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Health Informatics, Hospital Management and Physicians Together with Nursing Staff Facing Pandemic Diseases; Review

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Abstract

During the global pandemic, the proliferation of unstructured data has led to the increased prominence of Health Informatics, physicians, nurses, and medical administration. This enables healthcare units to utilize and derive significant insights for doctors and decision-makers, providing pertinent information to enhance operations and forecast future treatment modalities through Information Systems Communication. Currently, vast quantities of data are being gathered and analyzed globally to enhance patient diagnosis and treatment, improve public health systems, and aid government agencies in formulating and executing public health policies, thereby fostering confidence in future generations seeking superior public health systems. Hospitals must be equipped to adeptly address forthcoming epidemics. A thorough epidemic management strategy is essential to mitigate the epidemic's impact, limit public health risks, and ensure efficient and effective resource allocation.

Introduction:

The significance of disease surveillance, diagnosis, treatment, and research has been highlighted by the global pandemic. Many health networks would have less than a decade's worth of experience and opportunity to learn about the utility and limitations of this computer-based tool in improving healthcare quality, population health, and health system efficiency since the adoption of the electronic health record (EHR) with the American Recovery and Reinvestment Act in 2009. Conversely, the medical community has been familiar with the strengths and weaknesses of this tool from decades of practiced medical informatics. In its numerous forms and classifications, informatics is the ideal fusion of technology, process, and people, as well as its association with health information management [1,2]. The literature has described numerous principles of informatics in the context of disaster mitigation and preparedness, including computers, software, Internet connectivity, and telemedicine. Nevertheless, additional research is necessary to elucidate the practical clinical implementation of informatics in the context of a pandemic response. Even with an abundance of research and evidence, swift clinical practice changes can be difficult to implement within the confines of a large health organization [3].

Hospitals are essential infrastructures for the response to the COVID-19 pandemic, as they admit and treat patients who are afflicted by this disease [4]. Additionally, they are required to provide routine services, which increases their workload by twofold. The COVID-19 pandemic presented numerous challenges to hospitals in the provision of healthcare services, as a result of the limited knowledge and experience regarding this freshly emerging disease [5]. The situation was further complicated by the absence of a standard program for the preparation and response phases, the disproportionate management of resources, the disproportionate distribution of resources, the complex and expensive diagnostic-therapeutic equipment and methods, the staff and hospital bed shortages, the inadequate staff training and practice, and the varying experiences of healthcare managers [6].

The primary challenges faced by hospitals in managing the COVID-19 pandemic have been related to human and logistical resources, finance and budget, psychological issues, and infection prevention [7]. In order to enhance the resilience of hospitals, a variety of strategies were implemented to address the challenges that physicians and nurses encountered in each care context, taking into account the national structures of the respective countries. In Italy, structural modifications included the implementation of filter zones in various wards and the presence of airborne infection isolation chambers in the emergency departments. Additionally, technological advancements were implemented to facilitate the remote provision of healthcare services. Operational measures, including the differentiation of acute-care assets from low-care assets and the assessment of the risk of infection prior to admission, were designed [8].

Review:

The global coronavirus disease 2019 (COVID-19) pandemic has highlighted the need of illness prevention, detection, treatment, and research. With the adoption of the

electronic health record (EHR) as part of the American Recovery and Reinvestment Act in 2009, many health networks would have less than a decade of opportunity and experience with the utility and limitations of this computer-based tool in improving healthcare quality, population health, and health system efficiency, whereas the medical community has decades of experience with strengths and weaknesses in medical informatics.2 Informatics, in its various forms and categories, especially in conjunction with health information management, represents the ideal convergence of people, processes, and technology.3,4 Many informatics ideas relating to computers, software, Internet connectivity, and telemedicine have been characterized in the literature as disaster mitigation and preparedness strategies.5-8 However, resources clarifying the practical clinical use of informatics in pandemic response demand further investigation. Making rapid clinical practice changes within the limits of a major health organization can be difficult, even with a wealth of research and data [9,10].

As COVID-19 cases increased in the US, emergency departments and intensive care units quickly reached capacity. This highlights the importance of nurses and other healthcare providers (HCPs), including respiratory therapists, physicians, and patient care technicians, during pandemics. Early studies found that nurses caring for patients with confirmed or suspected COVID-19 reported physical and mental exhaustion due to feelings of helplessness, increased patient caseload, and lack of personal protective equipment (PPE) [11]. HCPs caring for COVID-19 patients face ethical challenges such as isolation, quarantine, and personal concerns, as well as limited resources. Previous study has indicated that HCPs caring for patients during epidemics such as influenza A subtype H1N1 (H1N1), SARS-CoV, and Ebola virus experienced higher discomfort due to worry of contracting and transmitting the disease (12, 13). Existing research suggests that HCPs endure emotional distress as a result of a lack of access or rationing of healthcare resources, such as PPE, as well as balancing personal and professional commitments. The additional responsibility to reprioritize care for highly contagious patients complicates these ethical quandaries and raises moral distress (MD) among health-care providers [14].

This study examined the obstacles faced by nurses and other healthcare providers while caring for patients and families during the COVID-19 pandemic. HCPs on the frontline experienced fear of the unknown and personal pressures, similar to reports of significant physical weariness and discomfort among nurses during MERS-CoV and Ebola epidemics (15). Nurses, doctors, hospital administrators, and other healthcare professionals expressed fear about transmitting COVID-19 to family and friends. HCPs in our sample chose to segregate themselves from family members when caring for COVID-19-positive patients at work due to concerns. Sun's study team (2020) observed that caregivers of children and elderly family members suffered considerable negative psychological affects while caring for patients during the COVID-19 pandemic, supporting concerns about catching and spreading the virus. Government-imposed restrictions resulted in isolation and limited access to stress-reduction activities, leading to increased despair and anxiety among individuals. One study indicated that HCPs who care for persons with confirmed or suspected COVID-19 are at higher risk of infection and mental health disorders [16].

The duty to care is based on the principle of beneficence and guided by professional ethics. HCPs expressed great fear about getting and transferring the virus, but they continued to work out of a sense of professional commitment to their patients and coworkers. Previous study has shown that this sense of professional obligation is unrelated to the magnitude of the danger; nevertheless, risk can be reduced by having access to suitable resources, including PPE [17]. Despite safety concerns, all of the HCPs in our study reported feeling obligated to work. When combined with concerns about a lack of access to PPE, these requirements had a negative impact on both their physical and mental health. COVID-19 patients required extensive physical and mental care from healthcare providers. Restrictive visitation regulations to prevent COVID-19 spread caused dread and isolation among patients, according to nurses. While visitor restriction is a solid method of controlling the transmission of infectious disease, hospitals may benefit more from finding other ways to satisfy patients' emotional needs that do not rely on nursing care. Hospital-established standards must evaluate the ethical implications of isolation and the hardship it may create on healthcare providers [17]. Nonetheless, nurses were frequently alone by their patients' bedsides (many of whom were very ill and afraid), serving as their sole source of support. This study discovered that nurses were frequently the only HCP permitted or willing to enter patient rooms, increasing their risk of infection and leaving them emotionally vulnerable in their additional role as lone supporter for their patient. Another study discovered that when HCPs came into intimate contact with MERS patients, they were more likely to become infected [18].
In some cases, nurses were asked to alter roles or undertake activities outside of their typical practice area because other healthcare providers refused or were directed not to enter a patient room. To the authors' knowledge, this conclusion is novel in the literature, as no previous studies demonstrated that pandemics forced nurses to practice outside of their customary function. Performing more jobs or practicing in unfamiliar places significantly increased the risk of exposure for nurses, raising concerns about the prospect of worse quality treatment. In addition to concerns about providing safe, quality care, HCPs working outside of their typical area of practice express greater anxiety about professional responsibility [17]. More than half of the HCPs in our sample were instructed to shift their scope of practice as their units became COVID-19 units. Therefore, information on reducing personal safety concerns may be advised. Nurses were often unable to transition to a non-COVID unit due to lack of notice and training. Previous research found that nurses who provided care outside their typical field of practice reported higher levels of stress [19].

Big data is a term used to represent a large volume of data that is now gathered and stored and has surpassed traditional data management and analysis tools. According to Roger Fyre and Mark McKenney, solutions such as Hadoop and Spark have emerged to address some of the challenges surrounding big data [20].

Researchers used Hadoop to create a range of parallel processing techniques to efficiently handle geographical data. Examples of these strategies are multistage map and reduce algorithms that produce on-demand indexes while retaining persistent indexes [20].
Much of the current research on predictive analytics, particularly in clinical settings,

is targeted at improving health and financial outcomes in order to make better decisions. Data mining, defined as the analysis and modeling of massive volumes of medical/health data to find previously unknown patterns or relationships, is one of the most important machine learning methodologies [21].
Data collecting for diseases such as cancer and neurological problems is used to enhance disease prognosis. Cancer detection and diagnosis, as well as other health-related issues, are now possible thanks to these discoveries. Here, notable research in the field of health monitoring and informatics is discussed, which can be utilized to validate future research [22].

Machine Learning is critical for testing and developing diverse models that use clinical and other relevant medical aspects when making decisions.Medical imaging, which includes capabilities such as image segmentation, image registration, annotation, and database retrieval, is one of the most well-known instances of emerging medical technologies that can be used for decision making in the future [23].

Holzinger et al. [24] investigated a variety of ways to building an understandable model for the medical domain. Prediction explanations can be valuable in a variety of settings, including education, research, and even court. In the medical field, there is an increasing demand for models that can be interpreted and explained. They must be able to re-enact decision-making and knowledge extraction procedures. In their study, Ribeiro et al. [25] emphasized how machine learning models are black boxes. Understanding the reasoning behind predictions might help to foster trust. It can be used to evaluate model performance and build better, more accurate, and correct models by providing information about the model. Ribeiro et al. [25] propose the LIME algorithm to explain any model's predictions. This study by Bahdanau et al. [26] focuses on neural machine translation, although the methodology described can be used to a variety of different applications.
As a corollary to facilitating simple and structured computerized order entry for radiologic operations during a catastrophe response, suspending noncritical compliance requirements for CPOE was an essential component in reducing alert fatigue. As recovery units and floor beds expanded into overflow intensive care units, the justification for alerting patients about intensive care unit-only reserved medications was removed. Observation of clinical decision support rights led to the suspension of essential documents for the New York State mandate to give HIV testing before filing a hospital admission or ED release order. Implementing clinical decision support reminders for physicians to order COVID-19 polymerase chain reaction testing and examine the results had the potential to speed up bed assignment and patient cohorting [27].
ED providers (physicians, physician assistants, and NPs) proposed these adjustments through their Clinical Leadership Group representative, and they were implemented to address the increased number of temporarily redeployed medical workers who were unfamiliar with typical ED workflows. Intended implications, such as a decrease in HIV testing availability, were evaluated and deemed insignificant. Other unforeseen repercussions (more walkouts, longer lengths of stay) were not noticed with regulatory standards and liability halted by the state government's emergency mandate [28].

Conclusion:

Throughout the pandemic, health care professionals encountered numerous uncertainties. Insights into organizational processes and issues during the pandemic can be gained by investigating the perspectives of health care professionals regarding collaboration and organizational support. Clinical informatics can be employed by hospital administrators, physicians, and nurses to facilitate clinical decision-making, virtualize medical care, coordinate communication, and establish workflow and compliance in response to a pandemic. The implementation of clinical informatics procedures must be swift, with governance measures in place to effectively supervise and direct the development of new patient care pathways, diagnostic and treatment workflows, and provider education and communication. It is imperative to implement clinical informatics principles with agility, ensuring that governance measures are in place to superintend and guide the development of innovative patient care pathways, diagnostic and treatment workflows, and provider education and communication.

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