



A Rapid Review of the Ethical Applications for Cybersecurity in Healthcare during the COVID-19 Global Pandemic

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Abstract

Telehealth as a service delivery method, has been an important shift for healthcare organizations in the COVID-19 pandemic to ensure persistence of care. Our study objectives were to identify and describe healthcare cybersecurity ethical challenges experienced during the pandemic with a view towards promoting accessibility, quality, safety continuity of care in the future. This systematic review was conducted following the methodology proposal from Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols, targeting articles about cybersecurity in healthcare organizations that were published during COVID-19 pandemic (March 2020 to October 2022). The articles commented are from the ebscohost and Pub-Med (which questions MEDLINE) databases by their platforms Academic Search Complete, MEDLINE complete, Complementary Index. The supplementary topic modeling included follow on ethical application results in the review findings. The rapid review identified three major bioethics themes across the 22 articles that met inclusion criteria with respect to data security and privacy normative aspects in responses to viral infectious diseases, including smart / medical infrastructure related concerns (reported in 73 % of occurrences), cybersecurity for at-risk population (reported in 55% of occurrences) and legal challenges within approaches to disclosure involving relative or absolute means for a future pandemic, referred to as public health surveillance (incorporating general human rights-related request flags) (reported in all included articles-100%). Researchers also conducted a latent Dirichlet allocation (LDA) analysis to characterize the three topics of review and public health data usage. These were then linked to fundamental moral health treatment principles. Conclusion we have discussed the importance of continued evaluation for cybersecurity threats and ethical considerations across multiple standards to ensure continuous care delivery in healthcare technologies interoperable with telehealth.



Introduction

Both hacking groups and ran somware compromised hospital networks leaving them unusable for weeks or even months causing some 40 million patient records to be exposed . At least in the United States, it was reported that more than 600 healthcare organization data breaches took place during the pandemic of 2021 alone , influencing about a collective number of over 22.6 million patients as customers have to use telemedicine services from security perspective also familiar-) (consumer clinical guide). Hence, the necessity to combat cybercriminal activity urgently has never been more essential than now when we are facing COVID-19 and other global environmental threats. In general, Cybersecurity is an activity that organization take to release or keep free from harm what they value using technology assets in its wide meaning (networks, devices and especially information data) [10]. Private health information is protected by law, enforced strictly in the healthcare industry by government. Healthcare has been the subject of much cybersecurity research with findings and modern trends, best practices surveyed . Although systematic literature reviews have been conducted previously on this (and related) topic, the type of systemic review does not interrogate – or evaluate – the ways in which said cybersecurity threats may implicate health care stakeholders with respect to their own cultural ethical principles. This study set out to ask a new question of what cybersecurity ethical considerations were practised under the pandemic during COVID-19, towards enhancing continuity in patient care. Reason The researchers were, therefore, interested to investigate further as there was limited academic study referring besides general ethics but not healthcare ethical principles in addressing inappropriate cyber-behaviors and data security risks during the pandemic. Although related work on cybersecurity in COVID-19 reports conducts that squarely violates ethical principles, this turn is often underrepresented by direct explicit mapping (or coding) to healthcare standpoints of ethics and ethicable actions. For instance, Mierzwa et al. In a more broad context, Aldekhayel et al. expressed the importance of incorporating ethics into all disciplines and even referenced 34 rules of Cyber Ethics from Center for Internet Security (CIS) with an outlined checklist to help prevent future cyberattacks. Nevertheless, no



unethical behaviors are mapped on to primary healthcare ethical principles. Research by Williams et al. Reference listed various reasons why individuals, organizations and employers were more susceptible to cyberattacks in healthcare but did not specifically consider past breaches involving COVID-19 or the ethical principles these may have violated. Lastly, Middaugh tackled Ransomware during the pandemic by discussing 4 risk categories: hospital ransom ware attacks), nurse manager responsibilities and how such incidents can be prevented. Therefore a subset of healthcare industry cyberattacks was sought from the literature to better understand and try make sense in mapping such behavior against some known healthcare ethical principles. To our best knowledge, this is the first systematic literature review that seeks to codify cybersecurity attacks and themes in pandemic times against the backdrop of healthcare ethical principles using an additional topic modelling. After the transition we also saw that many sectors within healthcare continued to believe they were able to sustain some of these changes particularly with congruent operations often stemming from increased telehealth utilization. While routine care is expected to return as infection rates of COVID-19 decrease and vaccines and boosters increasingly are able to control symptoms, it might not rise again ever or at least anytime soon back up the levels seen pre-pandemic. Healthcare technology made possible the feats medical providers and their healthcare organizations performed during both pandemic surges, with more now to come; but cybersecurity remains an ongoing threat. Even before the pandemic, various industries were experiencing ongoing and seemingly worsening digital attacks; this signals a need to examine the cybersecurity ethical considerations specific for healthcare stakeholders looking ahead to some of these anticipated violations. It may help the viability of health IT and telehealth when it comes to addressing such challenges, which will be important for coping with future COVID-19 variants.

Methodology

Eligibility:

Inclusion criteria Articles eligible for inclusion were those focusing on healthcare ethical initiatives and/or challenges faced during COVID-19 pandemic. All searches were limited to



original peer-reviewed academic journals. The review Articles in this review consisted of articles that were particular to healthcare cybersecurity ethical efforts and/or difficulties recognized during the COVID-19 pandemic. With regard to the search: We used only original, peer-reviewed scholarly journals. The review team defined aggressive publication date search criteria for article identification (1 March 2020 to 1 October 2022) in order that these findings be directly indicative of cybersecurity ethical concerns during the pandemic. The research team searched ECIFT from 10 to 14 October 2022. The team then decided upon an aggressive publication date search criteria for use in article identification (1 March 2020 to 1 October 2022) to ensure that findings were specifically related to cybersecurity ethical concerns during the pandemic. The search was carried out by the research team with respect to 10-14 October, 2022.

Information Sources

Summary of Information Sources Three databases were searched used in the review, these are Academic Search Complete, MEDLINE Complete and Complementary Index. Full-text articles were accessed through the Texas State University library website, Ebsco B. Stephens Company (EBSCO host), and PubMed which queries MEDLINE platform Contents/Coverages & Access Points reviewed Three research databases were used: Academic Search Complete, MEDLINE Complete and Complementary Index. The full research articles were accessed online through Texas State University's library website, the Ebsco B. Stephens Company (EBSCO host) and PubMed [which also searches titles of MEDLINE] platform. The three databases were selected for systematic review on the basis of an initial search in one database (with resulting in the most likely articles identified). In addition, the research team agreed at an early stage of searching not to use any terms/ search criteria around ethics/ethical issues (pertaining) so as not further filter out valid cybersecurity pandemic related studies from academic investigation. Review, according to the total identified in initial database search (to give number of potential articles any given algorithm might return). Finally, the research team agreed at an early stage of searching to exclude any search terms or criteria related ethics/ethical concerns in order avoid ruling-out studies on cybersecurity during pandemics.

Search Details



Details of the Search The research team developed a search string using multiple rounds of database queries to generate the first 100 search results from each database.

Systematic Review Protocol & Design

Focusing on Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, the review commenced. The initial database searches were conducted by the entire research team. In order to be as inclusive as possible, the research team did not have articles meet all full-text EBSCO host optional article exclusion option (which yielded results in 21) or a combination of that and two others options. From that initial sample of articles, the research team collected all full-text versions and filed these on an MS Teams site as well as in reference management software for citation purposes. The research team had multiple telephone and webinar meetings to help with identification of articles, revealing that the initial search selection criteria could assist in retrieval. An MS Excel spreadsheet was used to identify and discuss the construction of items that pinpointed individual comments for every paper(s) included in this re-view. The review decision (including the identification and categorization of constructs) did not result in any disagreements amongst the team. 2.5. The research team also used an additional topic modeling analysis method Latent Dirichlet Allocation (LDA) to analyze the review articles to advance validation of themes and their translation as necessary onto healthcare ethical principles. A computer-aided text analysis (CATA) method was used on the healthcare cybersecurity works discovered throughout our literature review utilizing a topic modeling algorithm. For topic modeling and downstream analysis, we chose latent Dirichlet allocation (LDA) [18] for this study.

Results

Study Selection and Exclusion Process

The study selection flow and process with an initial search from research databases yielding a total of 11,475 articles. At the EBSCO host website, based on [published within x number of days], 86 duplicates were found and initially taken off from searching. Then EBSCO host exclusion options were added to further narrow the relevant articles from the rest of general bioethics content. A further 11,365 articles were filtered out post subsequent filtering: (a)



English-only residency or fellowship curriculum development manuscripts; (b) Peer-review and academic journals only. The 3-member reviewer team then performed a full-text review of the remaining 24 articles. All papers were reviewed by a minimum of two research team members; many reports included input from multiple researchers (Table 1). When the full-text review concluded it was necessary to exclude two more articles [1 unrelated to investigation, 1 an additional article duplicate]. The article was excluded from the second search topic as 'not germane to topic' but somehow passed through in what we accessed via library research databases initially.

Conclusion

Protecting healthcare data and the systems that nurse them will only become a bigger factor in how we view cybersecurity moving forward. Security works must always be about how sustainable the ethical dimensions of those security efforts are seen by all stakeholders – not what or where they produce manners, thinkings and views on cares and outcomes. Care delivery relies on access to valuable information, as well as speed and convenience of measures. Medical directors will still be responsible for the protection of all health information, and to uphold principles of highest ethical standards. From this review, we identified three types of ethical constructs (cross-cutting themes) in the context of cybersecurity work done during the global COVID-19 outbreak. Simple supplementary topic modeling helped the research team to map these suggestions over three healthcare principles namely nonmaleficence, beneficence and justice. As required to pass the tests, healthcare robots (taking into account patient data), artificial intelligence or AI state of security for high risk populations and legal issue at an organization-level in terms of cybersecurity are all big issues facing health leaders as efforts continue, The critical ethical questions regarding cybersecurity in healthcare and the delicate balance required to upgrade technology without compromising patient data are pronounced by this review. Few of the identified articles corroborate a serious demand for further studies in this area and highlight that future work should include more databases to represent literature comprehensively. Future research will need to tackle the cybersecurity sectors that move quickly, ideally with suitable ethical



frameworks ready for a flexible and foresight regulation ecosystem able to adapt at lightning speed. They would protect patient data if such routines were in place.

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International Journal of Machine Learning Research in Cybersecurity and Artificial Intelligence

Volume: 15 Issue no: 01 (2024)

<https://ijmlrcai.com/index.php/Journal/index>

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