EXPLORING EMERGING TRENDS IN NURSING DURING COVID-19: A SKELETAL FRAMEWORK ANALYSIS.

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Abstract:
Our skeletal framework research reveals important themes and difficulties experienced by nursing practitioners as it examines developing patterns in nursing during the COVID-19 pandemic. The quick uptake of telemedicine, the increased emphasis on infection control, and the growing recognition of the mental health needs of nurses highlight how dynamic nursing practice is in this crisis. Moreover, the pandemic has highlighted the need for a more equitable approach to healthcare delivery by bringing to light already-existing health inequities. The role of nurses in overcoming these issues has been crucial, as seen by their adoption of resilience-building tactics, advocacy for underrepresented groups, and flexibility in providing virtual care. In other words, nursing is facing multiple and numerous technological advancement such as robotics, Artificial intelligence (AI), health mobile applications, personalized patient medicines, and other. Nursing professionals may ensure the continuous progress of the nursing profession despite the COVID-19 epidemic by addressing these developing trends and improving patient care and outcomes in the face of unprecedented circumstances.

Key Words: Covid-19, Technology Era, Trends, Nursing, Patient Care, Robotics, AI.

Introduction:
In late 2019, the first case of Coronavirus Disease 2019 (COVID-19) was reported in Wuhan, China, leading to a global spread. The World Health Organization declared it an international emergency on January 30, 2020. Healthcare workers, particularly nurses, have been at the forefront of combating this global challenge, playing a crucial role in infection control, mitigation, and providing primary and intensive care despite facing significant risks to their own health. In hard-hit countries like Italy and Spain, approximately 20% of healthcare workers were infected by COVID-19, with nurses being particularly vulnerable due to their prolonged close contact with patients [1].

The International Council of Nurses reported that healthcare professionals accounted for 7% of total COVID-19 deaths, highlighting the elevated risks faced by frontline workers. Studies by Liu et al. and Chew et al. underscored the immense stress and mental health challenges experienced by nurses and healthcare workers, including anxiety, depression, and stress. Additionally, nursing students encountered unique challenges during the pandemic, including economic uncertainty, fear of infection, and difficulties with online learning. The COVID-19 outbreak has underscored the critical role of nursing in public health, leading to numerous research studies on nursing and COVID-19.

However, there is a gap in comprehensive analysis of nursing-related research on COVID-19 to date [1].

Moreover, the COVID-19 pandemic has highlighted the urgent need for robust mental health support tailored for healthcare professionals, especially nurses, who have faced unprecedented stressors. Throughout this crisis, nurses have been exposed to immense pressure, witnessing widespread suffering and loss while enduring prolonged shifts under significant strain. This underscores the importance of prioritizing mental health resources within healthcare institutions, including accessible counseling services, peer support networks, and training programs focused on equipping nurses with coping mechanisms and stress management skills. Establishing a resilient support framework is crucial not only for alleviating immediate distress but also for building long-term mental resilience among nursing professionals facing ongoing and future challenges in their practice [2].

Additionally, the pandemic has prompted a critical reevaluation of nursing education and training. The rapid spread of the virus necessitated the integration of new data and dynamic protocols, emphasizing the need for continuous educational advancement among nursing professionals. This crisis has underscored the importance of incorporating comprehensive pandemic preparedness and crisis management modules within nursing curricula to equip future nurses with the skills needed to adapt quickly, respond efficiently to crises, implement infection control measures, and deliver quality care in unprecedented circumstances. Furthermore, an emphasis on interprofessional collaboration, communication, and ethical considerations has emerged as essential components of nursing education to prepare healthcare practitioners to navigate complex and evolving healthcare landscapes effectively [2].

Looking ahead, several transformative trends are expected to profoundly influence the nursing profession. The COVID-19 pandemic has accelerated the integration of artificial intelligence (AI) and data-centric healthcare approaches within nursing paradigms. Nurses are increasingly utilizing AI-driven tools for predictive analytics, personalized patient care, and optimizing administrative functions, enhancing operational efficiency and patient outcomes. The adoption of AI in nursing encompasses various applications, including analyzing extensive healthcare datasets, improving diagnostic accuracy, and refining treatment strategies. Additionally, AI facilitates proactive intervention and personalized care planning by identifying potential health issues preemptively. Moreover, AI-driven administrative tools streamline workflow efficiencies, enabling nurses to dedicate more time to direct patient care, thereby enhancing overall quality and responsiveness within healthcare settings. This multifaceted adoption of AI signifies a shift toward technology-enabled, patient-centric care approaches that are expected to shape the future trajectory of the nursing profession significantly [3].

Furthermore, the pandemic has emphasized the pivotal role of interdisciplinary collaboration in healthcare. Nurses have collaborated closely with diverse healthcare stakeholders, including physicians, public health specialists, and other professionals, to develop and implement effective strategies and protocols for managing the pandemic's impact. This collaborative model is anticipated to persist, fostering an increasingly integrated and comprehensive approach to patient care. By leveraging the diverse strengths and expertise of each discipline involved, interdisciplinary collaboration optimizes patient outcomes and enhances the overall effectiveness and efficiency of healthcare delivery. Moreover, this approach extends beyond immediate crisis management, positioning interdisciplinary collaboration as a cornerstone of healthcare, shaping future practices, and promoting a more cohesive, patient-centered healthcare landscape [3].

The COVID-19 pandemic has had an unprecedented impact across society, particularly affecting healthcare professionals, including nurses, who have been on the front lines of this crisis. This unique situation has prompted significant changes in nursing practice and has given rise to innovative trends that are poised to shape the future of the profession. Furthermore, the pandemic has highlighted the need for structural and systemic changes in healthcare delivery and nursing strategies, necessitating thorough exploration and analysis to enhance preparedness for future healthcare crises. This editorial underscores the importance of preparedness, adaptability, technological advancement, and collaboration in building a resilient healthcare system [4].

The pandemic has emphasized the crucial role of nurses in navigating unforeseen challenges such as shortages of personal protective equipment (PPE), high patient loads, and evolving treatment protocols. It has underscored the importance of robust contingency plans and flexible healthcare infrastructures capable of rapid adaptation to crises without compromising patient care or staff safety. Globally, COVID-19 has prompted healthcare systems to reassess their preparedness strategies, advocating for resilience and adaptability as essential components of effective crisis response [4]. Additionally, the pandemic has heightened awareness of the vital role of technology in nursing. The adoption of telehealth and remote monitoring has enabled healthcare delivery while minimizing exposure risks. Nurses have adeptly embraced telemedicine platforms, conducting virtual consultations, monitoring patient vital signs remotely, and providing educational and supportive services. This shift to telehealth has ensured continued care provision during lockdowns and has improved patient engagement and accessibility to healthcare services, particularly benefiting marginalized communities. Moreover, technology in nursing practice has spurred innovation in healthcare delivery systems, potentially reshaping post-pandemic healthcare landscapes [4].

Nursing Robotics:
Since the early 20th century, the concept of robots has captivated global imaginations, initially appearing in literature before being industrialized, notably by General Motors in their production processes. While the automotive industry remains the primary user of robotics, other sectors such as professional services, military, domestic assistance, and security have adopted automated technologies. This evolution has transformed manufacturing, households, and healthcare, where robots now assist or replace human efforts. The demand for robots has surged, resulting in a market valued at $17.8 billion, with automotive, healthcare, military, and consumer goods industries being major users [5].

These robots serve various functions, including assembly, surgery, welding, and painting. In healthcare, surgical robots are prominent, particularly in neurosurgery, orthopedics, and gynecology, with hospitals and academic institutions being primary purchasers. Despite their high cost, averaging $1 million per unit, medical robots offer significant value, with substantial growth anticipated. The International Organization for Standardization (ISO) has established standards for robotics, particularly focusing on performance, manipulation, and safety, including guidelines for personal care robots relevant to nursing robots. The ISO defines nursing robots as mechanized systems utilized by trained operators in healthcare settings to interact directly with patients, nurses, and other professionals, adapting their behavior based on environmental stimuli. This comprehensive definition encompasses professional service, collaborative, and intelligent robots, underscoring their potential within nursing care contexts [5].

Despite the fact that nurses make up almost 45% of all healthcare practitioners, nursing robots are not expressly addressed in the current state of medical robotics. The association between nurse understaffing and patient mortality suggests that utilizing nursing robots to augment or bolster staffing efficiency may result in better patient outcomes. The objectives of this study are to: (1) give a clear definition and explanation of nursing robotics; and (2) look at, analyze, and debate the data that has emerged regarding robotics advancements meant to support or improve nursing care, as shown by the patent landscape [5].

Since both machines and robots are able to perform autonomous activities, what distinguishes a robot from a machine? A machine is an automated tool that can be operated automatically or under operator direction. Robots, on the other hand, are machines that can do certain tasks independently and without the need for outside commands. The market for robotics is made up of complete robots (which make up 50%), robot parts (30%), robot software (14%), and safety supplies (6%). Designed to function autonomously, whole robots are fully integrated gadgets with the potential to save labor costs and increase efficiency [5].

Robot software acts as the electronic bridge between the hardware and software, while robot parts are the mechanical and electrical parts put together to create a robot. Robot software includes electronic controllers, whereas examples of robot parts are manipulators and arms. Steady progress in robotics

is largely dependent on enabling technologies, which go beyond complete robots, robot components, and robot software. These technologies provide features and performance improvements that address particular user needs, either on their own or in conjunction with other advances [5].

Robots Changing Nursing Work:

The limits of what robots can accomplish, such as their capacity to react emotionally to various circumstances, are being pushed by robotic engineers. These social or companion robots—also known as emotionally responsive robots—are finding their way into homes, offices, and healthcare facilities more and more. Social robots are made to behave in ways that mimic human reactions to encounters with humans. Sophia is one example of a robot that demonstrates how technical developments can improve the functioning of robots. Sophia was originally designed to be a companion for older persons. 2018 saw the noteworthy development of Sophia being awarded Saudi Arabian citizenship following a refit that included mobility features. Globally, scientists are investigating a range of uses for robots, such as driving assistance, addressing the issue of suicide, bolstering therapeutic telehealth applications, and more. The role of nurses in healthcare delivery is anticipated to change as robots gain the ability to carry out nursing tasks such assessing vital signs, giving medication, supporting ambulation, and adhering to infectious disease guidelines. Studies show that a large amount of a nurse's time is wasted on non-nursing chores that could be assigned to someone else. Robotically assisted nurses will be able to recover this time and devote more of it to patient care [6].

The goal of nursing-centered robotics projects sponsored by the National Science Foundation (NSF) since 2014 is to investigate the application of robots in nursing tasks. Over $3 million has been spent by NSF on studies to date in an effort to better understand how robots can carry out nursing tasks. This does not, however, imply that nurses are going extinct; rather, nurses are actively engaged in the creation and application of robots intended for patient care and the assistance of senior citizens. It is believed that these robots can support nurses in community and bedside environments. Multidisciplinary teams at Duke University's Pratt School of Engineering and School of Nursing are engaged in one such cooperative endeavor, where they are developing the Tele-Robotic Intelligent Nursing Assistant (TRINA). A remote-controlled robot named TRINA was created to help healthcare professionals who handle contaminated materials and regularly deal with patients and are at high risk of contracting an infection. In simulation labs, TRINA can presently complete roughly 60% of the prescribed nursing activities, although its performance is still far slower than that of a human nurse. Though it might take some time before TRINA or comparable robots are prepared for use, the knowledge gained from its creation will guide related efforts in the future [6].

The TCHAT (Telehealth Community Health Assistance Team) project was started by the University of Cincinnati College of Engineering and Applied Science, College of Allied Health Sciences, and College of Arts and Sciences in cooperation with Maple Knoll Village, a nearby independent living and retirement community. The research, which was led by nurses, sought to evaluate telepresence robot solutions for managing chronic illnesses and encouraging healthy lives. The healthcare program started with an in-home visit, and then there were follow-up telehealth remote appointments. Information was acquired about health outcomes for the participants as well as the robot intervention's usability and level of satisfaction [6].

Results from home-based telehealth coaching participants and comments from NPs studying adult gerontology who acted as telehealth coaches suggested that integrating in-person, in-person interventions with remote, robotic telehealth visits was beneficial for patients and clinicians alike. Among the lessons gained was the vital role that technology infrastructure plays in enabling internet-based robot connectivity. Insufficient bandwidth in patients' homes caused connectivity problems during the pilot, which resulted in robot freezing and disconnecting. The trial demonstrated how crucial it is for nurses to be involved in the development and execution of telehealth robots in order to create interventions that are relevant and successfully use new technology [6].

They discussed the role of nursing in the implementation of technology with Dr. Matthew Rota, assistant dean for technology, and Dr. Greer Glazer, dean, and vice president for health affairs of the

University of Cincinnati College of Nursing. They underlined that in order to fully utilize technology, nurses and data scientists must work together. Even though computer science and nursing are separate fields, nurses must transfer knowledge across disciplines in order to successfully evaluate data as technology improves. On the other hand, data scientists need to learn more about the patient variables influencing health outcomes. Dr. Glazer believes that as telehealth apps and smart robotics become more commonplace in patient homes, nursing will change into coaching responsibilities that help people achieve better health outcomes. But Drs. Glazer and Rota also stressed that human contact and developing relationships are still essential components of nursing, so robots will never completely replace nurses' duties in patient care [6].

In home care settings, nursing practice is changing as a result of the integration of new technologies and robots for medical data collecting, such as heart monitoring and urinalysis. Nurses will be able to perform practitioner tasks and provide care across the continuum, similar to a practitioner workload model, as AI capabilities advance, guaranteeing continuity of treatment. The acknowledgment of nurses' ability to practice at the greatest level of their licensing by other healthcare specialties, however, remains a major obstacle to achieving this goal. Dr. Rota emphasized that nurses must adjust to these changing responsibilities and adopt new tools and technologies. She also predicted changes in nursing education as courses become more heavily integrated with technology [6].

AI-Technologies in Nursing

Artificial intelligence (AI) is often likened to the transformative impact of electricity. Just as the advent of electricity revolutionized various aspects of our lives, AI is poised to reshape our world. By 2025, it is projected that global spending on AI in healthcare will reach $36.1 billion. China, in 2017, declared its ambition to become a leading force in AI by 2030, while the United States, on February 11, 2019, issued an executive order aimed at maintaining American leadership in AI, directing federal agencies to prioritize strategic objectives for accelerating AI research and development.[7]

With such substantial investments in technology and extensive government initiatives to advance AI, healthcare teams are bound to experience significant changes as innovations like intelligent robots are introduced into healthcare facilities and even patient homes. This article offers an overview of AI, discussing how AI algorithms and robots are altering the role of nurses and the challenges that the nursing profession may encounter as AI becomes integrated into healthcare delivery [7].

Yale New Haven Hospital (YNHH) nursing was an early adopter of the Rothman Index, a tool designed to reflect patient acuity and risk. Dr. Judith Hahn, Director of Nursing Professional Practice, Dr. Joan Rimar Sr., Strategic Analytics Innovation Scientist, and Leslie Hutchins, Clinical Informatics Manager, shed light on the process of introducing new algorithms into nursing and interprofessional practice. Hutchins described the goal of YNHH's technology implementations as providing timely advisories to enable meaningful decision-making for achieving desired patient outcomes [7]

The Rothman Index calculates scores using electronic medical record (EMR) data associated with 26 variables, including 11 nursing assessment metrics, presented in graphical form. Initially met with skepticism regarding its validity and reliability, the introduction of the Rothman Index lacked sufficient peer-reviewed literature to convince nurses and clinicians of its efficacy in influencing patient care. However, recent research suggests that the performance of the Rothman Index is positively influenced by nursing assessment data, thus highlighting the significant potential for nurses to impact patient care [7]

At YNHH, nurse SWAT (Special Weapons and Tactics) teams utilize the Rothman Index to identify at-risk patients. Comprising experienced nurses trained in critical care, advanced cardiovascular life support, and trauma care, these SWAT teams now receive immediate warning notifications on their mobile phones when the index indicates patient deterioration. The SWAT team then reviews the EMR and, when necessary, assesses the patient and collaborates with clinical nurses and medical staff on relevant aspects of care. Described as "a second set of eyes," SWAT nurses play a crucial role in patient monitoring and intervention [8]

The data utilized to generate the index are derived from routine nursing documentation, and timely input of nursing assessment data is essential for the calculation and utility of index scores, as the

index updates in real time from the EMR. For clinicians to embrace and consistently use the index, they may require a pivotal moment of realization, where they discover firsthand the impact of the data on their patient care and outcomes [8]

As healthcare systems incorporate new algorithms into patient care protocols, nurses must develop proficiency in interpreting diverse sets of data and incorporating novel information into their practice. Drawing from their experience with implementing the Rothman Index, the team at Yale New Haven Hospital (YNHH) offers insights into best practices for integrating new data into patient care [8]:

1. Foster a growth mindset within the organization, encouraging teams to embrace learning new methods for collecting and utilizing patient data effectively.
2. Tailor tool implementation to suit local needs and integrate seamlessly into existing practices, drawing from frontline provider experiences. The success of tool utilization hinges on anecdotes highlighting the practical utility of new technologies, alongside formal education efforts.
3. Ensure that tools are user-friendly, and that the interpretation of their outputs is intuitive for healthcare professionals.
4. Prioritize tools that directly benefit patient care, ideally enabling nurses to allocate more time to direct patient interaction. Such tools should facilitate a deeper understanding of the patient's condition and requirements, ultimately enhancing the quality of care provided at the bedside.

Applications and Nursing Care

Modern enterprises depend heavily on information and communication technology (ICT) to maintain competitive advantages and enhance operational efficiency. Various industries are utilizing digital breakthroughs to generate value and innovate in the Fourth Industrial Revolution (4IR), which is defined by sophisticated digital technologies. In order to improve both the quality of care and operational efficiency, hospitals, and other healthcare providers around the world—especially in developed economies—are embracing digital technologies like artificial intelligence (AI), machine learning, smart sensors, robots, big data analytics, and the Internet of Things (IoT). A Hewlett-Packard Enterprise survey by Aruba found that more than 60% of hospitals worldwide had IoT incorporated into their buildings. Therefore, it is important to look at how these cutting-edge digital devices affect customer-provider service interactions [9-10].

AI-enabled technologies have become increasingly prevalent in healthcare facilities in recent years with the goal of improving care services and making the most use of available resources. AI, which includes a wide range of technologies like natural language processing, machine learning, and intelligent robotics, presents a wealth of chances for innovation in the knowledge-intensive healthcare industry. Several new and well-established medical device firms presented their AI projects in December 2018 at the Radiological Society of North America (RSNA) conference in Chicago. These projects concentrate on using AI to help with patient diagnosis and therapy based on information gathered from clinical exams [10].

Furthermore, scientists, doctors, tech developers, and consumers from a variety of backgrounds are interested in AI because of its potential to bring about revolutionary advances in the treatment of human ailments and public health. Hospitals are expected to spend $6.6 billion a year on AI-related technology by 2021, according to Accenture, while Safavi and Kalis project that by 2026, AI applications could save the US healthcare system up to $150 billion yearly [10].

AI-supported tools greatly improve physicians' ability to make decisions about diagnosis and therapy by utilizing data from patient treatment records and substantial medical research. AI-based diagnostic algorithms, for example, are used to identify breast cancer and serve as a "second opinion" to help radiologists interpret images. Furthermore, compared to licensed dermatologists, AI technology has demonstrated higher accuracy in the diagnosis of skin cancer, enabling faster and more effective diagnoses based on a wealth of data and knowledge. Sophisticated virtual human avatars are being used to carry out the dialogues required for mental health diagnosis and treatment [10].

The usefulness of AI in healthcare operations is shown by real-world instances. For example, patients' vital signs can be remotely monitored by Wi-Fi-enabled armbands, which improves adherence to treatment plans and lowers the risk of hospital readmissions, ER visits, and costly home visits. The

use of AI-enabled technologies to detect "at-risk" patients resulted in considerable cost savings and a decrease in readmission rates for Grady Hospital in Atlanta. Although AI is helpful and enhances diagnosis, therapy, and operating procedures, issues with ownership, privacy, cybersecurity, data integrity, and medical ethics arise. Potential risks to patients' privacy, safety, and preferences give rise to ethical concerns, and laws and ethical standards are not keeping up with the rapid advancements in artificial intelligence. Furthermore, the dispute surrounding AI-based medical technology originates from the fact that not all healthcare practitioners have access to them. As a result, examining real-world examples of AI-based technologies and their uses is crucial to comprehending how these technologies will develop in terms of diagnosis, high-quality healthcare, and operational plans [10].

Personalized and Precision Medicine: Nursing Perspectives

President Obama unveiled the Precision Medicine Initiative (PMI) in 2015 with the goal of starting the "All of Us" longitudinal research cohort project. The goal of this project was to recruit one million individuals over a ten-year period from a variety of ethnic and socioeconomic backgrounds in the United States in order to study correlations between environmental, genetic, psychological, and demographic variables. By definition, precision medicine is the application of a person's genetic profile to guide decisions about illness prevention, diagnosis, and treatment. With over 269,000 participants, over 80,000 electronic health records, and over 210,000 bio samples as of October 2019, the PMI project has achieved great strides. Through this program, a vast range of digital, genetic/genomic, clinical, biologic, and electronic health information data will soon be available for authorized analysis by nurse researchers. Globally, large-scale research projects akin to the US PMI are beginning to emerge [11].

Contrarily, precision health refers to customized medical care that considers a person's particular genetic, genomic, or omic composition while also considering lifestyle, social, economic, cultural, and environmental factors. Its objective is to assist people in achieving optimal health and well-being. Interprofessional cooperation, community outreach initiatives, and coordinated care are necessary for the successful implementation of precision health, and nurses are well-positioned to lead in these areas. Many nurses are not sufficiently informed on the objectives of precision health and omics, despite the growing interest in these fields and their importance for nursing science and practice [11].

An important turning point in genomic research was reached with the commencement of the Human Genome Project (HGP), a multinational cooperation that began in the early 1990s. With the announcement of HGP's publication in the magazine Nature in 2001, the field of genomics officially began with the sequencing of more than 90% of the human genome. Precision medicine principles emerged from this age of research into the role a person's genetic makeup plays in health and disease [11].

According to the 2011 definition provided by the National Academies of Sciences, Engineering, and Medicine, precision medicine is the practice of customizing medical interventions to the unique medical needs of each patient. By integrating omics data—including genomes, proteomics, metabolomics, and microbiomics—into treatment plans, this idea transformed patient care. A comprehensive picture of an individual's molecular health status is provided by the field of omics, which is larger and encompasses diverse molecular interactions within physiological systems [11].

Although genomics offered significant understanding of the hereditary aspects of health and illness, omics evolved to capture the dynamic molecular interactions affecting general health. Omics provides a more thorough understanding of the mechanisms underlying health and disease. It encompasses genomes, epigenomics, transcriptomics, proteomics, metabolomics, and microbiomics. Launched in 2015, the Precision Medicine Initiative (PMI) seeks to enroll one million individuals in order to monitor their environmental exposures, socioeconomic determinants, medical history, and omics data over a ten-year period of time or longer. This program, which involves underrepresented minorities, places a strong emphasis on informed decision-making about participants' omic health information and participant participation [11].

Globally, comparable large-scale initiatives include the Hong Kong Genome Project, the National Health and Medicine Big Data Center in China, the Genome India Project, the NHS Genomic Medicine Service in the UK, the Million Veteran Program in the United States, and France's Genomic Medicine 2025 Program. To develop personalized medicine worldwide, these programs seek to sequence millions of genomes, establish biobanks, and combine genetic data with clinical information [12].

As the largest group of healthcare professionals, nurses are essential to the advancement of holistic health across a variety of demographics. By considering biological variability, environmental factors, and social determinants in patient treatment, nurses are leading the way in the advancement of precision health. Adopting a comprehensive perspective, nurses assess how social, environmental, and genetic factors interact to affect health outcomes, establishing them as front-runners in programs such as the Precision Medicine Initiative (PMI). The holistic nursing paradigm considers social variables, environmental exposures, genetic variability, and the larger context of patient well-being in addition to medical treatment. The comprehensive viewpoint of nurses highlights the significance of interdisciplinary cooperation in managing the intricacies of precision health programs. By identifying factors that influence illness susceptibility and resistance and providing individualized healthcare customized to each patient's needs, nurses help to achieve the aims of PMI through integrated care efforts [12].

Improving diagnostic precision and individualizing treatment plans for a variety of illnesses is the main goal of PMI and precision health. In order to investigate the effects of genetic differences on pharmacological responses and dietary influences, nurses play a crucial role in this attempt by utilizing scientific information. Through the incorporation of this comprehension into patient care, nurses can enhance treatment results and foster general health and wellness. Even with the critical role that nursing plays in precision health, there are still obstacles in the way of completely integrating nurses into leadership roles in PMI efforts. Efforts are being made to enable nurses to lead scientific discoveries and use data to enhance population health and preventative interventions since it is acknowledged that they bring an important perspective to the table. Achieving the objectives of precision health initiatives and successfully meeting each patient's unique health needs depend on embracing nursing competence in the omic era [13].

Future of Nursing Care:
Nursing care is expected to change significantly in the future due to a number of factors, including changing patient requirements, changing healthcare environments, demographic changes, and technological improvements. Looking ahead, a number of significant trends and advancements are anticipated to mold the nursing profession, from new care delivery models and an emphasis on individualized and holistic approaches to cutting-edge technologies and increased roles for nurses. Let's examine these points in greater detail:

Technology Integration: As a key component of nursing care, technology will continue to help nurses provide more accurate, timely, and patient-centered care. Technological developments in wearable sensors, telemedicine, AI, and remote monitoring will enable nurses to give care to patients in their homes and communities in addition to traditional healthcare settings. Telehealth platforms are expected to enhance access to care, particularly for marginalized groups and those living in rural areas, by facilitating virtual consultations, remote patient monitoring, and telemedicine. Artificial intelligence (AI)-driven solutions will help nurses with individualized care planning, predictive analytics, and clinical decision-making, hence improving patient outcomes and resource efficiency [13-14].

Expanded Practice Scope: As the need for primary care services, chronic illness management, and preventative treatments rises, nurses' roles and duties will also expand in the future. Advanced practice nurses (APNs) will become more and more important in the delivery of healthcare. They will cover gaps in primary care access and offer specialized services in a variety of clinical settings. NPs,

CNSs, RNs, and nurse anesthetists are examples of APNs. The increasing prevalence of nurse-led clinics, collaborative practice models, and interdisciplinary care teams will allow nurses to better address complicated patient needs and enhance patient outcomes by utilizing their expertise [12].

Preventive and population health activities will be given priority in the future of nursing care. These initiatives will center on encouraging wellness, preventing disease, and improving health at the individual, community, and population levels. In order to address socioeconomic determinants of health, lessen health inequities, and encourage healthy habits, nurses will take part in health education, community outreach, and advocacy initiatives. In order to enhance patient outcomes and save costs, population health management techniques, such as risk assessment, care coordination, and population-based treatments, will be included into nursing practice [15].

Holistic and Patient-Centered Care: With an emphasis on a thorough understanding of patients' physical, emotional, social, and spiritual needs, holistic and patient-centered care methods will shape nursing practice going forward. In order to provide treatment, nurses will take a tailored approach, adjusting interventions based on patients' choices, values, and cultural backgrounds. Prioritizing patient participation and shared decision-making will enable patients to take an active role in the planning and administration of their care. In order to guarantee that the provision of care is in line with patients' objectives and preferences, nurses will act as advocates for patients' rights, autonomy, and dignity [16] .

Patient-centered care (PCC) is becoming widely acknowledged as a fundamental component of high-quality healthcare delivery, and nurses are essential to its implementation. Nurses are the main proponents of PCC in healthcare settings because they are the healthcare providers that are at the patient's bedside all day and night. A more holistic model that puts patient values, preferences, and participation in decision-making processes first has replaced the conventional medically dominated approach with PCC [16].

A multitude of nursing theories emphasize the significance of patient-centeredness in nursing practice, including Leininger's idea of culture care, Boykin, and Schoenhofer's notion of nursing as caring, and Roach's definition of caring relationships. The substantial influence of nursing staff on patient satisfaction and the sense of being at the center of care is demonstrated by data from national surveys, such as the one conducted by the Israeli Ministry of Health on patient care experiences in general hospitals. Understanding how patients interpret nursing care is essential to identifying patients' needs and difficulties, which is at the heart of PCC implementation. In order to do this, nurses must actively interact with patients, finding out how they feel about their treatment and setting nursing priorities accordingly. Nurses must confirm with patients that their care is in line with their expectations and values in order to guarantee that their needs for care are met. They must also pay close attention to all elements of nursing care that patients find significant [16].

Establishing a supportive work environment and involving staff members in the creation, execution, and assessment of PCC procedures are essential to developing a PCC-committed healthcare workforce. Nurses and other healthcare professionals are essential in assessing PCC because they offer insightful information for QI projects and encourage advancements in patient care. Effective implementation of PCC requires nursing personnel to receive training on its concepts and practices. Nursing education programs ought to provide nurses with the necessary skills to recognize the individual requirements of every patient and encourage collaborative decision-making. In order to encourage patient participation and collaboration in care planning, advanced communication skills are very important. Moreover, instruction must go beyond conventional classroom environments by incorporating simulations that let learners practice using PCC concepts in authentic contexts [16].

In order to tailor treatment procedures to minimize vulnerabilities, nurses need to get a thorough awareness of the viewpoints, convictions, and values of each patient. This entails considering what sickness means to certain patients and modifying treatment approaches accordingly. In order to guarantee that care is in line with patients' preferences rather than only reflecting the preferences of healthcare personnel, individualized comprehensive nursing care should respect and value patients'

opinions and requests. In conclusion, the effective application of patient-centered concepts and practices will determine the direction of nursing care in the future. In addition to actively participating in the development and implementation of care practices that put patients' needs and satisfaction first, nurses must continue to be PCC's defenders. By means of continuous education, training, and cooperation, nurses may significantly influence the future of healthcare delivery, guaranteeing that patients stay at the core of care [16].

Interprofessional Collaboration and Team-Based Care: As nurses work together with other healthcare professionals, such as doctors, pharmacists, social workers, and allied health professionals, to provide coordinated and comprehensive care, collaboration and teamwork will be crucial traits of the nursing workforce of the future. Improved patient outcomes and care quality will result from interprofessional education and collaborative practice models, which will foster efficient communication, shared decision-making, and smooth care transitions. In order to confront complex healthcare difficulties as a group, nursing leadership will be essential in developing a culture of cooperation and teamwork inside healthcare organizations [17].

Emphasis on Lifelong Learning and Professional Development: In order for nurses to stay up to date with the quickly changing healthcare landscape and the latest advancements in technology and evidence-based practices, they will need to engage in both lifelong learning and professional development. In order to improve their clinical expertise, leadership qualities, and specific knowledge in fields like informatics, genetics, gerontology, and population health, nurses will seek higher degrees, certifications, and opportunities for continuing education yearly. Nurses' career advancement and professional growth will be facilitated by professional organizations, academic institutions, and healthcare employers via mentorship programs, research opportunities, and leadership development initiatives [18].

Ethical and Legal Considerations: Nurses will face new ethical and legal issues pertaining to patient privacy, informed consent, data security, and professional boundaries as their roles and duties grow and technology is more deeply incorporated into the delivery of care. In the face of developing concerns like genetic testing, telehealth ethics, and AI-driven care, nurses will need to negotiate difficult moral conundrums, preserve professional standards of practice, and promote moral decision-making. Nursing professionals will need to possess ethical reasoning, critical thinking, and ethical leadership abilities in the future healthcare environment [19].

In summary, there is a great deal of room for innovation, teamwork, and revolutionary change in the nursing profession in the future. In order to promote health, healing, and well-being for individuals, families, communities, and populations, nurses will need to embrace technology, broaden their roles, prioritize preventive care, and adopt patient-centered approaches. Nurses may effectively traverse the complicated landscape of contemporary healthcare and play a significant role in establishing a future where everyone has access to high-quality, affordable healthcare by remaining flexible, proactive, and dedicated to lifelong learning.

Challenges for Nursing Care:

Nursing care is at the forefront of healthcare delivery, offering patients in a variety of settings vital support and services. All the same, there are a lot of obstacles that nurses must overcome in order to provide high-quality care. These issues, which range from staffing shortages to technology breakthroughs, influence the nursing profession and call for creative solutions to guarantee the best possible outcomes for patients. In this post, we'll examine some of the major issues that nursing care is currently confronting and talk about possible solutions [20].

Staffing Shortages: The lack of competent nurses is one of the most urgent issues facing the nursing profession. A number of variables, including an aging population, a rise in the demand for healthcare services, and insufficient funding for nursing education and training programs, aggravate this

problem. Because of this, nurses are frequently overworked and understaffed, which can impair patient care and cause burnout and low job satisfaction. Comprehensive workforce planning techniques, more funding for nursing education and training, and programs to enhance recruitment and retention are all necessary to address the staffing shortages [20].

Workplace Violence: Patients, relatives, and even coworkers can verbally and physically attack nurses, resulting in harassment and other forms of violence. The safety and wellbeing of nursing workers are seriously threatened by this problem, which may also have long-term psychological and emotional repercussions. The implementation of workplace violence prevention programs, de-escalation technique training, and improved security measures are critical measures in tackling this widespread problem and establishing a secure work environment for nurses [21].

Technological Developments: Although technology can increase productivity and improve patient care, it also poses obstacles for nursing practice. Electronic health records (EHRs), telemedicine, and sophisticated medical gadgets are just a few of the new technologies that nurses must constantly adjust to. These can be difficult and time-consuming to use. To guarantee that nurses can effectively use technology to assist their practice, it is also necessary to address concerns around data privacy and security, interoperability, and the potential for technology to depersonalize patient encounters [22].

Ethical Dilemmas: In their line of work, nurses regularly face moral conundrums. These can include choices about end-of-life care and tensions between beneficence and patient autonomy. These conundrums can be especially difficult when patients, families, and healthcare professionals have divergent views or interests. To properly navigate these complicated situations, nurses need to have strong critical thinking abilities, ethical decision-making frameworks, and a firm grasp of professional ethics [23].

Healthcare Disparities: There are persistent differences in healthcare outcomes, quality, and access among groups, which exacerbates pre-existing social determinants of health and leads to disparities in health outcomes. By supporting health equity, advocating for vulnerable communities, and providing care that is culturally appropriate, nurses play a critical role in eliminating healthcare inequities. To achieve health fairness, however, will still require overcoming structural obstacles including institutionalized racism, socioeconomic restrictions, and restricted access to care [24].

Mental Health Issues: Being a nurse exposes nurses to trauma, suffering, and high-pressure work conditions on a regular basis. Nursing is an inherently stressful job. Because of this, nurses are more likely to suffer from mental health conditions such post-traumatic stress disorder (PTSD), burnout, and compassion fatigue. In order to address mental health issues among nurses, extensive support networks must be established. These networks must include peer support groups, mental health resource access, work-life balance initiatives, and self-care techniques [25].

Lack of Resources: The provision of nursing care is severely hampered by a lack of staff, financing, and equipment. Many times, nurses are overworked and under pressure to deliver high-quality treatment with little assistance or resources. A multifaceted strategy is needed to address resource restrictions. These strategies should include engagement with stakeholders to create creative solutions to resource shortages, advocacy for additional financing for healthcare services, and improved resource allocation and management. In summary, there are several obstacles that nursing care must overcome in order to provide excellent, patient-centered care. The workplace is becoming more violent, and nurses have to deal with a complex environment full of ethical, social, and systemic issues in addition to staffing shortages. Policymakers, healthcare executives, educators, and front-line healthcare professionals must work together to address these issues and make sure that nurses have the resources, tools, and support they need to succeed in their careers and give patients the best treatment possible. We can develop a more robust and adaptable nursing workforce that can

effectively handle the changing demands of patients and communities by taking on these difficulties head-on and putting creative solutions into practice [26].

Conclusion:

Finally, our examination of the skeleton architecture has shown a number of new developments in nursing during the COVID-19 pandemic. We have discovered important themes and difficulties that have had a big impact on the nursing profession through our investigation. First off, the quick uptake of telemedicine and telehealth has completely changed the way healthcare is provided, which offers nurses both opportunities and challenges. The trend toward virtual care has brought attention to how crucial it is for nurses to be flexible and tech-savvy when it comes to helping patients from a distance. Furthermore, the heightened focus on infection control protocols and personal protective equipment (PPE) has highlighted the vital role that nurses play in guaranteeing patient safety amidst limited resources and elevated infection risks. The epidemic has also brought attention to the need for increased assistance with the mental health and general wellbeing of nurses. The unheard-of workload, psychological stress, and trauma exposure have brought to light the significance of incorporating strong support networks and resilience-enhancing techniques into nursing practice. A more inclusive and culturally aware approach to healthcare delivery is also required, as the epidemic has brought attention to already-existing health disparities and inequities. In order to achieve health equality, nurses have been instrumental in tackling social determinants of health and speaking up for underrepresented communities. All things considered, our investigation has shed important light on how the nursing field has changed during the COVID-19 epidemic. Nursing professionals can improve patient care and outcomes despite previously unheard-of obstacles by tackling these new trends and difficulties and continuing to innovate in their practice.

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