concerns like hacking and third-party attacks etc. Therefore, the transparency of the EHRs should be made sure so that patient autonomy, privacy and security can remain intact. This will encourage patients to take part in the electronic health system and this will prove beneficial for public health.

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NTRODUCTION:

We live in an era of technology, where a large amount of information is available to us at a single command. The development of the first fully functioning electronic digital computer in 1945, the ENIAC (1), marked an important milestone in the field of information and technology. Before that, medical data was stored manually and it was a difficult task to record so much information in manual records.

With the development of new computer technology in the 1960s and 1970s, the foundation was laid for the development of electronic medical records (2). It not only made the understanding and availability of patients' medical information from any part of the world easier but also brought a change to the format of healthcare records and thus brought a massive change in healthcare (2). The use of electronic medical records has changed the dynamics of the patient-physician relationship. Studies suggest it has led to a better following of guidelines, prevention of medical errors, completeness of medical records, medication management and improved facilitation of patient access to medical records and communication (3).

However, the increasing digitalization occurring globally has raised many ethical dilemmas alongside, which are increasingly becoming more difficult to address. These ethical difficulties for doctors due to extensive electronic data are pivotal (4, 5). When there's big data, it increases concerns about data integrity (6), informed consent (7), confidentiality (8), trust (9), justice (10) and equity (11). There's also the issue of exchange of information and unauthorized access to electronic records between healthcare workers and organizations for the purpose of research that results in severe breaches of confidentiality and security of private data of patients (12). Different situations arise where care must be taken that no harm be posed to the patient either intentionally or carelessly; the basis of the principle of beneficence and non-maleficence in medical practice (13). It is essential for healthcare workers to follow the principles of bioethics i.e., do not harm, do not kill, do not offend do not deprive and do good for the benefit of t patient (14, 15). In the modern era where there is the increased use of mobile phones and social media apps as means of communication between doctors and patients, there is an increased risk of breach of privacy and confidentiality (16). Recently an incident was reported in Ohio, where a medical school health center mistakenly posted online treatment information and names of about 2800 patients (17).

The rationale of the study is to review the ethical dilemmas associated with EMR. Our review is intended to fill the gap and answer the question regarding what ethical issues concerning EMR in the context of biomedical research are discussed in the literature. The research aims at providing a useful database for professionals working under various legal regimes, concerning research involving humans, privacy protection and data processing. Regulators, software developers, electronic security specialists and researchers who are involved in designing policies may use it to determine if their policies cover all the ethical aspects of electronic medical records present in the literature.

METHODS AND METHOD:

Search strategy and selection criteria:

We searched four search engines; PubMed, Cochrane library, Mdpi, and Hindawi on Sep 15, 2022. Time restriction was added from 2017 to the present. Three search term combinations were used: 'electronic health records' AND ethic*, 'electronic medical records' AND ethic*, and 'electronic patient records' AND ethic*. Following the searches, the authors reviewed all the search items to identify all the existing literature for this review. We considered all peer-reviewed empirical research articles. To enhance the rigor of the review, our approach followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (18).

Exclusion and inclusion criteria:

The language of the articles was set to English. To be included for further review, the articles must be in full-text form and should have discussed the ethical dilemmas associated with electronic medical records usage. The articles that discussed only the importance of ethical standards and not the actual ethical dilemmas were excluded. The articles that discussed the ethical standards of any technology other than electronic medical record technology were also excluded.

Literature selection:

We selected literature for inclusion in three stages. In the first stage, authors (Fatima Sarwar, Fatima Tassawar, Fiza Naeem, Fizza Shafaq, Hafiza Khadija Hameed Khan, Hassan Murtaza, Haris Yaseen and Humza Ahmed) screened the articles for duplicate removal. In the next stage, authors screened the titles and abstracts of all searched articles and the selected articles were sought for full-text retrieval. In the final stage, authors independently examined the full text of these articles against pre-specified inclusion and exclusion criteria. Of the total of 624 articles, 41 duplicates were excluded. Then, from the remaining 583 articles, 437 articles were removed based on title and abstract screening. The remaining 146 articles were searched for their full texts and 55 were removed because of the unavailability of full texts. Of the 91 full-text articles, 62 articles that did not meet our eligibility criteria were excluded; consisting of articles whose language was not in English, articles that discussed only the importance of ethical standards in EPR usage and not the actual ethical dilemmas, and articles that didn’t discuss EPR technology at all. In all, 29 papers satisfied our eligibility criteria and were included by consensus agreement.

Data extraction and data analysis:

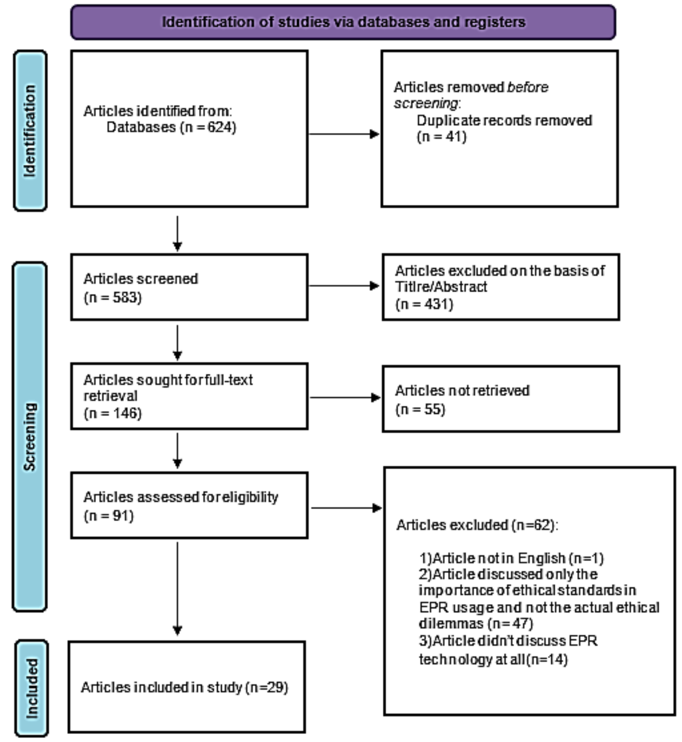
All six authors read and reviewed 29 articles to summarize the approaches, methodologies, samples and findings. The authors extracted data from the literature, entered it into a spreadsheet and analyzed the data. Discrepancies were resolved and data was confirmed in several rounds of discussions with other team members. Key themes from our review were discussed and summarized, and the gaps in the literature and methodologies were identified.

RESULTS

In this systematic review, 29 articles were included after the full-text screening. EHR is a medicine with side effects as described by some primary care physicians (19). A lot of public health benefits are associated with EHR as the data is easy to collect and summarize for epidemiological studies and also for research purposes (20). However, there are several ethical issues related to EHR which can't be overlooked. All the ethical concerns can be included in one of these five main groups: "privacy ", "autonomy", "risk/benefit analysis", "doctor-patient relationship" and "responsibility".

Privacy:

The issue of privacy was discussed in 26/29 (90%) articles. Patients have the right over their health information privacy (21) and it is the legal and ethical duty of the doctor to maintain the privacy and confidentiality of patients and to ensure data security (22). The breaches of confidentiality can result in significant psychological, social, ethical and legal harm (23). Electronic health records are more prone to attacks such as hacks, breaches of data, and leaks of important personal information (20) that can endanger patients' right to privacy. By using electronic health records more than required data can be shared with a large number of people which increases the risk of data breach and affects the privacy and confidentiality of patients (24). There is an increased possibility that big companies can obtain data and can identify individuals' medical history (25). In the evaluation of the electronic nursing documentation system, 35% of participants reported concerns about the confidentiality of their records and urged hospitals to increase their efforts in this regard (26).



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. (18)

Electronic health records have increased third-party access to medical data for research purposes, clinical studies and epidemiological studies. This data sharing raises important issues of privacy, and data security. Health institutions should take informed consent before sharing their data to maintain privacy and confidentiality (27). Informed consent is very important in medical ethics but single-purpose consent is problematic as there are many secondary uses of data as well and recon sent is mostly not possible (28). The public generally supports the use of EHR for research purposes but demands that it should be conducted in such a way as to maintain the privacy of patients' personal information (29). Chinese people are highly concerned about the privacy of their medical records but those patients who have previous experience using EHR are more willing to share their data on EHR platforms (30).

Privacy is a serious concern when sensitive information such as psychiatric illness records and the tic testing results are kept in EHR. When parents of children having suspected genetic conditions were asked about sharing their child's medical records raised the concern about privacy and transparency (31). In a survey among Huntington disease testing centers, it was observed that in the world of EHR, there is unfettered access to genetic testing results which makes it difficult to maintain patient confidentiality (32).

Big data-based surveillance has many public health benefits but it also imposes a risk to the patient's privacy and confidentiality. Access to EHR has many benefits in times of pandemic but ethical considerations must be satisfied (33).

Privacy challenges should be addressed through technological designs (34). Technologies that allow consumers to have greater control over their data can allow better options for policymakers hence investment in this area is essential (35). The sensitive information (such as psychiatric illness, and genetic records) should be labeled and it should be kept separate from the other medical records (36). Any data breach should be reported and legal actions should be taken against it (36). We need to regulate data-sharing practices and access to electronic health records through the implementation of laws and policies on the national level (24).

Autonomy:

Autonomy was discussed in 26 out of the 29 (90%) articles. The two main principles in medical ethics are autonomy and consent of the patients. It is very important that the health care staff value the patient's autonomy whether it is in the form of taking informed consent or related to any other situation (22).

Patients generally support the use of their electronic health records for research purposes but still they think that their consent should be taken above all (29).

Even in terms of the pandemic, the principles of autonomy should be satisfied and the patient should be allowed to take his own decisions keeping in view the potential benefits and risks Healthcare institutions should take informed consent from patients before sharing their data with Artificial intelligence companies (27). The information in the electronic health records of patients should be provided on portals only if the patients consent to it. Communicable disease surveillance involves masses of anonymous data that are compared and used without any consent. That's why there are many controversies about who can have access to data without the consent of individuals (37). In the field of psychiatry, the major problem that was noticed was the lack of a system to obtain users' consent in various matters of data usage and access (25). Doctors raised concerns about the autonomy of patients in sharing notes and electronic health records with people affected by mental health who are unable to understand the terms like “consent”, “control”, and “autonomy” (38). In a study conducted in Jordan about the implementation of electronic health records in the field of Psychiatry, it was concluded that the psychiatric information should be labeled as sensitive and explicit consent should be taken from the psychiatrist if the patient is mentally unstable and is unable to give consent (36). A study conducted in China showed that most of the people who were previously involved in studies are willing to give consent for sharing personal health data for good cause but most uneducated people did not consent to share their data (30). In another study which was conducted to understand the legal, ethical, and social issues that were described by the parents of children with known or suspected genetic disorders, parents were concerned about the use of their child’s data beyond the level to which they had consented (39). Although the advancement in the age of technology has improved healthcare systems, many ethical issues arise regarding the autonomy of the patients (20).

Electronic patient record technologies increase patients’ access to their data. However, consent and the patient’s control over the data are of important concern when data is used outside of the domains of the doctor-patient relationship (34).

Doctor-patient Relationship:

This was mentioned in 21/29 (72%) articles. In ethical principles of medicine, the doctor-patient relationship is a very important matter. It is based on trust and transparency. Doctors receive patients’ information in terms of the confidential relationship between doctor and patient and exposure of this information for research purposes damages the trust of the patient in the doctor (21). The trust of the patients can be severely damaged in the EHR system the involuntary access to patient data is perceived (33). A shared EPR may cause people to avoid seeking help for sensitive issues (19). EPR technology increases access of the patients to their medical records which improves the doctor-patient relationship by enhancing communication and reducing the information gap (34). However, due to excessive data sharing with the third party by using EPR technology, patients are reluctant to share their sensitive information with the doctors (34) and it can make the treatment of patients difficult. Psychiatric health records are very sensitive because of the stigma attached to mental illness, so the privacy of psychiatric health records should be maintained (36) to make the patient completely trust their doctor. Patient having access to their medical records improves transparency, but it can also make them feel that he is not completely understood (38). EPR technology may reduce human interaction and interpretation (34).

Sr. no.	Author	Year	Journal	Country	Research design	Sample size	Main Findings
1	Celeste et al.	2020	Molecular Genetics & Genomic Medicine	USA	Qualitative: Survey-based study	n = 23	In the world of EHRs, routine clinical care may also infer an ability for providers of all types to have unfettered access to genetic testing results. Many patients view this as a breach of their confidentiality. HD centers have the desire to protect the confidentiality of patients; however, this is becoming increasingly difficult with the modernization of medical records through EHRs and legal requirements. Centers often create workarounds to avoid all this. Still, the chances for identification errors, inability to retrieve results when needed, loss of records, and miscommunication are there. As far as the solution is considered, a possible solution could be an access-limiting note, which would deem such notes as private and appear to maintain the argument of “genetic exceptionalism”.
2	Ying He et al.	2022	Journal of Oncology	China	Quantitative: survey-based study	n = 932 (Male = 393 female = 530)	It showed that participants hesitated in general to share their EHR data and the main factors were the nature of their jobs in healthcare, any previous experiences, and the knowledge of the benefits and risks of using such a system. So, strategies should be advised by the authorities to address these concerns.
3	Hagström et al.	2022	Studies in Health Technology and Informatics	4 countries (Sweden, Norway, Finland, Estonia)	Qualitative: comparison study	n = 4	It showed that all 4 countries give automatic access to their child's HER data to parents at birth. The child age at which parents lose this access is less in Norway and Sweden as compared to Finland and Estonia. In all 4 countries, children have access to their data when they obtain an electronic Id. No sensitive information was withheld from parents in any country which may be problematic in certain cases such as psychiatry patients. There is a debate about adolescents having a right to privacy and at the same time if they are capable of giving informed consent for their data usage or not.
4	Andrews et al.	2020	Journal of the American Medical Informatics Association	USA	Quantitative: focus group study	n = 38 (Male=11, Female=27)	This study was conducted to understand the ethical, legal, and social issues that were described by parents of children with known or suspected genetic conditions. After conducting the study, the factors that affect parents' readiness to allow the use of their children's EHR for research purposes include trust, transparency, altruism and concerns about privacy. So, researchers should explain to parents how they'll maintain the privacy of EHR data.

5	Brelsford et al.	2018	Journal of the American Medical Informatics Association		Quantitate: focus group study	n=110 (Male=44, Female=66)	This study was conducted to study patients' attitudes and opinions about being contacted by researchers for access to their EHR. Most patients were of the view that researchers should take action if they discovered information suggesting a serious health concern. Issues of trust and professional role were the main ethical dilemmas that made the patients concerned about sharing of their EHR data with researchers.
6	Reema et al.	2019	Risk management and healthcare policy	Jordan	Quantitative: cross-sectional, questionnaire-based survey	n=102 (Male=64, Female=38)	It is a cross-sectional study that was conducted in Jordan to access the practice of the health care practitioner regarding data sharing, confidentiality and security of data with the main focus on using electronic health records for the research purpose. According to this study data sharing the practice of health care practitioners for research purposes is less than optimal. Using electronic health records, more than required data can be shared with a large number of people which increases the risk of data breaches and affects the privacy and confidentiality of patients. We need to regulate data-sharing practices and access to electronic health records through the implementation of laws and policies on the national level.
7	Lysaght et al.	2020	BMC Medical Ethics	Singapore	Quantitative: focus-group study	n=62 (male = 37%, female=67%)	The study highlighted four aspects. First was the data security and privacy, the second was the battle between data protection and the possible usage of this data in future research, the third was the level of trust between different sectors to share the data among them and fourth was regarding the ultimate control of the flow of this data to different entities. Participants conditionally supported data sharing with researchers and health institutions if the benefits of the research outweigh the risks involved and a governing body should be developed for its regulation.
8	Shafiee et al.	2022	BMC Nursing		Mixed method study: literature review, a Delphi study	n = 80 (male=37, female=43)	It is a study done among nurses using EMR on its different aspects. They discussed some positive and some negative aspects of using EMR as compared to the paper-based system they used before. Among the negative aspects, 35% of the participants reported concerns about the CONFIDENTIALITY of these records and urged the hospitals to increase their efforts in this regard to increase software security and access.

9	Tania et al.	2020	Journal of the American Board of Family Medicine	No	Qualitative: semi-structured interview-based study	n = 14 (male=6, female=8)	1) PCPs describe the EHR as a medicine with side effects, for which they provide suggestions for improvements; 2) A shared record raises ethical questions related to autonomy and trust; 3) Although the use of the EHR often disturbs rapport with the patient, it can also support the patient-doctor interaction when it becomes an active part of the conversation; 4) A shared EHR may cause health care providers (and their relatives) to avoid seeking help for sensitive issues. PCPs fear access to test results could cause confusion and anxiety in patients. Improved efficiency and quality of care with a shared EHR rely on doctors trusting each other's input to avoid duplicate tests. However, we should be aware of the risk of increased confirmation and anchoring bias. The EHR is considered to be a work in progress—EHR design could be improved by examining physicians' coping strategies and implementing their suggestions for improvement. Ethical questions related to autonomy, trust, and the status of records that belong to the doctor–patients need to be considered in future research and EHR development
10	Daniel et al.	2019	BMC Medical Ethics	Kenya	Qualitative: interview-based study	n=34 (male=17, female=17)	Most forms of clinical data reuse were seen as an important public health good. Individual consent and general notification processes were often argued as important. Underlying concerns were linked to issues of patient privacy and autonomy; perceived risks to trust in health systems; and fairness in how data would be used, particularly for non-public sector re-users. Support for engagement often turned on the anticipated outcomes of information-sharing processes, such as building or undermining trust in healthcare systems. As reported in high-income countries, learning healthcare systems in low-middle counties may generate a core ethical tension between supporting a public good and respecting patient autonomy and privacy, with the maintenance of public trust acting as a core requirement. While more evidence is needed on patient and public perspectives on learning healthcare activities, greater collaboration between public health and research governance systems is likely to support the development of efficient and locally responsive learning healthcare activities in LMICs.

11	Ignaas et al.	2021	Health Informatics Journal	No	Quantitative: questionnaire-based study	n=1688 (male=39%, female=61%)	This study examined patients' moral intuitions concerning digital information sharing and the EHR. First, participants strongly believe that hiding information could negatively affect the quality of care. Second, they hold patients accountable for the negative consequences of hiding information and think patients share responsibility for the accuracy of EHR data. And third, our study population does not strongly favor direct results release through a patient portal but prefers either result discussion during a visit or an individual choice option. Patients with poor health or a higher education level seem to value autonomy the most. Considering participants' lack of experience using patient portal systems and their need for more information about EHRs, efforts should be tailored toward better informing and educating patients about these electronic systems.

Sr. No.	Author	Year	Journal	Research design	Main Findings
12	Ahmed R. Karajeh et al.	2020	International journal of nursing sciences	Qualitative study	Psychiatric health records are highly sensitive so their privacy should be maintained without affecting data accessibility. The current policy in Jordan is still immature as it allows the access of psychiatric data to non-specialized personnel. The author reviews social (stigmas, anxiety, depression), ethical (privacy, consent, breach, doctor-patient relationship and autonomy) and legal concerns of psychiatric data and suggests a policy through which these can be minimized. The psychiatric information should be kept separate and labeled as sensitive information. The criteria of "explicit consent" from the psychiatrist should be used if the patient cannot give consent due to mental illness. Any data breach should be reported and legal actions should be taken against it.
13	Baric-Parker et al.	2020	The Linacre quarterly	Qualitative study	This article talks about the ethical and social dilemmas that arise in patient data-sharing collaborations with AI companies. Patient privacy and confidentiality should be maintained. Healthcare institutions should take informed consent from patients before sharing their data with AI companies. Transparency is critical to trust. Patients should be able to opt out of data sharing if they deem fit.
14	Canaway et al.	2019	Medical Journal of Australia	Qualitative study	This study conducted in the primary care sector in Australia shows that there are many barriers to data sharing by using EMR. The task now is to build trustworthy primary care data repositories for research that will provide researchers with timely access to quality-assured general practice data. But at the same time, it will pose ethical problems related to such open access to data. For this purpose, technologies that allow consumers to have greater control over how their data are used can provide better options to policymakers, hence investment in this area is essential.

15	Cordeiro J et al.	2021	Frontiers in medicine	Qualitative: review the article	Informed consent is a cornerstone of medical ethics but defining its scope is especially difficult. On one hand, single-purpose consent is problematic as secondary uses are often necessary for research and care purposes and re-consent is impracticable. Moreover, there are some challenges associated with the patient-doctor relationship as well. Also, health illiteracy and the digital divide affect patient participation, possibly compromising access to healthcare. The protection of electronic health records has been widely recognized as insufficient. Responsible use of data is key particularly projects with public notoriety demand greater responsibility if public trust is to be preserved. Clear and fair health data ownership rules, beyond the traditional property approaches, should continue to be developed and harmonized
16	Gariépy et al.	2021	The journal of the Canadian Health Libraries Association	Review study	The limitations of EHR regarding its privacy issues are of great concern. It comes with the cost of patient privacy and data breach. So, there is a serious need to weigh the risks and benefits of this technology. This causes patients to withhold the necessary medical information from their physician and this may result in poor health coverage. It was found that patients with a better understanding of this system were less likely to withhold their sensitive information.
17	Gilbert et al.	2019	Asian bioethics review	Qualitative: review article	Having all the health-related data in a single place helps a lot in tracking the course of any communicable disease and taking important decisions in this regard. This has benefits in research, improved quality of healthcare and disease epidemiology. But there is no guarantee of data security as there may be hacking of the system or the guardians of data may provide unauthorized access to private entities for their benefit.
18	Lee L et al.	2017	Journal of Biomedical Informatics	Qualitative study	A lot of health-related benefits are associated with these electronic health records, however, there are several ethical issues associated with them too, which cannot be overlooked. An electronic health record is a very private document/report of a person and its privacy and autonomy should remain intact. These records are liable to attacks such as hacks, breaches of data, and leaks of important information which can lead to decreased confidence of people in this digitalization and more risks rather than benefits. Secure and private data collection and storage policies must be implemented to avoid these risks and proper risk-averting techniques should be set up. This coordinated and secure digital health system can then prove highly beneficial for public health.

19	Roth et al.	2021	International Journal of Environmental Research and Public Health	Qualitative: review the article	This article is a narrative review and discusses different technologies being used today in the field of psychiatry including EMRs. The main concerns were: • Privacy issues are important ones and also their complex policies in this regard make it difficult to protect it. •The check of transparency regarding the sharing of the data • Lack of a system to obtain user consent in various matters of data usage and access. • Possibility of big companies to obtain this data and uniquely identify individuals' medical history.
20	Scheibneret al.	2021	Journal of the American Medical Informatics Association	systematic review	This article highlighted concerns like privacy, autonomy and security of EMR data. It also emphasized that patients are also responsible for the security of the EMR data in their possession. It highlighted that only the patient can give consent about the usage of his data for research purposes and also who else can access his data. Data decentralization should be done as data stored in one place is liable to be lost and gone at once.
21	Schwarz et al.	2021	JMIR Mental Health	Systematic review	It mentions the following concerns: 1) Sharing notes with the patient increased trust and transparency thus strengthening their relationship with clinicians. 2) Patients were concerned about the privacy and breaches of their data. Some patients don't want to share their data with their care providers while some were willing to do so. On other hand, most care providers wanted to access the patient's data to better take care of them at home. 3) Some patients said that reading the notes made them feel that they were being judged or perceived as a complainer. This may have a bad effect on the relationship. 4) Doctors also raised concerns about privacy, anonymity, and patient safety.
22	Sipanoun et al.	2022	International Journal of Medical Informatics	Systematic review	This is a review of Users (Physicians, children, and Parents) of EMR in pediatric hospitals. It reported high perceived efficiency due to EMR use but there were concerns about the access of EMR to the parents (who are the decision makers) of the pediatric patients. Doctors raised concerns about the complete access to EMR data because parents may misinterpret the medical terminology which may impact their decision-making about the treatment of their child. A study completely denied this access as this may harm the professional relationship between the parents and doctors while another study stated that not sharing the EMR data may raise trust issues and suspicion. Studies reported that some parents cannot access these records due to the unavailability of a digital device or the inability to use one. At last, it was suggested that the access to parents should be partial and only include selective information about their children.

23	Stockdale et al.	2018	Welcome open research	Systematic Review	This systemic review interpreted a range of public views suggesting that the public generally supports the use of patient data for research purposes. However, the public demands that it should be conducted in a secure way to prioritize privacy, and minimize individual and collective harm. The biomedical ethics that are discussed include privacy, trust, autonomy and consent.
24	Stoeger et al.	2020	Journal of law and the biosciences	Qualitative: review the article	In this article, ethical and legal concerns regarding the use of EHR by health authorities in a pandemic to identify persons with a particular health risk are assessed. Ethical consideration: From a legal point of view, access to EHR may in principle be permissible in times of pandemic but from the ethical point of view, four principles must be satisfied. These principles include trust, autonomy, non-maleficence and beneficence. Trust in the EHR system can be severely damaged by the state if involuntary state access to personal health data is perceived as disadvantageous. Autonomy of the patient should be respected and he/she must be enabled to make his/her own decision.
25	T. Forcht Dagi et al.	2017	Neurosurgery	Qualitative: Review the article	Even the most highly secured databases are vulnerable to penetration. Medical data repositories are no less so. They seem to have become attractive targets. The more data are shared, the higher the risks. Despite the evolution of cybersecurity protocols, breaches abound. Data security involves an obligation to guarantee physical security as well as network and cybersecurity. The obligation to protect patient data is both legal and ethical. Despite the fact that patients are asked formally for their consent to access records or share them, more often than not they do not have a choice. It is neither fully voluntary nor fully informed consent.
26	Tim Jacquemard et al.	2020	BMC Medical Ethics	literature review	It explores moral arguments about EPR, rather than empirical research, about people's attitudes. 1) Third-party usage of data (for health insurance, research, etc.) highlights particular privacy challenges and should be addressed through technological design. 2) EPR technology increases the patient's access to their data and can promote patient autonomy. However, consent and type of consent vary when the patient’s data is used outside the doctor-patient relationship. 3) There is a debate that EPR technology is more beneficial for the larger community and other parties rather than an individual patient. So, the risk and benefits of EPR should be critically analyzed and compared. 4) EPR technology increases the access of patients to their health records and it can improve the doctor-patient relationship by enhancing communication. However, due to data sharing, patients may be reluctant to share their sensitive information with the doctor.

27	Timothy et al.	2019	Studies in Health Technology and Informatics	Qualitative study	MyHR is Australia's EHR system. It shifted from a push method, which is a discharge letter to a pull method, which is Australia's GP or Physician pulling or downloading the data from MyHR. This shift can cause issues in the integrity of the EHRs. Like their recentness and validity can be affected. There should be a set definition of confidentiality so that issues like breaches of security can be avoided. Patient privacy and security should be given the utmost privilege so that participation of people in the MyHR system is encouraged, which can lead to good outcomes for public health.
28	Vuong et al	2022	Australian Journal of General Practice	Qualitative: review the article	This article is aimed to discuss the ethical considerations associated with the pooling of general practice EHRs for research. In using pooled EHRs for research, the risks to patients and GPs include potential psychological, social, economic and legal harms that may be associated with the breach of confidentiality. The confidentiality of the patient, and GPs needs to be protected at all times. There are benefits of using EHR data as well as potential risks. GPs should ensure there are processes for informing patients in a timely, meaningful and accessible way about pooling EHRs. Careful consideration and judgment are required to ensure that ethical requirements are met.
29	Wallis et al.	2018	Journal of Primary Health Care	Qualitative: record review article	In this article, ethical issues in using public health information in research without consent are discussed. These include: Patients have a right to health information privacy that stems from the principle of autonomy. Doctors receive private information in the course of a confidential relationship and exposure of this information for research purposes damages the doctor-patient relationship and trust of the patient in doctors. These ethical issues can be minimized through data anonymization, clear communication with patients about potential uses of health information and the development of trust between GPs and researchers.

Responsibility:

Responsibility refers to being accountable or having control over something and was reported in 4/29 (14%) articles. Responsibility for the safe and ethical application of electronic health records requires a complete network of interconnected channels. The question arises that who is responsible for the storage and implementation of this highly sensitive information where needed. All the health care professionals, patients, as well as the IT team, are responsible to provide encryption and safe application of electronic patient records (34). In order to maintain the privacy and confidentiality of the patients, responsible use of data should be done. Especially, if the public trust is to be kept intact, careful monitoring of EPRs and EHRs is necessary. In some projects in UK and US, patient data was accessed by companies without the informed consent of the patients. These types of cases emphasize the need for crateful and responsible systems that can help in preserving the trust and confidentiality of the patients. Therefore, healthcare systems should provide access to EPRs only if the patient gives consent (28). In another scoping review, it was discussed that it is the responsibility of doctors to provide adequate medical care and the responsibility of patients who can have access to their data (40).

Benefit-risk analysis:

Patients, clinicians and the health care system are greatly benefiting from online electronic portals however there is a debate that EPR technology is providing more benefits for larger communities than for individual patients. This was discussed in 18/29 (62%) articles. HER-based researches provide benefits to many insurance and private companies but at the same time, researchers also think of ethical challenges that can arise as a result. There are potential risks to patients' privacy and autonomy as well as risks of harm, risks of leakage of data and these risks are not only limited to patients but the whole healthcare system (34). Therefore, many concerns have been raised regarding the risk of breach of confidentiality and privacy of the patients. It is the responsibility of the researchers to keep the patient's records private and guarantee the utmost safety (24). Additional terms like benefits and risks should be included in the research form and only then informed consent should be taken (34). Additionally, the healthcare team should only allow data sharing with AI companies keeping in view the potential benefits and risks (31). Despite the efficacy that EHRs provide, psychiatric electronic data is still a part of conflict because of its sensitivity and privacy (36).

Using pooled EHRs for research purposes raises many concerns. There are significant social and privacy risks to patients. End-to-end encryption and safe storage of data can eliminate these risks to some extent (23). MyHR Australia has allowed patients to have ownership of their health information but the benefits and risks of this are still in question because benefits are not equally distributed among all. Literate people may get more benefits as they can better understand the risks as well as advantages associated with it (41). In a study conducted in Singapore, patients were confused between the benefits and risks of sharing personal data for genomic and other research studies but most of them were of the view that risks can be taken for research that would be in the best interests of the people (42).

In another study, The Health care practitioners were of the view that sharing health records contributed to better doctor-patient collaboration. At the same time, some thought that the patients would not be able to understand the complexity of ERP technology and they can misinterpret the reports (38). A study was conducted in a pediatrician hospital, 5 of the included studies highly perceived the efficacy of using EMR. On the other hand, concerns were raised about the access to EMRs of children by parents as they can misinterpret the information and it can disturb the professional relationship between parents and doctors (43).

Despite potential benefits, only a few countries are successfully using the EHR system because data safety and efficacy still can't be guaranteed (37). The benefits of using EHRs for extracting different kinds of data are well established. Nevertheless, many important ethical issues arise at the same time, because even more highly secured databases are vulnerable to theft (22).

DISCUSSION:

The use of electronic media in medical practice has proved a great revolution in this modern era. It has converted a lot of bothersome paperwork into time-saving and more reliable electronic data. However, it has also given birth to a lot of ethical dilemmas. This review has highlighted all those EPR-related ethical issues nowadays. This systemic review discussed ethical issues such as privacy, autonomy, risk/benefit analysis, doctor-patient relationship and responsibility. Privacy and confidentiality of a patient are highly compromised by this modern technology use in healthcare as seen in the recent pandemic. The confidential information can easily be accessed by any researcher and a pharmaceutical company for research purposes and so ethical issues arise. The most crucial step for the prevention of this ethical issue is strict regulation of sharing highly confidential data and also imposing laws for its protection. Any violation of a patient's confidentiality should be reported and so, and more and more awareness should be directed toward this ethical issue. Autonomy is the right of a patient to his/her body. So, consent is a must thing for everything related to patient disease, diagnosis and treatment. The autonomy of the patients is highly compromised in the recent pandemic. Also, psychiatric issues are highly sensitive and so any breach in autonomy can lead to some serious ethical issues. Thus, electronic records should not be leaked without any strict surveillance, and consent should be taken from the patient before its use.

Other ethical issues are self-explanatory and the need of the hour is to highlight these dilemmas so that they can be avoided in near future. Healthcare should be designed in such a way that all the principles of ethics in the medical step up retain their value so this modern electronic work could easily be incorporated into the medical world.

The major significant thing about this systemic review is that all recent literature has been included in this study and all the information is up-to-date. So, all recent ethical issues including those faced during the time of COVID-19 pandemic have been addressed.

Limitations:

The number of articles on the topic of interest is low since the concept is relatively novel. The content matter mostly did not take into account the ethical issues regarding EHRs. Moreover, the electronic health system is still somewhat geographically limited, leading to assumptions and extrapolations from data existing in specific regions.

CONCLUSION:

The digitalization of healthcare and the rapid adoption of electronic health records (EHRs) of patients in recent times can prove very beneficial in the future of medicine, public health and epidemiological studies. Through the integration of the data of patients, clinicians can collaborate and identify the patterns and treatments of clinical conditions.

But all of this comes at a cost. As the digitalization of healthcare is relatively new, the basic standards can be compromised. Electronic health records contain sensitive information related to an individual and any breach in their integrity can prove to be a major ethical issue. The records might be vulnerable to hacks, and third-party attacks. The transparency of the EHRs should be made sure so that patient autonomy, privacy and security can remain intact. This will encourage patients to take part in the electronic health system and this will prove beneficial for public health.

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