Review Paper

Medical Ethics in a Digital Era: A Systematic Review

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ABSTRACT

Medical Ethics are codified or non-codified principles which are governing the norms of dealing patients. The digital era has revolutionized the field of medicine and raised diversified medical ethical concerns. The aim of granter systematic review analysis was to find out the ethical problems in the digital era regarding medicine and the mutual consensus and differences of the authors to solve them for a brighter future medicine. The PRISMA diagram methodology was adopted to complete the research article. The total 18 article were revised in systematic analysis. The methodological framework of the included research study these were qualitative case studies, interrogator reviews, thematic review literatures, mixed method analysis and multi-site studies involving the semi structured interviews. The analysis has concluded that the digital era is facing the numerous ethical concerns of privacy, transparency, credibility and medical legal responsibility of medical professionals. However, by solving this ethical concern the digital era contributes more effectively in medicine.
Keywords: Digital Era, Medical Ethics, Privacy, Transparency, Informed Consent

Introduction

The medical ethics are codified or non-codified norms and principles to preserve the autonomy, respect and dignity of the patients [1]. The principles of medical ethics based on respect to autonomy[2], beneficence [3], non-maleficence [4], respect to human rights [5], solidarity [6] and acceptance to ambiguity in medicine [7]. The medical ethics considers the humanitarian, regional, cultural, ethnic and religious principles. It gives importance to the informed consents, privacy and confidentiality of the patients [8]. The dynamic global circumstances bring rapid transition and advancement in medical ethics worldwide. The global transition of medical ethics ranges from Hippocratic Oath [9], the Nuremberg Code [10] and the Declaration of Helsinki [11] to the code of ethics adaptation by American Medical Association (1947) and the United Nation principle of medical ethics [12].

The digital era has brought the great revolution in the field of medicine [13]. The challenges and the professional responsibilities has also governed in digital era. The digital life has provided the artificial intelligence as the solution of challenge in healthcare sector. Morley et all., 2019 has

concluded that the artificial intelligence raises further challenges of ethical consideration, regulation and legal framework [14]. The ethical problems arise at six level such as individual, interpersonal, group, institutional, sectorial and societal level. These level of ethical challenges are classified as epistemic, normative and overarching [14].

In digital era, the use of artificial intelligence in medicine has provided wide variety of facilitation in prevention, diagnosis and management of diseases. The use of decision tree technique for diagnosis and treatment of Brest cancer is great contribution of artificial intelligence in domain of healthcare [15]. The supported vector machine technique classify human genes and diagnose diabetes mellitus [16]. The enable learning method is implemented to predict the outcomes of the cancer patients. The neural network technique is used to assess the human movement [16]. However, besides these contributions, the use of artificial intelligence has risen the challenges of privacy of the patients. It also raise questions of legal accountability of machines, mistaken decisions and unfair behaviour [14].

The pandemic outbreak of Covid-19 incorporated the use of digital access to the medical consultation in healthcare sector. The digital consultation provided the on screen opportunity for face to face consultation during pandemic [17]. It controlled many hazards of medical issues such as nosocomial infection, influx of OPDs, distraction of medical staff from over influx of emergencies and critical units by patient relatives and visitors [17]. However, it give rise to the several ethical consideration i.e. privacy of the patient's data, transparency of the medical procedure, legal accountability and authenticity of the practitioner [17].

The majority of The US population gain frequent access to the digital forums such as Facebook, tweeter, Instagram, email services and other social medical website in 2018. The digital access is being rapidly attained by developing countries as well [18]. These websites are offering the development of medical information resources and online consultation. The social media provides the collateral information and builds the patient doctor relationship. It provides the beneficial information to the patients and doctors in field of psychiatry [18].

Similarly, the coded medical ethics in digital era varies in different region however, there is a general conscience with human right charter of the united nation and world health organization. The constitution of Oman through article 332 of Royal Decree 7/2018 allows that the medical photo can be taken without the consent of individuals [19]. In contrary to it, the article 3 of human right commission prohibits and states that written inform consent must be taken from patient before any procedure. This article states the No one shall be subjected to torture or to inhuman or degrading treatment or punishment [5]. The dynamicity and transition of medical ethics in digital era remained the prime focus of scholars and researchers in recent years. A published systematic review literature qualitatively revised the literature published before 2018 [20]. The current research article is aimed at for systematic review of articles published on topic of medical ethics in digital era in period between 2019 and 2022.

Methodology
The current systematic review analysis was performed through Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) statement protocol [21].

Search Strategy
A digital computerized search library of articles in PubMed was created on 29 October, 2022 by using EndNote Version X9. The specific key words such as medical ethics and digital era were used to identify the articles. The additional articles were directly transported to the PubMed library through Google scholar. The Trials and Custom year range 2019 to 2022 was used to filter the articles.

Inclusion and Exclusion Criteria
The research studies were including in this systematic meta-analysis according to justified criteria. The research studies published on medical ethics during 2019 to 2022 were included in this analysis. The research design of included research studies were qualitative research design, case report, interrogative review and thematic literature review. The research studies related to medical

ethics in relation to contribution of any digital forum or modality were retained in qualitative assessment of analysis. All the research studies published before 2019 on topic of medical ethics in digital era were excluded from current systematic meta-analysis literature review because of previous evidence of publication [20, 22]. The articles related to medical ethics other than the concern of digital age were also excluded from current literature review.

Table 1: Inclusion and Exclusion Criteria of Systematic Literature Review

Criteria	Inclusion	Exclusion
Topic, Keyword	Medical Ethics, Digital Era	Other than medical ethics and digital era
Research Design	Qualitative Research Design, Case Report, Interrogative Review and Thematic Literature Review	Quantitative Analysis, Cohort Studies
Year of Publication	2019 to 2022	Before 2019
Language	English	Other than English

Reviewing Process
Through use of specific keywords (medical ethics & digital era) articles were searched in PubMed library of EndNote Version X9. Firstly, the articles were filtered based on year of publication and all published material before 2019 was removed from digital PubMed library. After that, the articles were revised on title base and duplication of the articles was removed. The full text articles, free to access in English language were downloaded and included in qualitative analysis.

Data Extraction and Assessment of Risk of Bias
The data was extracted based on author and publication year, title of the article, followed research design, adopted cored digital technology for discussion, outcomes and limitation. The quality of included studies was assessed and risk of bias was limited by using thematic analysis [23].

Results
Initially 362 articles were identified by using online library of PubMed in EndNote X9 software. There were 25 articles downloaded through other medium such as Google scholar. The total 387 articles published during period of 2019 to 2022 on topic of medical ethics in digital era were identified. After removing duplication according to defined criteria given above. Furthermore, 49 articles were removed based on language issues, free accessibility problems and research design deviations from the inclusion criteria of current systematic review literature and 18 were subjected to evaluate for further analysis. These 18 articles were downloaded and revised for full text to include in qualitative systematic meta-analysis of literature review. The screening of literature did not show the scientific research contribution from Pakistani scholars on concerned domain in defined time frame and according to selection criteria of studies. Therefore, in these 18 articles, there was no publication from Pakistan.

Author Name	Title	Study Design	Conclusion	Limitations
Al Balushi, 2019	The Ethics and Legality of Using Personal Smartphones to take Medical Photographs	Qualitative, Case Study	The use of personal smartphone for medical photography is easy and faster procedure for medical record. However, it raises the ethical issues	Case study (limited number of observations) No statistical analysis of the observation.

			of patient confidentiality and privacy. Only hospital equipment should be used.	
Chang, Shi, & Zhang, 2019	The contemporary ethical and privacy issues of smart medical fields. International Journal of Strategic Engineering	Qualitative, Case Study	Electronic healthcare record is best maintained by digital devices. Ethical issues such as privacy and security of medical record.	-Case report with limited number of observational data for qualitative analysis.
Han et al., 2019	Medical education trends for future physicians in the era of advanced technology and artificial intelligence: an integrative review	Interrogative Review	Digital platforms facilitate to develop and bring advancement in the medical curricula. Provides data management and assent facilities.	
Keskinbora, 2019	Medical ethics considerations on artificial intelligence.	Qualitative Analysis	Artificial Intelligence algorithms can cause unforeseen consequences and unfair outcomes. However, the researcher and ethicists ensured more secure and positive future in prospective of medical field.	
Morley et al., 2019	The debate on the ethics of AI in health care: a reconstruction and critical review	Thematic Literature Review	Revised literature concluded that the algorithm of artificial intelligence revolutionaries the healthcare sectors and raised the serious ethical concerns. However, future is safer and secure with AI by mitigating the ethical problems.	Search parameters to identify the articles were variant throughout the review. Database was not operated with same syntax.
Nebeker, Torous, & Bartlett Ellis, 2019	Building the case for actionable ethics in digital	Mixed method analysis	Research studies should be conducted to	

	health research supported by artificial intelligence		identify the necessary ethical concerns regarding use of arterial intelligence in healthcare sector.	
Terrasse, Gorin, & Sisti, 2019	Social Media, E-Health, and Medical Ethics	Qualitative Research Design	Social media platforms i.e. Facebook, Instagram, Websites and YouTube are the main resource for medical awareness. They are offering the online face to face consultations. The ethical concerns of privacy and norm of written informed consents are necessary for sharing information of patients.	
Varghese et al., 2019	Ethical standards for cardiothoracic surgeons' participation in social media	Qualitative Research Design	Cardiothoracic Surgeon should maintain the privacy and confidentiality of the patients whiling sharing the information on social media. Shared information will be considered permanent. Personal and professional boundaries should be maintained.	
Wangmo, Lipps, Kressig, & Ienca, 2019	Ethical concerns with the use of intelligent assistive technology: findings from a qualitative study with professional stakeholders	Multi-site study involving semi structured interview	The study concluded the outcome as multifaceted spectrum of ethical concerns. The stakeholders and end consumers should have promise to	

			maintain professional boundaries.	
Chew & Ko, 2020	Medical ethics in the era of COVID-19: Now and the future			
Curkovic, Kosec, & Curkovic, 2020	Medical professionalism in times of COVID-19 pandemic: is economic logic trumping medical ethics?			
Gasser, Ienca, Scheibner, Sleigh, & Vayena, 2020	Digital tools against COVID-19: taxonomy, ethical challenges, and navigation aid.			
Masters, 2020	Ethics in medical education digital scholarship			
Dugdale & Braswell, 2021	The ethics of leveraging medical student status on social media			
Wong et al., 2021	Harnessing the digital potential of the next generation of health professionals			
Erler et al., 2022	Clinical Ethics Consultation During the First COVID-19 Pandemic Surge at an Academic Medical Center: A Mixed Methods Analysis			
Lettieri et al., 2022	Medical confidentiality in the digital era: an analysis of physician-patient relations			
Pasricha, 2022	Ethics for Digital Medicine: A Path for Ethical Emerging Medical IoT Design			
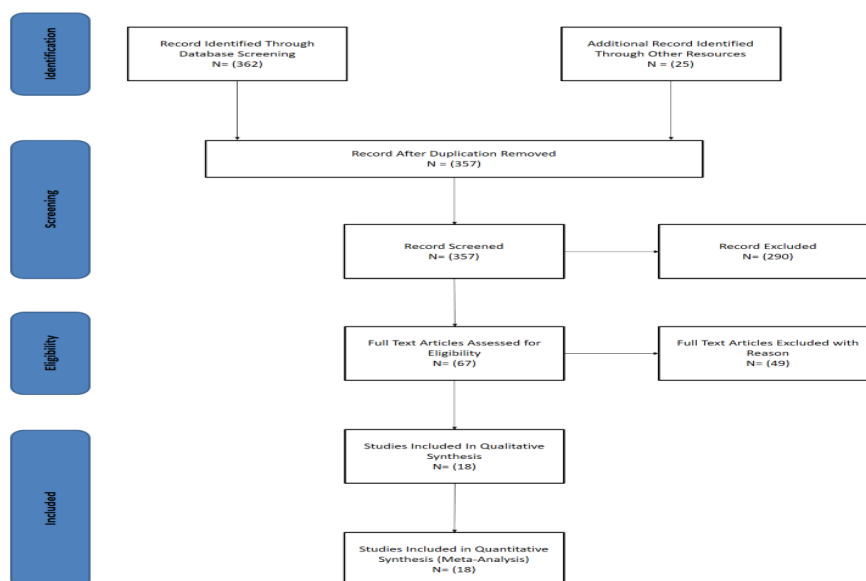
Figure 1: PRISMA Diagram

Discussion

The health care sectors facing a number of challenges in growing era of technology. The digital life has provided the aritfical intelligence as the solution of challenge in healthcare sector. Morley et all., 2019 has concluded the the artifical intelligence provide raise further challeneges of ethical consideration, regulaiton and legal framework [14]. The ethical probelems arise at six level such as individual, interperosonal, group, institutional, sectoral and societal level. These level of ethical challenges are catagoriesed as epistemic, normative and overarching.

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information consent from patients and their family member before publishing such those information for academic purpose [18]. The critics of the telemedicine argue that the field of medicine is need physical interaction of patient and doctor for effective diagnosis. Therefore, the diagnosis made through telemedicine is ineffective and causes the more damage to the patients.

Conclusion

The digital era has made various facilitation for the modern treatment of diseases. It has also provided various digital access to the doctors and medical resources. The digital era, along these facilities has risen the issues of ethical concern of privacy, transparency, credibility and medico-legal responsibility. However, the future of medicines with digitalized era is brighter by solving these ethical issues.

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