

Considerations for the future of nursing in the digital age

By:

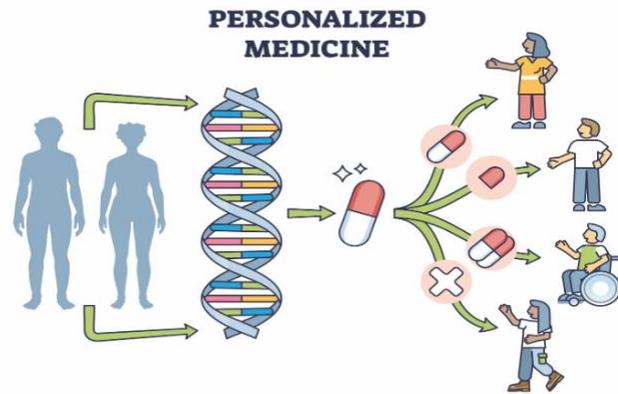
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Introduction:

The impact of digital technologies on the nursing profession is growing worldwide. Instances encompass the expanding prevalence of artificial intelligence (AI) and robotic systems; society's dependence on mobile, internet, and social media; and the rising reliance on telehealth and other virtual care models, notably in reaction to the covid-19 pandemic. Although there have been significant advancements thus far, there are still ongoing difficulties in the implementation of digital technology in nursing. An ongoing issue is that nurses have not kept up with the rapid advancements in digital technologies and their effects on society. These limitations hinder the full extent of the advantages they offer to nursing practice and patient care. In order to address these issues and adequately prepare for the future, the nursing profession must promptly undergo a transformation that incorporates digital technology. This transformation will enable nurses to effectively respond to the intricate global challenges that health systems and society are currently confronting. Several examples demonstrate the advantageous impact of digital technologies on nursing practice and education. (Krick, et al., 2019) Telehealth programs, in which nurses offer daily monitoring, coaching, and triage to individuals with multiple chronic illnesses, have effectively decreased emergency department admissions. (van Berkel, et al. 2019) Nurses are using mobile technology, including cellphones and health applications, to provide remote guidance on pain management to teenage cancer patients. (Jibb, et al. 2020) enhance nursing education by offering inventive pedagogical strategies for delivering knowledge and facilitating remote learning options. (Chuang, et al. 2018) The utilization of AI systems in nursing is still in its early stages of development and implementation. Initial evidence indicates that virtual Chabot's may contribute to the optimization of patient communication, while robots could enhance the emotional and social assistance provided by nurses to patients. However, it is important to recognize the inherent difficulties related to data privacy, ethics, and cost effectiveness. (Buchanan, et al. 2020)

Supportive digital technologies for the nursing profession:

The nursing literature includes numerous examinations of digital technologies utilized to enhance or expand the profession. These technologies encompass various areas such as practice (e.g., hospital information systems, electronic health records, monitoring systems, decision support, telehealth), education (e.g., e-Learning, virtual reality, serious games), and rehabilitative and personalized healthcare approaches (e.g., assistive devices sensors, ambient assisted living). (Krick et al. 2019) The following text outlines the possible advantages, difficulties, and consequences of new technologies in practical applications.



1. Mobile health

Utilizing applications to coach patients can enhance short-term outcomes. (Young et al. 2020) The perceived unreliability and high cost of mobile applications utilized for clinical decision support. Concerns regarding the impact of mHealth usage on the professional image of nurses, especially in hospital contexts. (O'Connor et al. 2020) Policies and a professional culture that encourage the use of mobile devices in clinical practice must be established. These should be incorporated with EHRs and other pertinent technologies when applicable.



2. Personalized/precision healthcare

Customized treatment for specific patients allows nurses to provide care that is more individualized. (Fu, et al., 2020) The rapid pace of technical advancements and the inequitable access to technology may pose a threat to the progress of precision health initiatives. (Starkweather, et al. 2019). Nurses should support

and promote the fair and equal availability of patients' and families' genetic health data for utilization in tailored and precise healthcare solutions.

3. Artificial intelligence

Utilizing decision support systems can enhance the detection of infections. Utilizing big data analytics for contact tracing and population health response during a pandemic/outbreak. Fourteen. AI algorithms can develop and retain biases from existing datasets. The complexity of the techniques may inadvertently diminish the participation of nurses in the creation of these systems. (Topaz & Pruinelli, 2017) The ethical and accountable nature of judgments produced by these systems,



encompassing issues of openness and privacy. Research is necessary for the implementation of AI-based nursing in acute and primary care. Professional accountability policies are required. Competencies and possibilities in education and leadership that are specifically connected to AI and data analytics. (Robert, 2019)

4. Clinical decision support systems

Systems have the ability to identify infectious diseases and initiate suitable measures. The citation for the source is (Hoelscher & McBride, 2020). Excessive notification of healthcare professionals leads to a state of alert weariness



and the adoption of other methods. The impact and effectiveness in certain therapeutic situations, such as emergency departments, remains unknown due to a lack of study rigor. Bennett & Hardiker (2017) is

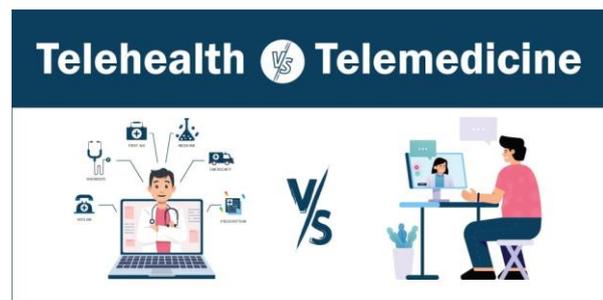
provided that Nurses ought to participate in the design, development, and implementation processes. When designing systems that enhance decision making and workflow, it is important to take usability into consideration rather than creating systems that cause disruption.

5. Automation technologies

Robots have the ability to assist those who have cognitive, sensory, and motor disabilities, provide aid to those who are sick or injured, offer support to caregivers, and assist the clinical workforce. Eighteen Collaboration among technologists, researchers, suppliers, and users is essential to guarantee success. The integration of AI and robots in nursing practice will bring about both deliberate and unintentional alterations to the field and its professional culture. Nursing should actively participate in the process of co-designing and developing these solutions to ensure they align well with the practice. (Riek, 2017) There is a need for a cost-benefit analysis of creating intricate health technologies that rely on planetary resources.

6. Telehealth/ telemedicine

During outbreaks of infectious diseases, such as the covid-19 pandemic, implementing this approach in nursing homes can be advantageous. It helps to mitigate isolation and ensures the safety of both residents and nursing staff. (Alexander, et al. 2021) The proficiency of nurses in technical abilities and their unfavorable attitudes towards telemedicine can impede its implementation. Additionally, their apprehensions regarding data protection and confidentiality can also serve as obstacles. (Koivunen & Saranto, 2018) Nurses should actively endorse the collaborative development of telehealth systems and new virtual models of care with patients and caregivers.





7. Social media and online information

A wide range of health information sources enhance nursing procedures and assist in educating patients and students. (O'connor, et al. 2018) The quality and dependability of online health information, especially on social media, is inconsistent and can pose risks or be hazardous. (Sun, et al. 2019) Nurses should receive comprehensive education regarding the proper utilization of social media and online health information. Additionally, they should actively encourage and facilitate patients' utilization of these technologies to enhance their self-management.

8. Virtual and augmented reality

Virtual reality training has the potential to enhance knowledge in nursing education and can be utilized as a therapy tool or clinical intervention in both pediatric and adult populations. (Eijlers et al. 2019). May induce simulation sickness, characterized by symptoms such as vertigo and visual impairments. (Kothgassner et al., 2019) Nurses and educators should create affordable gadgets and software that can seamlessly connect with current mobile, internet, and other digital technologies.

9. Electronic health records (EHRs)

Nursing documentation surpasses paper-based records in terms of data completeness and structure, including legibility. Deficiencies in the quality and quantity of documentation arise from causes such as time constraints or inadequate system or interface design. (Akhu-Zaheya, et al. 2018) Nurses require allocated



time and specialized equipment, as well as a helpful digital work environment. It is crucial to seek out both planned and unforeseen implications when considering the importance of incorporating AI-driven clinical decision assistance into electronic health records (EHRs) to enhance decision-making. Nursing leadership ought to reconfigure electronic health records (EHRs) in order to diminish the onerousness of documentation.

10. Assisted living technologies or "smart homes" technology

A motion monitoring system installed in houses can assist in customizing care decisions for elderly individuals with memory impairments. (Klemets, et al. 2019) Implications regarding privacy The multitude and rapid change of various technologies poses a challenge in finding appropriate devices. (Fritz, et al. 2019) Obstacles related to technology and cost. Nurses ought to participate in the process of designing, developing, and implementing systems in conjunction with patients and caregivers.



Persisting obstacles

Notwithstanding the aforementioned advantages that digital technologies contribute to the nursing profession, they could be perceived as an unwelcome intrusion or a diversion from the therapeutic

alliances and hands-on caring responsibilities that nurses maintain with patients and their families.(Robichaux, et al. 2019) The potential contradiction with conventional nursing principles, including the delivery of empathetic care, could account for the hesitancy of certain nurses to embrace digital healthcare methods. Moreover, throughout history, nursing has been structurally subordinate to other disciplines within healthcare, and the field continues to solidify its position of authority and relationship within health systems. Nursing informatics, an area of expertise that has long advocated for the incorporation of technology to aid the profession, has a relatively small number of practitioners worldwide. (Hussey, et al. 2015) Although the United States appears to be the birthplace of nursing informatics, it is not the only country or region where the digital nursing workforce and involvement with informatics are expanding. Delays in certain domains have resulted from inadequate investment and leadership that hinder the capacity of nurses to advocate for and direct digital health initiatives. (Atique, et al. 2020) Concerning the next measures the nursing profession should undertake to increase and optimize its use of digital technology, there is still international uncertainty. The global diversity of the profession, which includes disparate access to resources such as technological infrastructure maturity and expertise, exacerbates this difficulty. Regarding the transparency of health information processes, access to the internet, and the digitalization of healthcare processes, there are substantial disparities between nations and regions.

Approaches for integrating digital technologies into the nursing profession

The following is a list of the several approaches that can be taken in order to fully incorporate digital technologies into the nursing profession:

A. Embracing Technological Advancements: A Call for Innovative Nursing Education Initiatives:

It is imperative that we promptly establish educational programs at the undergraduate and graduate levels in the fields of informatics, digital health, co-design, implementation science, and data science. (Buchanan, et al. 2021) These chances should encompass collaboration and knowledge exchange with peers in the fields of computing, engineering, and other interdisciplinary areas. For example, the field of

nursing requires a sufficient number of professionals who has the knowledge and skills to utilize data science in order to enhance the development of nursing knowledge and support practical applications. (Pepito & Locsin, 2019) These professionals will also require expertise and bravery to spearhead the advancement of novel patient care models facilitated by digital technologies. (Sapci & Sapci, 2020) The assessment of how, where, and why technology such as AI should be employed to enhance practice is currently a pressing concern and an increasingly essential skill in health sciences and informatics education. (Chen, et al. 2020) Nursing education should adapt its skills and educational programs in response to the growing use of digital technologies in all areas of practice. This includes integrating new teaching methods, such as immersive technologies like virtual and augmented reality, to provide simulation-based education. (Novita, et al. 2024) The American Association of Colleges of Nursing recently published core competencies for nursing education, which specifically highlight the use of informatics, social media, and emergent technologies in decision making and quality improvement within the nursing profession.

B. Empowering Nursing Leadership in the Digital Age: Advocacy, Investment, and Innovation:

Nursing leaders at all levels must aggressively promote and allocate resources to enhance the nursing profession through the integration and expansion of digital technology. In order to advance the use of digital technology in the profession, it is important to encourage and assist nurses in acquiring expertise in data analytics, virtual models of care, and the collaborative development of digital solutions with patients. However, it is important to consider the variations in contexts and regions. It is crucial to enhance leadership skills in current informatics technologies, including as clinical decision support systems, electronic health records, and mobile technologies. These systems are expected to have more advanced artificial intelligence capabilities in the future. It is crucial to have a sufficient number of nursing leaders who comprehend both the intended and unexpected outcomes, as well as the potential advantages, of these types of technology in order to guarantee the quality and safety of nursing. (Kirby, 2015) The growing prevalence and acknowledgement of the significance of chief nursing informatics officers is a positive development. In addition, allowing nurses from various specializations to participate in the creation and

execution of digital health policies at both local and national levels could enhance the use of digital technology in the field of nursing.

C. Embracing Digital Tools: Redefining Nurse-Patient Dynamics in the Digital Age:

In the era of digitalization, it is imperative for the nursing profession to redefine their approach towards patient interaction and care. The wide range of self-administered health and wellness tools, such as personalized genetic testing services and virtual mental health support, as well as mobile and social media applications like m-health and online communities of practice, and other virtual healthcare options like telemedicine and virtual consultations, that are accessible to consumers is remarkable. While it may appear contradictory to the traditional nursing role of establishing therapeutic relationships through physical interactions, patients are now becoming more empowered, connected to the internet, and seeking personalized or self-management healthcare models that accommodate their busy and diverse lifestyles. (Choi, et al. 2019) In order to optimize its influence on patient care, the field should persist in advancing virtual care methods that leverage internet and mobile technologies, building upon its knowledge gained via telehealth and remote care models. These care models could also be expanded using virtual or augmented reality technologies or combined with assisted living or "smart home" systems, as well as more precise and individualized healthcare solutions that utilize genomic and other biometric data. (Spiegel, et al. 2019) It is important for the interprofessional healthcare team, patients, and careers to collaboratively design care approaches, interpretations of privacy, and technical interoperability features. These should be made available to patients in both physical and digital forms, according to their preferences. Further examination and scientific investigation are necessary to adequately analyze the access, cost, utilization, and fairness consequences of the growing digitization of nurse-patient relationships. (deBronkart & Eysenbach, 2019)

D. Advocating for Digital System Enhancement: Addressing Challenges and Embracing Opportunities

The membership and leadership of the organization should actively advocate for the improvement of

digital systems in order to effectively address current and future requirements. Frequently, the technology utilized to assist nursing is inadequately set up, funded, or updated to adapt to changes in practice and societal patterns. Nurses frequently utilize practice systems that exhibit deficient usability, such as leading to alert fatigue and reinforcing disruptive workflow procedures, or generating additional paperwork costs due to inadequate configuration and optimization. (Yan, et al. 2021) There is significant disparity worldwide in the availability, incorporation, and long-term viability of digital technology. The solutions differ and are contingent on the specific context. The covid-19 pandemic has sparked a renewed recognition of the utilization of digital technologies. This is an opportunity for nurses to accept and adopt necessary changes. (Konttila, et al. 2019) Nurses should consider divesting from tasks that do not significantly contribute to patient care. These tasks can be better incorporated into future technology-driven processes or delegated to other healthcare practitioners. The profession should reexamine cultural perceptions of how technology, such as drones, robots, and other AI-enabled systems, might be viewed as complimentary to nursing practice and processes, rather than as competitors or rivals. (Brown, et al. 2020) To achieve success, it will be crucial to collaborate with technology developers, providers, and patients. While certain obsolete nursing activities and processes that have become irrelevant may be missed by some professionals in the field, digital technology offers potential to facilitate new care models and nursing practices. It is imperative that we prevent cultural and historical interpretations of nursing from disrupting or obstructing development. (Booth, et al. 2021)

Conclusion:

It is highly likely that nurses who start their careers now will experience significant disruption and transformation caused by digital technology by the time they reach the middle of their careers. If prompt action is not taken, the nursing profession risks losing a significant chance to create new roles, knowledge, and relationships in future health systems and communities that are heavily influenced by digital technologies. The field of nursing will maintain its significance and provide substantial benefits to healthcare systems in the forthcoming decades. Nevertheless, the profession must contemplate its function, expertise, and interactions with technology and patients in order to stay significant in digitally

empowered communities and healthcare systems, and persist in delivering empathetic treatment in a digital realm. In the absence of proactive and deliberate self-reflection, planning, and action, the nursing profession will be unable to effectively manage its path through the significant differences between the past, present, and future of practice.

References:

1. Akhu-Zaheya, L., Al-Maaitah, R., & Bany Hani, S. (2018). Quality of nursing documentation: Paper-based health records versus electronic-based health records. *Journal of clinical nursing*, 27(3-4), e578-e589.
2. Alexander, G. L., Powell, K. R., & Deroche, C. B. (2021). An evaluation of telehealth expansion in US nursing homes. *Journal of the American Medical Informatics Association*, 28(2), 342-348.
3. Atique, S., Bautista, J. R., Block, L. J., Lee, J. J., Lozada-Perezmitre, E., Nibber, R., ... & Topaz, M. (2020). A nursing informatics response to COVID-19: Perspectives from five regions of the world. *Journal of Advanced Nursing*, 76(10), 2462.
4. Bennett, P., & Hardiker, N. R. (2017). The use of computerized clinical decision support systems in emergency care: a substantive review of the literature. *Journal of the American Medical Informatics Association*, 24(3), 655-668.
5. Booth, R., Strudwick, G., McMurray, J., Chan, R., Cotton, K., & Cooke, S. (2021). The future of nursing informatics in a digitally-enabled world. *Introduction to nursing informatics*, 395-417.
6. Brown, J., Pope, N., Bosco, A. M., Mason, J., & Morgan, A. (2020). Issues affecting nurses' capability to use digital technology at work: An integrative review. *Journal of clinical nursing*, 29(15-16), 2801-2819.
7. Buchanan, C., Howitt, M. L., Wilson, R., Booth, R. G., Risling, T., & Bamford, M. (2021). Predicted influences of artificial intelligence on nursing education: Scoping review. *JMIR nursing*, 4(1), e23933.
8. Buchanan, C., Howitt, M. L., Wilson, R., Booth, R. G., Risling, T., & Bamford, M. (2020). Predicted influences of artificial intelligence on the domains of nursing: scoping review. *JMIR nursing*, 3(1), e23939.

9. Chen, F. Q., Leng, Y. F., Ge, J. F., Wang, D. W., Li, C., Chen, B., & Sun, Z. L. (2020). Effectiveness of virtual reality in nursing education: Meta-analysis. *Journal of medical Internet research*, 22(9), e18290.
10. Choi, Y. K., Lazar, A., Demiris, G., & Thompson, H. J. (2019). Emerging smart home technologies to facilitate engaging with aging. *Journal of gerontological nursing*, 45(12), 41-48.
11. Chuang, Y. H., Lai, F. C., Chang, C. C., & Wan, H. T. (2018). Effects of a skill demonstration video delivered by smartphone on facilitating nursing students' skill competencies and self-confidence: A randomized controlled trial study. *Nurse education today*, 66, 63-68.
12. deBronkart, D., & Eysenbach, G. (2019). Gimme my damn data (And let patients help!): The#gimmemydamndata manifesto. *Journal of medical Internet research*, 21(11), e17045.
13. Eijlers, R., Utens, E. M., Staals, L. M., de Nijs, P. F., Berghmans, J. M., Wijnen, R. M., ... & Legerstee, J. S. (2019). Systematic review and meta-analysis of virtual reality in pediatrics: effects on pain and anxiety. *Anesthesia & Analgesia*, 129(5), 1344-1353.
14. Fritz, R. L., & Dermody, G. (2019). A nurse-driven method for developing artificial intelligence in “smart” homes for aging-in-place. *Nursing outlook*, 67(2), 140-153.
15. Fu, M. R., Kurnat-Thoma, E., Starkweather, A., Henderson, W. A., Cashion, A. K., Williams, J. K., ... & Coleman, B. (2020). Precision health: A nursing perspective. *International journal of nursing sciences*, 7(1), 5-12.
16. Hoelscher, D., & McBride, S. (2020). Usability and the rapid deployable infectious disease decision support system. *CIN: Computers, Informatics, Nursing*, 38(10), 490-499.
17. Hussey, P., Adams, E., & Shaffer, F. A. (2015). Nursing informatics and leadership, an essential competency for a global priority: eHealth. *Nurse Leader*, 13(5), 52-57.
18. Jibb, L. A., Stevens, B. J., Nathan, P. C., Seto, E., Cafazzo, J. A., Johnston, D. L., ... & Stinson, J. N. (2017). Implementation and preliminary effectiveness of a real-time pain management smartphone app for adolescents with cancer: A multicenter pilot clinical study. *Pediatric blood & cancer*, 64(10), e26554.

19. Jibb, L., Nathan, P. C., Breakey, V., Fernandez, C., Johnston, D., Lewis, V., ... & Stinson, J. (2020). Pain Squad+ smartphone app to support real-time pain treatment for adolescents with cancer: protocol for a randomised controlled trial. *BMJ open*, 10(3), e037251.
20. Kirby, S. B. (2015). Informatics leadership: The role of the CNIO. *Nursing2023*, 45(4), 21-22.
21. Klemets, J., Määttä, J., & Hakala, I. (2019). Integration of an in-home monitoring system into home care nurses' workflow: A case study. *International journal of medical informatics*, 123, 29-36.
22. Koivunen, M., & Saranto, K. (2018). Nursing professionals' experiences of the facilitators and barriers to the use of telehealth applications: a systematic review of qualitative studies. *Scandinavian journal of caring sciences*, 32(1), 24-44.
23. Konttila, J., Siira, H., Kyngäs, H., Lahtinen, M., Elo, S., Kääriäinen, M., ... & Mikkonen, K. (2019). Healthcare professionals' competence in digitalisation: A systematic review. *Journal of clinical nursing*, 28(5-6), 745-761.
24. Kothgassner, O. D., Goreis, A., Kafka, J. X., Van Eickels, R. L., Plener, P. L., & Felhofer, A. (2019). Virtual reality exposure therapy for posttraumatic stress disorder (PTSD): a meta-analysis. *European journal of psychotraumatology*, 10(1), 1654782.
25. Krick, T., Huter, K., Domhoff, D., Schmidt, A., Rothgang, H., & Wolf-Ostermann, K. (2019). Digital technology and nursing care: a scoping review on acceptance, effectiveness and efficiency studies of informal and formal care technologies. *BMC health services research*, 19, 1-15.
26. Novita, D., Hariyati, R. T. S., Masfuri, M., & Besral, B. (2024). The Nurse Lecturer's Competencies: A Systematic Review. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*, 9(1).
27. O'Connor, S., Chu, C. H., Thilo, F., Lee, J. J., Mather, C., & Topaz, M. (2020). Professionalism in a digital and mobile world: A way forward for nursing. *Journal of advanced nursing*, 76(1), 4-6.
28. O'connor, S., Jolliffe, S., Stanmore, E., Renwick, L., & Booth, R. (2018). Social media in nursing and midwifery education: A mixed study systematic review. *Journal of advanced nursing*, 74(10), 2273-2289.

29. Pepito, J. A., & Loecin, R. (2019). Can nurses remain relevant in a technologically advanced future? *International journal of nursing sciences*, 6(1), 106-110.
30. Riek, L. D. (2017). Healthcare robotics. *Communications of the ACM*, 60(11), 68-78.
31. Robert, N. (2019). How artificial intelligence is changing nursing. *Nursing management*, 50(9), 30-39.
32. Robichaux, C., Tietze, M., Stokes, F., & McBride, S. (2019). Reconceptualizing the electronic health record for a new decade: a caring technology? *Advances in Nursing Science*, 42(3), 193-205.
33. Sapci, A. H., & Sapci, H. A. (2020). Artificial intelligence education and tools for medical and health informatics students: systematic review. *JMIR Medical Education*, 6(1), e19285.
34. Spiegel, B., Fuller, G., Lopez, M., Dupuy, T., Noah, B., Howard, A., ... & Danovitch, I. (2019). Virtual reality for management of pain in hospitalized patients: A randomized comparative effectiveness trial. *PloS one*, 14(8), e0219115.
35. Starkweather, A., Jacelon, C. S., Bakken, S., Barton, D. L., DeVito Dabbs, A., Dorsey, S. G., ... & Miller, J. L. (2019). The use of technology to support precision health in nursing science. *Journal of Nursing Scholarship*, 51(6), 614-623.
36. Sun, Y., Zhang, Y., Gwizdka, J., & Trace, C. B. (2019). Consumer evaluation of the quality of online health information: systematic literature review of relevant criteria and indicators. *Journal of medical Internet research*, 21(5), e12522.
37. Topaz, M., & Pruinelli, L. (2017). Big data and nursing: implications for the future. *Stud Health Technol Inform*, 232, 165-171.
38. van Berkel, C., Almond, P., Hughes, C., Smith, M., Horsfield, D., & Duckworth, H. (2019). Retrospective observational study of the impact on emergency admission of telehealth at scale delivered in community care in Liverpool, UK. *BMJ open*, 9(7), e028981.
39. Yan, Q., Jiang, Z., Harbin, Z., Tolbert, P. H., & Davies, M. G. (2021). Exploring the relationship between electronic health records and provider burnout: a systematic review. *Journal of the American Medical Informatics Association*, 28(5), 1009-1021.

40. Young, H. M., Miyamoto, S., Dharmar, M., & Tang-Feldman, Y. (2020). Nurse coaching and mobile health compared with usual care to improve diabetes self-efficacy for persons with type 2 diabetes: randomized controlled trial. *JMIR mHealth and uHealth*, 8(3), e16665.