

## TRAINING PROGRAMS FOR CAPACITY-BUILDING IN NURSING INFORMATICS: A PERUVIAN PERSPECTIVE

### PROGRAMAS DE CAPACITACIÓN PARA EL FORTALECIMIENTO DE CAPACIDADES EN INFORMÁTICA EN ENFERMERÍA: UNA PERSPECTIVA PERUANA

### PROGRAMAS DE TREINAMENTO DE CAPACITAÇÃO EM INFORMÁTICA EM ENFERMAGEM: UMA PERSPECTIVA PERUANA

WALTER H. CURIOSO\*  
ELSA OSCUVILCA-TAPIA\*\*

#### ABSTRACT

Nursing personnel has the great challenge of taking advantage of new technological resources to carry out their work in a more efficient and effective way. Nursing informatics has been described as an essential competence for nurse professionals in several countries. In Peru, nursing personnel is predominantly female and represents the largest workforce group in the healthcare system. This article discusses the challenges for capacity-building training programs in nursing informatics in Peru. In general, the published literature on nursing informatics training programs in Peru is rather scarce. Only one out of four Peruvian universities offer courses related to health informatics in undergraduate nursing academic programs. In 2020, the Peruvian Ministry of Health defined the core nursing competences to manage information and communication technologies, and health information systems, including telemedicine. However, nursing informatics has not yet been sufficiently developed in Peru due to organizational, material, cultural and sociotechnical challenges. Moreover, pandemics such as COVID-19 require urgent action to transform health care delivery, to expand telenursing and distance learning nursing programs and initiatives in Peru. It is essential to promote research and capacity-building programs in nursing informatics in Peru and foster global collaborative networks between public and private institutions.

**Key words:** Nursing; Informatics; Professional training; Education; Capacity building; Peru.

\*Medical Doctor. PhD in Biomedical and Health Informatics. Universidad Continental, Perú. ORCID: <https://orcid.org/0000-0002-5068-5357> Email: [wcurioso@continental.edu.pe](mailto:wcurioso@continental.edu.pe) Corresponding author.

\*\*Nurse. Doctor in Public Health. Universidad Nacional José Faustino Sánchez Carrión, Perú. ORCID: <https://orcid.org/0000-0003-0586-875X> Email: [elsaoscuvilca@gmail.com](mailto:elsaoscuvilca@gmail.com)

## RESUMEN

El personal de enfermería tiene el gran desafío de aprovechar los nuevos recursos tecnológicos para llevar a cabo su trabajo de manera más eficiente y efectiva. La informática de enfermería se ha descrito como una competencia esencial para los profesionales de enfermería en varios países. En Perú, el personal de enfermería es predominantemente femenino y representa la mayor fuerza de trabajo en el sistema de salud. Este artículo analiza los desafíos para los programas de capacitación para el desarrollo de capacidades en informática en enfermería en el Perú. En general, la literatura publicada sobre los programas de capacitación en informática en enfermería en el Perú es escasa. Solo una de cada cuatro universidades peruanas ofrece cursos relacionados con informática en salud en los programas académicos de pregrado en enfermería. En el 2020, el Ministerio de Salud del Perú definió las competencias básicas de enfermería para gestionar las tecnologías de información y comunicación, y los sistemas de información de salud, incluida la telemedicina. Sin embargo, la informática en enfermería aún no se ha desarrollado ampliamente en el Perú debido a desafíos organizacionales, de recursos, y factores culturales y sociotécnicos. Además, las pandemias como el COVID-19 requieren una acción urgente para transformar la prestación de atención de la salud, para expandir los programas e iniciativas de teleenfermería y la educación a distancia en el Perú. Es esencial promover programas de investigación y desarrollo de capacidades en informática en enfermería en el Perú y fomentar redes de colaboración global entre instituciones públicas y privadas.

**Palabras clave:** Enfermería; Informática; Capacitación profesional; Educación; Fortalecimiento institucional, Perú.

## RESUMO

O pessoal de enfermagem tem um grande desafio de aproveitar novos recursos tecnológicos para realizar seu trabalho de maneira mais eficiente e eficaz. A informática em enfermagem tem sido descrita como uma competência essencial para profissionais de enfermagem em vários países. No Peru, o pessoal de enfermagem é predominantemente feminino e representa o maior grupo de força de trabalho no sistema de saúde. Este artigo discute os desafios dos programas de treinamento de capacitação em informática em enfermagem no Peru. Em geral, a literatura publicada sobre os programas de treinamento em informática em enfermagem no Peru é escassa. Apenas uma em cada quatro universidades peruanas oferece cursos relacionados à informática em saúde em programas acadêmicos de graduação em enfermagem. Em 2020, o Ministério da Saúde do Peru definiu as principais competências de enfermagem no gerenciamento de tecnologias da informação e comunicação e sistemas de informação em saúde, incluindo telemedicina. No entanto, a informática de enfermagem ainda não foi desenvolvida amplamente no Peru devido a desafios organizacionais, físicos, culturais e sociotécnicos. Além disso, pandemias como a COVID-19 exigem uma ação urgente necessária para transformar a prestação de serviços de saúde, expandir os programas e iniciativas de telenfermagem e ensino a distância no Peru. É essencial promover programas de pesquisa e capacitação em informática em enfermagem no Peru e promover redes globais de colaboração entre instituições públicas e privadas.

**Palavras-chave:** Enfermagem; Informática; Capacitação profissional; Educação; Fortalecimento institucional; Perú.

Reception date: 22/09/2020

Acceptance date: 24/01/2021

## INTRODUCTION

According to the World Health Organization, nurses play a critical role in promoting health, disease prevention and delivering primary and

community-based care<sup>(1)</sup>, and nurses are at the forefront of transforming healthcare and working with the most vulnerable in the context of achieving the sustainable development goals of the United Nations Agenda 2030<sup>(2)</sup>.

Nursing personnel face today a great challenge in taking advantage of new technological resources to carry out their work in a more efficient and effective way. It is essential that nursing academic programs and universities review their curricula in accordance with the technological advances in digital health, promoting the development of digital and informatics competencies necessary for professional performance, according to the international recommendations<sup>(3, 4)</sup>.

Nursing informatics has been defined by The American Nurses Association (ANA) as a “specialty that integrates nursing science with multiple information and analytical sciences to identify, define, manage and communicate data, information, knowledge and wisdom in nursing practice”<sup>(5)</sup>.

Moreover, nursing informatics has been described as an essential competency for nurse professionals in countries such as the United States of America and Canada, while in countries such as New Zealand, England, Finland, and Australia, nursing informatics competency varies considerably<sup>(6)</sup>.

Nursing informatics training programs around the world vary among countries in relation to the length of the educational program, the place where the program is offered and the balance between theory and practice within the curriculum<sup>(6)</sup>. It is essential that nurses and nursing students acquire competencies to successfully utilize information and communication technologies in their education and practice to benefit patients and improve their own practice. Therefore, this article discusses the challenges for capacity-building training programs in nursing informatics from a peruvian perspective.

### **NURSING INFORMATICS TRAINING PROGRAMS IN LATIN AMERICA**

Informatics competencies required by nurses at a global level have substantially increased in diversity and complexity over the last decade<sup>(7)</sup>. This higher skill level is indicative of the need to periodically develop and evaluate nursing informatics competencies in Latin America<sup>(8)</sup>. To best prepare students at undergraduate and graduate levels, nursing educators must be properly trained in using electronic health information systems, keeping up

to date with the nursing literature, among other nursing informatics skills<sup>(9)</sup>. However, in many Latin American countries, data collection is still recorded in paper-based forms and is only related to patient interaction<sup>(10)</sup>. In addition, the lack of proper infrastructure, slow Internet connection and low bandwidth in Peruvian cities, inequalities in access to electricity, digital illiteracy and the resistance to change, are important challenges to consider<sup>(9)</sup>.

Latin American countries have developed a wide range of nursing informatics initiatives, including educational initiatives and capacity-building training programs in nursing informatics<sup>(11-16)</sup>. In the region, one of the countries with the most experience in nursing informatics education programs is Brazil, which started nursing informatics in 1985, when nurse educators from the Federal University of Rio Grande do Sul presented experiences in the use of computers for nursing education<sup>(8)</sup>. Five years later, a nursing informatics session was organized at the Brazilian Society of Health Informatics. In 1991, the Inter-American Symposium on Nursing Informatics was organized by the Nursing Informatics Group of the Federal University of São Paulo<sup>(8, 12)</sup>. Subsequently, several Brazilian universities integrated nursing informatics into health informatics, giving nurses the opportunity to interact with multidisciplinary colleagues<sup>(8, 12)</sup>.

Nursing programs at the Argentinian Instituto Universitario, related to the Hospital Italiano de Buenos Aires, included an informatics course as part of the nursing curriculum<sup>(16)</sup>, consisting of four courses (Basic Informatics I and II and Applied Informatics I and II). In 2019, the Hospital Italiano de Buenos Aires organized the first Symposium on Nursing Informatics, as part of the Fourteenth Conference on Health Information Systems at the Department of Health Informatics of the Hospital Italiano de Buenos Aires.

In Chile, almost a decade ago, an online diploma course on nursing informatics was offered, at the Universidad Central de Chile (La Serena, Chile), to nurses working at hospitals and community-based programs<sup>(10)</sup>. In addition, the Pontificia Universidad Católica de Chile offers an online Diploma on Clinical Informatics targeted to health professionals, including nurses (<https://educacioncontinua.uc.cl/40725-ficha->

nuevo-diplomado-en-informatica-clinica). The National Network of Nursing Informatics in Chile (REDENFI Chile) was created in 2013 and has an active Facebook group where members share webinars, courses, articles and information regarding nursing informatics (<https://www.facebook.com/groups/696562927659456/>).

Nursing informatics in Cuba has been promoted by the National Network of Nursing Informatics (<http://www.sld.cu/sitios/redenfermeria/>), created in 2010, where Cuban nursing technicians and professionals cooperated for the development of the nursing informatics in the country<sup>(12)</sup>. In Colombia, the Nursing Informatics Network, known as REDENFI Colombia, was founded in 2015 (<http://www.enfermeriainformaticalac.org/index.php/redes/red-colombia>).

In Mexico, the School of Nursing at the Universidad Michoacana de San Nicolas de Hidalgo includes in its curriculum Informatics and Telenursing (<http://www.telenfermeria.umich.mx/>). In the Facebook group Red de Informática de México (<https://www.facebook.com/riem2012?fref=ts>) members share news, events and information related to nursing informatics.

Chérrez-Ojeda et al.<sup>(17)</sup> reported that 96.3% of Ecuadorian nurses used information and communication technologies (ICTs) to communicate with colleagues, and 80.1% reported the use of ICTs to communicate with their patients. More than 70% of participants agreed that ICTs can be useful to promote professional services, create new job opportunities and/or professional development, encourage health promotion, and improve the workflow with colleagues.

Finally, nursing informatics in Costa Rica has been promoted since the early 2000s and the incorporation of information and communication technologies into the daily nursing workflow in Costa Rica has been gradual but constant<sup>(18)</sup>.

## THE NEED FOR NURSING INFORMATICS PROGRAMS IN PERU

Nursing represents the largest workforce group in the Peruvian healthcare system and nursing personnel is predominantly female<sup>(19)</sup>. As of 2018, according to the Peruvian College of Nurses, 90%

of nurses were women and 10%, were men<sup>(19)</sup>. It is estimated that for every 10,000 inhabitants in the Peruvian healthcare system there are only 12 nurses, so in order to meet demand in hospitals 250,000 nurses would be urgently needed<sup>(19)</sup>.

Peruvian universities that offer courses related to health informatics in nursing programs are limited. According to Condor et al.<sup>(13)</sup>, out of 62 nursing-related programs in Peruvian universities evaluated, only 15 (24%) offered specific courses in health informatics, nursing informatics or ICTs for nursing care in their undergraduate academic curriculum. They also reported that a third of the universities were located in Lima (34%) and most of them were private (67%).

Uriarte<sup>(20)</sup> reported the lack of willingness and commitment for training among some nurses who used a traceability software in a sterilization center of a public hospital in Chiclayo, Peru. Moreover, noted that the results of her research would serve to assess nursing competencies and include nursing informatics competencies<sup>(20)</sup>.

Similarly, López and Ydrogo<sup>(21)</sup> conducted a study in Lambayeque (Peru), where the use of ICTs among nurse educators in universities was evaluated. A total of 120 people from four nursing schools participated and the authors found that 92% of respondents used computers, 90% had laptops, 93% had access to Internet at home, 93% used cell phones, 46% had smartphones and 39% used tablets. Although good ICT penetration was reported in this group, 58% of the people reported that they did not use ICTs properly. This study suggests that, despite the high use of ICTs in the group, adequate training is required to be able to take full advantage of the wide range of ICT tools and uses for nursing.

These results are consistent with the limited literature published on the use of ICTs by nursing personnel, and healthcare personnel in general, in Peru<sup>(22)</sup>. However, some Peruvian programs deserve to be highlighted.

In Peru, the Quipu network, created in 2010, had the following objectives: 1) develop and implement short- and long- term training opportunities in biomedical informatics for global health in the Andean region; 2) engage new researchers in the Andean region to conduct research health informatics and bioinformatics; and 3) expand and consolidate a research network

in the Andean region, promoting South-to-South collaboration and collaborative initiatives with universities and institutions in the United States<sup>(9)</sup>. “Quipu” is a Quechua word that describes an ancient system used throughout the Andes by the Incas to record and distribute information<sup>(23)</sup>. The Center has implemented several face-to-face and virtual courses and has supported the creation of a diploma and a master’s degree program on Biomedical Informatics, the first such training programs in Peru<sup>(9)</sup>, and nursing professionals were part of the Quipu Network.

It is essential to promote research and capacity-building programs on nursing informatics, as well as to develop networks of public and private institutions with academic centers with experience in nursing informatics.

In 2020, the Peruvian Ministry of Health set up the core nursing competencies for managing information and communication technologies, as well as health information systems, with emphasis on telemedicine<sup>(24)</sup>. This is an important first step, however, it would be advisable to take as a reference the competency profile in nursing informatics of the American Nurses Association and others<sup>(5-9)</sup>. In Brazil, for example, the field of ICT has been considered a core competence since 2001 and listed in the National Curricular Guidelines for undergraduate courses in nursing<sup>(8)</sup>. Regarding this, nurses should “properly use new technologies, both in information and communication, as a guide for nursing care”<sup>(8)</sup>. According to Staggers et al.<sup>(25)</sup>, validated nursing informatics competencies include, but are not limited to nursing practice areas, such as education, privacy and security, research, data access and structure, project and financial management, quality improvement, simulation, selection systems, as well as computer knowledge and skills<sup>(25)</sup>.

Universities should also seek to work in close collaboration with local, regional, and national governments to promote nursing informatics in Peru<sup>(9)</sup>. In this regard, partnerships with public and private institutions, as part of a well-planned strategy, have shown encouraging results<sup>(9)</sup>. Each partnership is unique and nursing informatics programs must ensure that the curriculum is relevant to addressing the country’s local needs and priorities<sup>(9)</sup>.

The promotion of nursing informatics might

include courses, webinars, diploma courses and master’s degree programs provided by universities, but also the Peruvian College of Nurses can play an important role in promoting the discipline. In fact, the Peruvian College of Nurses is currently offering webinars, providing opportunities to acquire knowledge and skills in different topics (<https://www.facebook.com/cep.org.pe/>). Additionally, nursing informatics training programs in Peru should promote leadership competencies and encourage international exchange and internships at institutions with relevant experience in nursing informatics in Latin America and the world.

Furthermore, the group of experts in digital health, established by the World Health Organization, shows promise for boosting collaboration between medical and nursing informatics experts from Latin America and abroad<sup>(9)</sup>. It is, therefore, essential to share experiences and lessons learned regarding the development, implementation and evaluation of capacity-building programs for nursing informatics.

### **CHALLENGES FOR NURSING INFORMATICS TRAINING PROGRAMS IN PERU**

It is important that Peruvian nurses recognize the need for documenting their nursing practice fully. Electronic medical records and telehealth have not yet been implemented broadly in Peru due to organizational, physical, and technological challenges<sup>(9)</sup>. However, nurses need to be closely and actively involved with the design and the implementation of health information systems, and in the way such systems are developed to record nursing data<sup>(5-9, 26)</sup>.

Peruvian nurses should be more connected and social media could contribute to sharing information and resources on nursing informatics<sup>(9)</sup>. In Peru, there is a group in Facebook called Red Peruana de Enfermería Informática (Peruvian Network of Nursing Informatics) (<https://www.facebook.com/redperuei/>), which promotes research, webinars, and debate on the use of information and communication technologies to support nursing care. Considering that we have a shortage of nursing informaticians in Peru, it is important to promote virtual courses and programs on nursing informatics.

Another challenge is how to expand the very few courses on nursing informatics throughout Peru, promoting effective collaboration nationally and internationally in shaping academic curriculum and research agenda. For this reason, the role of collaborative partnerships could be very useful for sharing resources, experiences, and lessons learned among countries to optimize nursing informatics training and research opportunities in Latin America.

The International Network of Nursing Informatics (<http://www.enfermeriainformaticalac.org/>), created in 2008, was initially sponsored by the Pan American Health Organization with participation of nursing technicians and professionals from countries like Argentina, Brazil, Chile, Colombia, Cuba, El Salvador, Mexico, Peru, Spain, Uruguay and Venezuela. This network could play a significant role in supporting digital health resources, the exchange of information technologies and promoting joint research projects.

The Federation of Health Informatics for Latin America and the Caribbean (IMIA LAC) Nursing Informatics Group (<https://www.facebook.com/wgniimialac.enfermeria>) has organized training workshops for nurses to improve their skills in using ICTs. In addition, the IMIA LAC Nursing Informatics Group has hosted virtual meetings and teleconferences over the last years on different topics such as virtual libraries, computer programming, and ICT and nursing education.

Finally, it is important to reexamine what is expected from Peruvian nurses to know about privacy, confidentiality and security issues in a digital health ecosystem<sup>(9)</sup>. New legal, ethical, social and public policy factors might arise from the socio-legal and political changes<sup>(9)</sup>.

### **CAPACITY BUILDING AND TRAINING IN TIMES OF COVID-19**

The COVID-19 pandemic demands for urgent and necessary action to transform healthcare delivery, to expand telenursing and distance learning nursing programs and initiatives around the world<sup>(27)</sup>.

Specifically, telehealth has been used to monitor the health status of populations and to decrease the number of people attending local healthcare centers, with the involvement of many nursing informaticians during the process<sup>(28)</sup>.

It is important to point out that, apart from the COVID-19 pandemic, nursing informatics is an integral part of all emergency actions taken by healthcare organizations during natural disasters, social conflicts, and national emergencies<sup>(29)</sup>.

Due to the increasing prevalence of COVID-19 in Peru, healthcare centers are lacking specialized nurses and there is a serious deficit of intensive care units for patients with COVID-19<sup>(30)</sup>. Therefore, telenursing seems to offer a great opportunity in the COVID-19 pandemic crisis, by improving healthcare response and the quality of care<sup>(31)</sup>.

### **CONCLUSION**

It is necessary to standardize nursing training in Peru, including the definition of competency profiles in nursing informatics, according to the country's health needs, and taking into account local economic, social, cultural, legal, organizational factors and global challenges. The creation and strengthening of the existing networks of public and private institutions with academic centers that have experience in nursing informatics training and research should be promoted in Peru.

All nursing professionals require knowledge of informatics, and now is the time to accelerate the pace to develop nursing informatics and leadership skills, but always considering a person-centered approach. Nurses should take advantage of the opportunity of adapting technology to the nursing practice rather than adapting the nursing practice to technology. Training programs on nursing informatics in Peru should incorporate the local context, consider the local needs, and be sensitive to the local economic, social, cultural, and organizational factors. Finally, leadership in nursing informatics is crucial at all levels and in all clinical, administrative, educational and research settings, especially during the COVID-19 pandemic<sup>(32)</sup>.

## REFERENCES

1. World Health Organization. Nursing and midwifery [Internet]. Geneva, Switzerland 2020 jan 9 [cited 2021 jan 22]. Available from: <https://www.who.int/news-room/fact-sheets/detail/nursing-and-midwifery>
2. Rosa WE, Dossey BM, Koithan M, Kreitzer MJ, Manjrekar P, Meleis AI, et al. Nursing Theory in the Quest for the Sustainable Development Goals. *Nurs Sci Q* [Internet]. 2020 [cited 2021 jan 22]; 33(2): 178-182. Available from: 10.1177/0894318420903495
3. Forman TM, Armor DA, Miller AS. A Review of Clinical Informatics Competencies in Nursing to Inform Best Practices in Education and Nurse Faculty Development. *Nurs Educ Perspect* [Internet]. 2020 [cited 2021 jan 22]; 41(1): E3-E7. Available from: 10.1097/01.NEP.0000000000000588
4. Topaz M, Ronquillo C, Peltonen LM, Pruinelli L, Sarmiento RF, Badger MK, et al. Advancing Nursing Informatics in the Next Decade: Recommendations from an International Survey. *Stud Health Technol Inform* [Internet]. 2016 [cited 2021 jan 22]; (225): 123-7. Available from: 10.3233/978-1-61499-658-3-123
5. American Nurses Association (ANA). *Nursing Informatics: Scope and Standards of Practice* [Internet]. 2<sup>nd</sup> ed. United States. 2014 [cited 2021 jan 22]. 235 p. Available from: <https://www.nursingworld.org/nurses-books/nursing-informatics-scope-and-standards-of-practice-2nd-ed/>
6. Honey ML, Skiba DJ, Procter P, Foster J, Kouri P, Nagle LM. Nursing Informatics Competencies for Entry to Practice: The Perspective of Six Countries. *Stud Health Technol Inform* [Internet]. 2017 [cited 2021 jan 22]; 232: 51-61. Available from: 10.3233/978-1-61499-738-2-51
7. Strudwick G, Nagle L, Kassam I, Pahwa M, Sequeira L. Informatics Competencies for Nurse Leaders: A Scoping Review. *J Nurs Adm* [Internet]. 2019 [cited 2021 jan 22]; 49(6): 323-330. Available from: 10.1097/NNA.0000000000000760.
8. Barbosa SF. Competencies Related to Informatics and Information Management for Practicing Nurses and Nurses Leaders in Brazil and South America. *Stud Health Technol Inform* [Internet]. 2017 [cited 2021 jan 22]; 232: 77-85. Available from: 10.3233/978-1-61499-738-2-77
9. Curioso WH. Building Capacity and Training for Digital Health: Challenges and Opportunities in Latin America. *J Med Internet Res* [Internet]. 2019 [cited 2021 jan 22]; 21(12): e16513. Available from: 10.2196/16513.
10. Hernández CA, Wigodski SJ, Caballero ME. Informática en enfermería un desafío a la formación actual. *Medwave* [Internet]. 2012 [cited 2021 jan 22]; 2: 1-4. Available from: 10.5867/medwave.20012.02.5307.
11. Hullin C. Nursing Informatics Education: Latino America & Caribe. *Stud Health Technol Inform* [Internet]. 2016 [cited 2021 jan 22]; 225: 729-31. Available from: <https://europepmc.org/article/med/27332321>
12. Vialart VN. Apuntes y experiencias en el desarrollo de la informática en Enfermería de Cuba. *Rev Cubana Enfermer* [Internet]. 2007 [cited 2021 jan 22]; 23(3). Available from: [http://scielo.sld.cu/scielo.php?script=sci\\_arttext&pid=s0864-03192007000300003](http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=s0864-03192007000300003)
13. Condor DF, Sánchez Alvarez K, Bidman AA. Nursing Informatics Training in Undergraduate Nursing Programs in Peru. *Studies in Health Technology and Informatics* [Internet]. 2018 [cited 2021 jan 22]; 250:81. Available from: 10.3233/978-1-61499-872-3-81
14. Marín HF, Silveira DT, Sasso GD, Pérez HHC. Evolution: Nursing Informatics in Brazil. In: Ball M. et al. (eds) *Nursing Informatics. Health Informatics* [Internet]. London: Springer; 2012 [cited 2021 jan 22]. Available from: [https://link.springer.com/chapter/10.1007/978-1-84996-278-0\\_24](https://link.springer.com/chapter/10.1007/978-1-84996-278-0_24)
15. Otero P, Leikam M, González Z, Marín HF, Aravena IP, Zawadzki S. Informatics Education in Latin America. In: Berner ES (ed). *Informatics education in Healthcare. Health Informatics* [Internet]. Cham: Springer; 2020 [cited 2021 jan 22]; 167-182. Available from: [https://link.springer.com/chapter/10.1007%2F978-3-030-53813-2\\_13](https://link.springer.com/chapter/10.1007%2F978-3-030-53813-2_13)
16. González ZA, Schachner MB, Tattone MA, Benítez SE. Changing Educational Paths in an Informatics Course According to the Needs and Expectations of Nursing Degree Students. *Stud Health Technol Inform* [Internet]. 2016 [cited 2021 jan 22]; 225: 324-8. Available from: <https://europepmc.org/article/med/27332215>
17. Chérrez-Ojeda I, Felix M, Valeria L, Mata VE, Simancas-Racines D, Aguilar M, et al. Use and Perceptions of Information and Communication Technologies Among Ecuadorian Nurses: A Cross-sectional Study. *The Open Nursing Journal* [Internet] 2020 [cited 2021 jan 22]; 14: 8-17. Available from: doi: 10.2174/1874434602014010008.
18. González-Sáenz G. Evolución histórica de la enfermería informática en Costa Rica. *Enfermería en Costa Rica* [Internet]. 2007 [cited 2021 jan 22];

- 28(1): 26-28. Available from: <http://www.binasssa.cr/revistas/enfermeria/v28n1/art5.pdf>
19. Andina. Más de 89,000 profesionales de la enfermería celebran su día en el Perú. [Internet]. Lima: Agencia Nacional de Noticias © 2017; Mayo 12, 2018 [cited 2021 jan 22]. Available from: <https://andina.pe/agencia/noticia-mas-89-mil-profesionales-de-enfermeria-celebran-su-dia-el-peru-709747.aspx>
  20. Uriarte BZ. Percepciones del personal de enfermería en el proceso de implementación del programa de trazabilidad. Central de esterilización. Hospital III-1, MINSA. Chiclayo, 2017 [Tesis] [Internet]. Chiclayo: Universidad Católica Santo Toribio de Mogrovejo; 2018. [cited 2021 jan 22]. Available at: [http://54.165.197.99/bitstream/20.500.12423/1294/1/TL\\_UriarteBecerraZulema.pdf.pdf](http://54.165.197.99/bitstream/20.500.12423/1294/1/TL_UriarteBecerraZulema.pdf.pdf)
  21. López RCJ, Ydrogo SJR. Uso de tecnologías de la información y la comunicación (TIC) por parte de enfermeros docentes en la región Lambayeque, 2017 [Tesis] [Internet]. Chiclayo: Universidad Católica Santo Toribio de Mogrovejo; 2018. [cited 2021 jan 22]. Available from: <http://tesis.usat.edu.pe/handle/20.500.12423/1293>.
  22. González-Argote J. La producción científica latinoamericana sobre historia clínica digital: un análisis desde Scopus. *Rev Cubana Salud Pública* [Internet]. 2019 [cited 2021 jan 22]; 45(3): e1312. Available from: <http://www.revsaludpublica.sld.cu/index.php/spu/article/view/1312/1386>
  23. Blas MM, Curioso WH, García PJ, Zimic M, Cárcamo CP, Castagnetto JM, et al. Training the biomedical informatics workforce in Latin America: results of a needs assessment. *BMJ Open* [Internet]. 2011 Jan [cited 2021 jan 22]; 1(2): e000233. Available from: doi: 10.1136/bmjopen-2011-000233.
  24. Ministerio de Salud. Resolución Ministerial N° 960-2020-MINSA. Perfil de competencias esenciales que orientan la formación de los profesionales de la salud, Primera fase: Médico(a) y Enfermero(a) peruano(a) [Internet]. Lima, Perú. 2020. [cited 2021 jan 22]. 66 p. Available from: <https://www.gob.pe/institucion/minsa/normas-legales/1364189-960-2020-minsa>
  25. Staggers N, Gassert CA, Curran C. A Delphi study to determine informatics competencies for nurses at four levels of practice. *Nurs Res* [Internet]. 2002 Nov-Dec [cited 2021 jan 22]; 51(6): 383-90. Available from: [https://journals.lww.com/nursingresearchonline/Fulltext/2002/11000/ADelphi\\_Study\\_to\\_Determine\\_Informatics.6.aspx?casa\\_token=ccNfoMYdwhQAAAAA:YS\\_lodOz5cWttpeeSk2t40vqWiMsbG2dQ8wkwnhgx3xb02ZeRsCSLHssCzGMsmRKUua7AbdiGMM9y6UVefK6WpgBlb05](https://journals.lww.com/nursingresearchonline/Fulltext/2002/11000/ADelphi_Study_to_Determine_Informatics.6.aspx?casa_token=ccNfoMYdwhQAAAAA:YS_lodOz5cWttpeeSk2t40vqWiMsbG2dQ8wkwnhgx3xb02ZeRsCSLHssCzGMsmRKUua7AbdiGMM9y6UVefK6WpgBlb05)
  26. Mantas J, Ammenwerth E, Demiris G, Hasman A, Haux R, Hersh W, et al. Recommendations of the International Medical Informatics Association (IMIA) on Education in Biomedical and Health Informatics. First Revision. *Methods Inf Med* [Internet]. 2010 [cited 2021 jan 22]; 49(2): 105-120. Available from: doi:10.3414/ME5119.
  27. Atique S, Bautista JR, Block LJ, Lee JJ, Lozada-Perezmitre E, Nibber R, et al. A nursing informatics response to COVID-19: Perspectives from five regions of the world. *J Adv Nurs* [Internet]. 2020 Oct [cited 2021 jan 22]; 76(10): 2462-2468. Available from: doi: 10.1111/jan.14417.
  28. Sood A, Pollard C, Suer KL, Vlahovich K, Walker J. Caring for Miners During the Coronavirus Disease-2019 (COVID-19) Pandemic. *J Rural Health* [Internet]. 2021 Jan [cited 2021 jan 22]; 37(1): 165-168. Available from: 10.1111/jrh.12444.
  29. Nejadshafiee M, Bahaadinbeigy K, Kazemi M, Nekoei-Moghadam M. Telenursing in Incidents and Disasters: A Systematic Review of the Literature. *J Emerg Nurs* [Internet]. 2020 Sep [cited 2021 jan 22]; 46(5): 611-622. Available from: doi: 10.1016/j.jen.2020.03.005.
  30. Acosta G, Escobar G, Bernaola G, Alfaro J, Taype W, Marcos C, et al. Caracterización de pacientes con COVID-19 grave atendidos en un hospital de referencia nacional del Perú. *Rev Peru Med Exp Salud Publica* [Internet]. 2020 [cited 2021 jan 22]; 37(2): 253-8. Available from: 10.17843/rpmesp.2020.372.5437
  31. Watkins S, Neubrandner J. Primary-care registered nurse telehealth policy implications. *J Telemed Telecare* [Internet]. 2020 Aug [cited 2021 jan 22]; 3: 1357633X20940142. Available from: 10.1177/1357633X20940142.
  32. Hoffmann RL, Battaglia A, Perpetua Z, Wojtaszek K, Campbell G. The Clinical Nurse Leader and COVID-19: Leadership and quality at the point of care. *J Prof Nurs* [Internet]. 2020 Jul-Aug [cited 2021 jan 22]; 36(4): 178-180. Available from: doi: 10.1016/j.profnurs.2020.06.008.