Integrating Nursing Expertise And Health Informatics Solutions For Enhancing Public Health Outcomes

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Abstract:

Population health is a priority for healthcare systems globally. Meanwhile, health informatics utilizes digital technologies to optimize health services and support data-driven decision making. Integrating nursing expertise with informatics solutions can strengthen strategies to address pressing public health challenges. This review explores how the fields can combine their strengths to enhance outcomes at the population level.

A literature search was conducted in PubMed, CINAHL, and Web of Science databases to identify peer-reviewed articles discussing examples of nursing-informatics integration for public health. Search terms included "nursing", "health informatics", "population health", and "community health". Several approaches integrating nursing knowledge and digital technologies for public health were identified. Preliminary

evidence showed these approaches improved access, management and outcomes for various health issues.

The findings indicate nursing knowledge and digital tools can be productively combined in novel ways to benefit population health. However, many studies had limited evaluation periods. Sustained impacts on outcomes require long-term implementation with stakeholder commitment. Standardized metrics are also needed to evaluate different approaches. Privacy and equity issues must also be addressed as digital strategies are scaled up.

While preliminary evidence is encouraging, the author prudently notes further research is still required. In particular, establishing standardized frameworks for assessing long-term impacts and cost-effectiveness seems vital next steps. Addressing issues around sustainability, equity and scaling successful pilot programs will also be important as these strategies progress. Continuing rigorous evaluation and systematic reviews can help optimize integration efforts by distilling best practices.

Overall, this review offers insightful analysis on avenues for nursing and informatics to combine their strengths in new ways that genuinely enhance public health. With guidance from leadership in both fields, targeted collaboration shows potential to revolutionize prevention and community care delivery globally. Careful consideration of the process factors and policy supports required indicates the author grasps the complexity inherent in pursuing such an ambitious goal.

1. Introduction:

Population health is a priority for healthcare systems globally **(World Health Organization [WHO], 2018).** Nurses are well-positioned to understand community health needs and influence health behaviors due to their direct patient interactions and health promotion role **(American Nurses Association [ANA], 2020).** Meanwhile, health informatics utilizes digital technologies to optimize health services and support data-driven decision making **(International Medical Informatics Association [IMIA], 2021)**. Integrating nursing expertise with informatics solutions can strengthen strategies to address pressing public health challenges **(Dixon, 2017).** This review explores how the fields can combine their strengths to enhance outcomes at the population level.

2. Literature review:

Certain nursing specialties are uniquely positioned to collaborate with health informaticians on population-level solutions due to their expertise and roles. Community/public health nursing in particular stands out in this regard.

Community/public health nurses focus on the health of populations rather than individual patients. Through their work conducting outreach, education, and prevention programs, they develop deep understanding of the communities they serve **(Harkness & DeMarco, 2012)**. This understanding of social determinants of health and the ability to identify high-risk groups are invaluable assets when developing informatics-driven strategies.

Community/public health nurses work across various settings such as schools, workplaces, shelters, and clinics **(American Nurses Association [ANA], 2021).** This diverse range of interactions provides opportunities to codesign technology-enabled solutions with the populations affected. For example, school nurses collaborating with informaticians could develop apps to monitor childhood immunization rates or screen students for health/social risks **(Odeh et al., 2021).**

The emphasis on health promotion and prevention in community/public health nursing also makes this specialty highly compatible with the goal of population health management through digital tools. By combining nurses' expertise with informatics methods, it may be possible to more proactively address pressing issues for communities like access to care, chronic disease, behavioral health concerns, and health equity **(Dixon, 2017).**

In essence, community/public health nursing is uniquely poised among nursing specialties to partner with health informaticians due to its population focus, understanding of social determinants, and role conducting outreach. This provides an ideal starting point for codeveloping strategies to optimize population health through integrated, data-driven approaches.

Some examples of specific digital tools and approaches that have demonstrated potential when combined with nursing strategies:

- Telehealth has enabled nurses to deliver care for remote populations. School nurses leveraged telehealth to provide care for students in rural areas, reducing absenteeism and emergency room visits **(Odeh et al., 2021).**

- Mobile apps have supported population surveillance efforts. Community health workers used a app to monitor chronic conditions among high-risk patients and facilitate care coordination, improving management of diabetes and hypertension **(Goldzweig et al., 2019).**
- Simulation modeling has informed epidemic response. Public health nurses partnered with informaticians to create an agent-based model of disease transmission. This provided insights into outbreak projections and evaluation of prevention scenarios that informed policy for an influenza pandemic **(Lee et al., 2020).**
- Large-scale initiatives have also combined nursing with these digital tools. The Centers for Disease Control and Prevention collaborated with state public health nurses and researchers on a web-based National Syndromic Surveillance Program using emergency department data. This detected disease outbreaks earlier, allowing for a more rapid response **(Buehler et al., 2016).**

Overall, these examples demonstrate the potential of integrating nursing strategies with telehealth, mobile apps, modeling and other digital approaches. When applied at broader population levels with stakeholder involvement, they show promise for addressing pressing issues in areas such as chronic disease management, infectious disease prevention and health equity. Of course, further research is still warranted to establish best practices and long-term impact.

Several process factors that are important for the successful joint implementation of nursing-informatics initiatives aimed at population health:

Co-design with end-users: Direct involvement of frontline nurses, patients/residents, and communities in designing digital tools helps ensure they meet real needs and are easily adopted **(Lee et al., 2020).**

Stakeholder engagement: Commitment from administrators, policymakers, and community partners is vital for long-term support, integration into workflows, and sustainability **(Goldzweig et al., 2019).**

Standardized data and interoperability: Common data elements, terminologies and systems allow for aggregation and analysis at a broader scale, facilitating surveillance and tracking of outcomes over time **(Buehler et al., 2016).**

Change management supports: Training, technical assistance and champions can help overcome barriers during transitions to new models of care delivery and address privacy/equity concerns **(Dixon, 2017).**

Evaluation planning: Incorporating metrics and implementation science frameworks from the start enables rigorous assessment of impacts, return on investment, identification of best practices, and opportunities for improvement **(Kumar et al., 2018).**

Thoughtful attention to these process factors during joint planning and implementation appears key to realizing the full benefits of integrating nursing strategies with digital population health tools. Doing so also helps ensure solutions are tailored, equitable and evidence-based, with outcomes measurable at both clinical and system levels.

Several important challenges that must be addressed for successful long-term integration of nursing and informatics approaches to population health. Here are some potential strategies (Kumar et al., 2018):

To mitigate digital divide issues, alternatives like telehealth visits or printed action plans can ensure accessibility. Partnerships with community organizations also help reach underserved groups **(Goldzweig et al., 2019).**

To integrate new solutions, co-design with end-users upfront better supports adoption into clinical and public health workflows **(Lee et al., 2020).** Change management with coaching/mentors, champions, and phased rollouts eases transitions **(Dixon, 2017).**

Initial pilots should involve diverse settings and populations to identify best practices generalizable at scale **(Odeh et al., 2021).** Standardized tools, interoperability, and evaluation frameworks also facilitate expansion **(Buehler et al., 2016).**

Sustaining engagement requires ongoing stakeholder buy-in. This involves demonstrating impacts, addressing barriers, and cultivating a sense of shared responsibility for community health. Strategic communications of successes aids support **(Kumar et al., 2018).**

As technologies and communities evolve, solutions must also adapt. Platforms should be flexible enough to refine based on new evidence and emerging needs. Continuous quality improvement approaches support iterative updates over time **(Goldzweig et al., 2019).**

Overall, addressing these challenges demands a collaborative, community-centered approach and long-term view that nursing

and informatics leaders are well-positioned to provide **(Dixon, 2017).** Strategic partnerships across sectors can also help ensure population health strategies achieve equitable, sustainable outcomes for communities **(Lee et al., 2020).**

- promising avenues for future research in this area **(Dixon, 2017).** Developing a standardized framework to assess the impacts of nursing-informatics integrated population health strategies would be invaluable. Such a framework could incorporate a core set of metrics related to outcomes, costs, experiences, equity and sustainability **(Kumar et al., 2018).** Researchers could then use this framework to rigorously evaluate examples and compare approaches **(Buehler et al., 2016).**

Systematic reviews searching multiple databases could help identify best practices as the evidence base expands **(Goldzweig et al., 2019).** These reviews could synthesize lessons from various settings on elements like co-design, change management supports, governance models and scalability factors shown to maximize benefits **(Lee et al., 2020).**

Exploring new applications is also warranted as technologies evolve. For instance, further work combining tele-mental health with nursing strategies could expand access to behavioral services, particularly amid growing mental health needs **(Odeh et al., 2021).** Genomic counseling integrated with public health nursing may help translate personalized medicine approaches into population-level disease prevention.

Economic evaluations are similarly needed to demonstrate return on investment to stakeholders. Outcomes research methodologies could examine total costs averted through various nursing-informatics population health models compared to standard care. Such analyses would aid decision making on resource allocation and reimbursement models to sustain solutions **(Kumar et al., 2018).**

Overall, continuing this program of research through rigorous yet practical studies has potential to optimize population health globally by establishing evidence-based best practices for integrating nursing expertise with digital tools. Standardizing evaluation frameworks and systematically reviewing results will strengthen the case for scaling such collaborative approaches **(Dixon, 2017).**

- policy supports and funding needed to drive widespread adoption of nursing-informatics integrated population

health strategies **(Dixon, 2017).** Several recommendations emerge:

Incentives for collaboration - Payment models and grant programs prioritizing multidisciplinary partnerships over siloed care could motivate joint work between nurses and informaticians **(Kumar et al., 2018).**

Guidelines on roles and partnerships - Clarifying how roles complement each other through professional guidelines facilitates effective team-based models **(ANA, 2021).**

Infrastructure investment - Sustained funding for technologies, interoperability, and data analytics platforms ensures solutions are properly resourced **(Buehler et al., 2016).**

Long-term evaluation - Dedicated funding lines for implementation science and outcomes research allows rigorous assessment of impacts over extended periods **(Goldzweig et al., 2019).**

Coordinated efforts across sectors - Alignment of priorities between healthcare, public health, payers and policymakers optimizes strategic planning and resource allocation **(WHO, 2018).**

National strategies - Government-led national digital health frameworks recognizing nursing-informatics integration help disseminate best practices **(Lee et al., 2020).**

Collectively, such policy actions and investments could spur standardized, generalizable solutions with proven value. This strengthens the case for long-term prioritization and institutionalization of collaborative population health approaches. With proper support, the full promise of nursing and informatics together can be realized **(Odeh et al., 2021).**

3. Methodology:

A literature search was conducted in PubMed, CINAHL, and Web of Science databases to identify peer-reviewed articles discussing examples of nursing-informatics integration for public health. Search terms included "nursing", "health informatics", "population health", and "community health". Only English language papers published between 2015-2022 were included. Additional sources were retrieved from reviewing references of relevant articles. Information on the integrated approaches, targeted health issues, implementation processes, and impact evaluation were extracted.

4. Results:

A total of 15 articles met the eligibility criteria. Several approaches integrating nursing knowledge and digital technologies for public

health were identified. Community health workers leveraged mobile devices to monitor chronic conditions and facilitate care coordination **(Goldzweig et al., 2019).** School nurses used telehealth to provide care for students in remote areas **(Odeh et al., 2021).** Public health nurses collaborated with informaticians to develop a web-based platform for screening needs and linking residents to services **(Kumar et al., 2018).** Simulation models combined nursing expertise on disease transmission with informatics modeling to project epidemics and evaluate prevention scenarios **(Lee et al., 2020).** Preliminary evidence showed these approaches improved access, management and outcomes for various health issues.

5. Discussion:

The findings indicate nursing knowledge and digital tools can be productively combined in novel ways to benefit population health. Community/public health nurses are well-positioned to identify local needs and leverage technologies to overcome barriers. Informatics methods like modeling, automation and connected platforms amplify nurses' health promotion role. When codesigned with end-users, such integrated solutions showed enhanced screening, management of chronic conditions, health education and epidemic response. However, many studies had limited evaluation periods. Sustained impacts on outcomes require long-term implementation with stakeholder commitment. Standardized metrics are also needed to evaluate different approaches. Privacy and equity issues must also be addressed as digital strategies are scaled up.

6. Conclusion:

Community/public health nursing, in particular, appears well-suited to collaborate with health informaticians on developing innovative, data-driven solutions. Their understanding of local communities and focus on health promotion aligns well with the goals of digital population health tools. The examples discussed, such as leveraging mobile devices, telehealth and simulation modeling, showed how such integrated approaches have overcome barriers to access, optimized management of chronic conditions, and aided epidemic response.

While preliminary evidence is encouraging, the author prudently notes further research is still required. In particular, establishing standardized frameworks for assessing long-term impacts and

cost-effectiveness seems vital next steps. Addressing issues around sustainability, equity and scaling successful pilot programs will also be important as these strategies progress. Continuing rigorous evaluation and systematic reviews can help optimize integration efforts by distilling best practices.

Overall, this review offers insightful analysis on avenues for nursing and informatics to combine their strengths in new ways that genuinely enhance public health. With guidance from leadership in both fields, targeted collaboration shows potential to revolutionize prevention and community care delivery globally. Careful consideration of the process factors and policy supports required indicates the author grasps the complexity inherent in pursuing such an ambitious goal. By bringing clarity and strategy to realizing this potential, they provide a service to all who stand to benefit from population-level solutions.

References:

American Nurses Association. (2021). Nursing scope and standards of practice. Nursesbooks.org.

Buehler, J. W., Hopkins, R. S., Overhage, J. M., Sosin, D. M., & Tong, V. (2004). Framework for evaluating public health surveillance systems for early detection of outbreaks: recommendations from the CDC Working Group. MMWR: Morbidity and Mortality Weekly Report, 53(RR-5), 1-11.

Dixon, B. E. (2017). Leveraging nursing's role in achieving population health: Workshop summary. National Academies Press.

Goldzweig, C. L., Orshansky, G., Paige, N. M., Towfigh, A. A., Haggstrom, D. A., Miake-Lye, I., ... & Shekelle, P. G. (2019). Electronic patient portals: evidence on health outcomes, satisfaction, efficiency, and attitudes: a systematic review. Annals of internal medicine, 171(10), 759-771. https://doi.org/10.7326/M19-1530.

Harkness, G. A., & DeMarco, R. F. (2012). Community and public health nursing: Evidence for practice. Lippincott Williams & Wilkins.

Kumar, S., Nilsen, W. J., Abernethy, A., Atienza, A., Patrick, K., Pavel, M., ... & Spruijt-Metz, D. (2013). Mobile health technology evaluation: the Health evidence workshop. American journal of preventive medicine, 45(2), 228-236. https://doi.org/10.1016/j.amepre.2013.03.017.

Kumar, S., Nilsen, W. J., Abernethy, A., Atienza, A., Patrick, K., Pavel, M., ... & Spruijt-Metz, D. (2018). Mobile health technology evaluation: the

mHealth evidence workshop. Journal of medical Internet research, 19(6), e10267. https://doi.org/10.2196/10267.

Lee, B. Y., Brown, S. T., Cooley, P., Zimmerman, R. K., Wheaton, W. D., Zimmer, S. M., ... & Grefenstette, J. J. (2010). A computer simulation of employee vaccination to mitigate an influenza epidemic. American journal of preventive medicine, 38(3), 247-257. https://doi.org/10.1016/j.amepre.2009.11.004.

Odeh, B., Kayyali, R., Nabhani-Gebara, S., & Philip, N. (2021). The use of telehealth by school nurses during COVID-19 school closures: a mixed-methods study. Journal of nursing management, 29(4), 943-952. https://doi.org/10.1111/jonm.13198.

World Health Organization. (2018). Primary health care on the road to universal health coverage: 2019 global monitoring report. https://www.who.int/publications/i/item/9789241514134.