

Evaluating Nursing Informatics Competency among Filipino Registered Nurses

Kay Sunshine Acar¹, Jane Manuel², Irene Cara Villas³, Ruel Lajara⁴, Josephine D. Lorica⁵

^{1, 2, 3, 4}Ph. D. Nursing Students, St. Paul University Philippines, Tuguegarao, Cagayan Valley, Philippines

⁵Graduate School Faculty, St. Paul University Philippines, Tuguegarao, Cagayan Valley, Philippines

Abstract: *Nursing Informatics in the Philippines is an emerging field that was included in the Bachelor of Science in Nursing in 2008 but was later revised as Health Informatics course in 2010 since the previous curriculum was more focused on basic computer literacy. **Objectives:** This study aims to assess the nursing informatics competency of Filipino nurses and how their profiles have influenced their competencies. This study likewise seeks to determine the factors that have affected their acquisition of skills in nursing informatics. **Methods:** The study used descriptive cross-sectional research design initially targeting 323 Filipino nurses who graduated from 2010 to 2023. Using TANIC as the tool, 238 nurses actually responded via online survey. **Results:** Nurses got an over-all mean score of 3.132 qualitatively described as experts, where the area of probability of finding individual scores within the proficient and expert zones is 84.16%. Results further revealed that, area of practice and baccalaureate degree did not affect their competencies. Instead, having graduate or post-graduate studies, access to Hospital Information System and length of experience are the variables that influenced their competencies. Factors negatively affecting nurses' performance in nursing informatics include, the absence of automated information system, attitude towards computerization, lack of technical and government support, and inadequate training. **Conclusion:** Registered Filipino nurses are generally experts in nursing informatics. Exposure to automated information system, length of service and prior knowledge acquired from advanced studies are contributory factors in honing their skills in nursing informatics over those without the experience.*

Keywords: Nursing Informatics; Hospital Information System; Competence; Computer Literacy, Electronic Health Record.

1. Introduction

Nursing informatics is a new field that emerged in the practice of professional nursing. It is the field that integrates technology in the nursing practice to enable health practitioners to gather, manage and communicate information for the improvement of nursing care to patient. According to the American Nurses Association (2018), integration of information technology (IT) into healthcare, nursing education, and practice enables nurses to improve the provision of care. It incorporates effective administration and sharing of data in patient care and the interaction between healthcare practitioners and patients. Nursing informatics supports nurses in planning and prioritizing patient care using electronic medical record system (Jedwab, et.al., 2025). In recent years, nursing informatics has made significant research advances in the field of artificial intelligence (AI), data science, mobile health and the integration of technology into nursing education and practice (Borycki, 2025). The implications of using AI to lifestyle monitoring in long-term care (Groeneveld, et. al., 2024), detecting behavioral disorders (Fernandez, et.al., 2024) and identifying depression (Taylor, et.al., 2024) are just few of the impressive breakthroughs in the field of nursing informatics.

Nursing Informatics, a discipline introduced in the Philippines in 2005, has gained recognition in the undergraduate program with the issuance of Commission on Higher Education (CHED) memorandum order no. 5, series of 2008 to include it in the Bachelor of Science in Nursing (BSN) curriculum. The course was later superseded by CHED memorandum order no. 14, series of 2009, which was implemented in 2010. The integration of technology and information science in nursing has led to an increasing need for nursing informatics skills. Virtual nursing has emerged as

an option in the shortage of nurses, offering uninterrupted attention, seamless assistance, and easy access to specialists' doctors (Hess & Alper, 2024). Virtual nurses also provide mentorship to new nurses (Sagastume & Peterson, 2023). Proficiency in nursing informatics is a crucial element of a professional nurse's knowledge foundation. Dhingra and Dabas (2020) argue that the inclusion of health informatics competencies in the education and training of health professionals is essential for their practical application. The absence of adequate informatics standards and competencies could limit the effectiveness of information technology and communication in healthcare settings, endangering patient safety.

Despite the inclusion of nursing informatics in the BSN curriculum in the Philippines, it can be said that the emerging field is still in the infancy stage. Abatol (2013) cited the observed gap between nursing informatics theory and practice. Accordingly, computerization program in government hospitals is least a priority due to the more serious problems that the government should be concerned of. On the other hand, problems like loading nursing informatics as a major subject in some nursing schools were offered to IT professionals instead of nurses who are IT experts at the same time, since having these two skills in one person is rare to find. This is very crucial because IT experts are only concerned with using the application but lacks the content knowledge of what and how clinical data information should be processed. Moreover, the lack of standardized criteria for teaching nursing informatics as cited by Forman et.al. (2020) was seen as another challenge in the teaching of nursing informatics. The emergence of AI as one of the components in nursing informatics presents opportunities to improve diagnostics, treatment and healthcare management. However, integrating AI technology into nursing practice requires

specialized trainings in informatics (Nashwan, et.al.,2025) and with the current issues involving faculty qualifications, it seems the quality of nursing graduates remains a question. Bivona-Tellez, et.al., (2024) expressed concerned on the preparation of nursing graduates as they remain uneven due to the lack of clear direction on how to teach informatics and what competencies to teach.

Therefore, the investigators were compelled to assess the competency of registered Filipino nurses to gauge their level of nursing informatics competence and identify ways to improve their capabilities. Furthermore, this study sought to identify variables influencing the development of nursing informatics competency and the factors that hinder their acquisition.

2. Research Methodology

Research Design

The study utilized a descriptive cross-sectional research design to analyze the characteristics of registered Filipino nurses and their nursing informatics competencies at a specific point in time, specifically those who graduated with a Bachelor of Science in Nursing from 2010 to 2023.

Participants of the Study

The study targeted 323 nurses that encompass a cohort of registered Filipino nurses affiliated with various nursing associations locally and abroad. The sample size was calculated using the formula, $n = z^2 \cdot [p \cdot q] / d^2$ (Charan & Biwas, 2013) which was used to calculate the sample size in a cross-sectional study with unknown population size. However, only 238 nurses responded which is 73.68% of the targeted population. This actual number though, is more than the standard 10% of the projected population as suggested by Connelly (2008) which now becomes the basis in determining the sample size in lieu of the fact that not all nurses willingly volunteered to take part in the survey.

Research Instrument

The study used the Technology Information Guiding Education Reform (TIGER)-Based Assessment of Nursing Informatics Competencies (TANIC) (Hunter et al., 2015) to evaluate the nursing informatics competencies of participants. The tool, consisting of 85 competencies across computer abilities, information literacy, and clinical information management, was distributed to all qualified nurses, including those with post-secondary education, bachelor's degrees, and university degrees.

Data Collection

The questionnaire was encoded using google sheet for easy access and consolidation of results and was posted online to allow qualified participants to respond. Responses were collected and sorted out for statistical analysis.

Data Analysis

To visualize the distribution of nurses according to their competency level, the data were analyzed using the percent distribution, mean, and standard deviation, which are essential for calculating the Gaussian Curve. Secondly, the t-test was employed to calculate the significant difference between variables to ascertain the extent to which the

variables were influencing the competency of nurses in nursing informatics. The descriptive ratings listed below were assigned numerical equivalents for statistical presentation, as illustrated in Table 1.

Table 1: The mean range and descriptive interpretation of the NI Competency

Mean Range	Descriptive Interpretation
3.25 – 4.00	Expert
2.5 – 3.24	Proficient
1.75 – 2.49	Competent
1.0 – 1.74	Novice

Ethical Considerations

Prior to the conduct of the study, a courtesy letter was submitted to the Research Ethics Committee of St. Paul University, Tuguegarao City, Philippines and was approved dated March 10, 2025, with code number, SPUP_2025_00100_SR_KA. Moreover, participation to the online survey was purely voluntary and that, the participants' consents were sought before they can proceed to the survey proper. They were not required in the google sheet tool to disclose their personal information such as names, addresses, and place of work to ensure confidentiality. Results in the assessment, however, was automatically returned to them through their respective email addresses for their information and confirmation.

3. Results

The demographic characteristics showed that more than half of the respondents (66.81%) are aged 31-40 years old (table 2), followed by the youngest group aged 23 to 30 (28.57%) and the least above 40 years old with only 4.62%. The sample is primarily dominated by female respondents (76.05%), while the male population makes up only 23.95% or about one-fourth of the female population. In terms of educational background, nurses with a baccalaureate degree are the most numbered (79.83%), followed by graduates in masteral programs and those undergoing masteral studies (10.50%). Only a few with a doctorate degree (7.98%) participated in the survey. While respondents with prior knowledge in nursing informatics before employment are almost equal in number with participants who did not have background of the course. Moreover, a bulk of respondents (47.25%) has more than 3 years of experience, followed by 6 months to 3 years of experience (38.53%) and 14.22% are very new, with less than 6 months of experience. Most nurses (90.24%) work in private institutions, with only 9.76% in public-funded facilities. In terms of access to Hospital Information System (HIS) in the workplace, 91.59% of the respondents have good access to automated information system while only 8.41% have no experience in using the application due to its absence in the workplace.

Table 2: Participants' Personal Profile

Variables	Categories	N	Percent Distribution (%)
Age Group	23-30	68	28.57
	31-40	159	66.81
	41 and above	11	4.62
Gender	Male	57	23.95
	Female	181	76.05
Level of Education	Bachelor's Degree	190	79.83
	Master's Level	19	7.98
	Master's Degree	25	10.5
	Doctorate Degree	4	1.69
Course in Informatics Taken	Yes	121	50.84
	No	117	49.16
Length of Experience	Less than 6 months	31	14.22
	6 months to 3 years	84	38.53
	More than 3 years	103	47.25
Area of Practice	Private Institution	220	92.44
	Public Funded Facility	18	7.56
Access to HIS	Yes	218	91.6
	No	20	8.4
Total		238	100

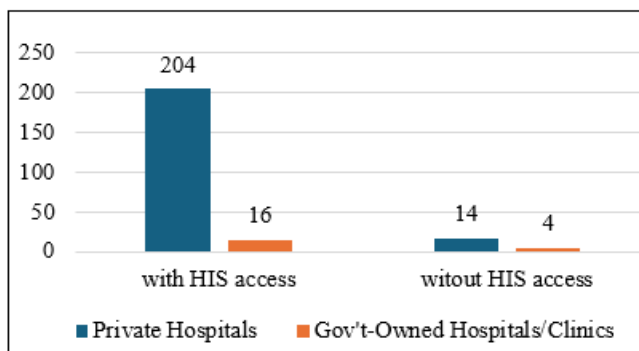
**Figure 1:** Distribution of HIS access between Private and Government-Owned Hospitals/Clinics

Figure 1 shows the distribution of HIS access between private and government-owned hospitals/clinics in contrast with health facilities where automated information system is absent in the workplace. Of the 218 nurses who are HIS users, 204 or 93.58% are coming from private hospitals while 6.42% are coming from government health facilities. With regards to nurses' inaccessibility to HIS, 16 out of 20 or 80% are coming from private hospitals while 4 out of 20 or 20% are from government health facilities.

Table 3: Nurses' Competency Level in Nursing Informatics

Competency Level	Numerical Range	Number	Frequency Distribution (%)
Expert	3.25 – 4.00	108	45.38
Proficient	2.50 – 3.24	88	36.97
Competent	1.75 – 2.49	39	16.39
Novice	1.00 – 1.74	3	1.26
Total		238	100.00
Total Score			745.47
Group Mean			3.132
Standard Deviation			0.6312916
Qualitative Description			Expert

Table 3 shows the distribution of nursing informatics competency of the respondents according to the given categories where *experts* (45.38%) are occupying the highest category followed by the *proficient* (36.97%). Meanwhile, the *competent* and *novice* categories with 17.65% in total are just below the 2.5 competency threshold. Table 3 likewise presents, the over-all mean at 3.132 described qualitatively as *experts*, showing a small standard deviation of 0.6 indicating homogeneity of individual scores.

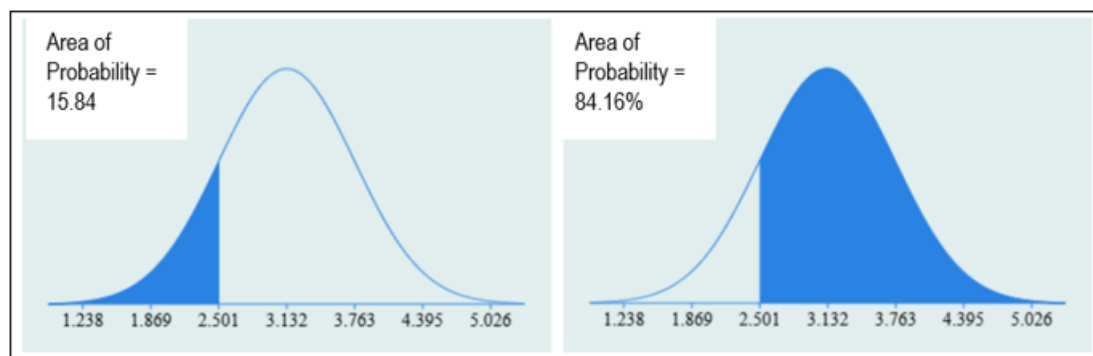
**Figure 2:** Normal Distribution Curve of the Competency Level of Filipino Nurses in Nursing Informatics

Figure 2 shows that 84.16% of individual scores are found within the proficient and expert categories while only 15.84% of individual scores are falling below the 2.5 threshold indicating that only few nurses lack the required skills in nursing informatics.

Table 4 presents the significant differences between nurses' competency in relation with selected variables as shown in their personal profiles using t-test. Results showed that, area of practice and background knowledge in informatics during

their undergraduate course are *not significantly different* with nurses' competency where t-values of the variables mentioned are lower than their critical values at 5% level of significance. On the other hand, utilization of HIS in the workplace, having graduate and post-graduate studies, and length of experience are found to have *significant differences* with the competency of nurses in nursing informatics, where, t-values are higher than their critical values at 5% level of significance.

Table 4: Significant difference between nurses' competency and their personal profiles

Profiles	Mean	Variance	Stand. Dev.	Critical Value	t-value	p value	Interpretation
Private Hospitals	3.1442	0.4097	0.6401	1.717	1.247	< .05	No significant difference
Public Health	2.9906	0.2397	0.4896				
Course in Nursing Informatics Taken							
Yes	3.1021	0.4396	0.663	1.653	0.7328	< .05	No significant difference
No	3.1621	0.3571	0.5976				
Utilization of HIS in Workplace							
With HIS	3.1772	0.3575	0.5979	1.721	3.0165	< .05	There is significant difference
Without HIS	2.646	0.5872	0.7663				
Level of Education							
Bachelors' Degree	3.0555	0.3929	0.6268	1.664	4.1655	< .05	There is significant difference
Graduate and Postgraduate	3.4375	0.3042	0.5515				
Length of Experience							
>3 years	3.2833	0.3929	0.6276	1.976	3.0794	< .05	There is significant difference
< 6months	2.9207	0.542	0.7362				

Perceived barriers of nurses in the acquisition of knowledge and skills in nursing informatics are presented in table 5, where availability of automated information system (30.89%) in their respective workplaces is the most cited factor that affects their competency, followed by sufficient trainings (23.57%) and attitudes towards computerization (16.26%). While other notable factors cited include, technical support, internet connectivity, availability of personal devices such as laptops and tablets, and other issues such as lack of government support and generation gap.

Table 5: Factors Affecting Nursing Informatics Competences

Factors Affecting Nursing Informatics Competencies	Number	Percent Distribution (%)
Availability of HIS	38	30.89
Sufficient trainings/seminar	29	23.57
Attitude towards computerization	20	16.26
Technical Support	14	11.38
Internet connectivity	13	10.57
Availability of personal laptop or tablet	7	5.70
Other concerns: lack of government support and generation gap	2	1.63
Total	123	100

4. Discussions

Demographic Characteristics

Many respondents are female, in their early to mid-career stages, and possess a bachelor's degree, which suggests that this is the standard educational requirement in the nursing field. While a small portion hold advanced degrees, which implies a modest presence of higher academic qualifications. On the other hand, the significant disparity between male and female respondents can be attributed to the gender disparity in nursing, a profession that is predominantly female (Woo et al., 2022).

The study found that respondents with prior knowledge in nursing informatics is almost equal to those without, suggesting a transitional stage in digital literacy training. Although all participants were assumed to have taken the course in the years specified, nursing informatics was more focused on basic computer operations in the 2008 BSN curriculum. It was only in 2010 that Health Informatics was treated as one of the major subjects with the issuance of another CHED memorandum order no. 14, series of 2009.

Hence, the age group between 31-40 which comprise the majority population are products of the initial implementation of nursing informatics in the Philippines.

Utilization of Hospital Information System (HIS)

The Hospital Information System (HIS), a centralized database for patient, doctor, and staff information, is extensively used in hospital and institutional settings. Table 3 illustrates the integration of Nursing Informatics in nurses' workplaces. This suggests that HIS has been extensively implemented in most healthcare environments. The 218 HIS users, as illustrated in Figure 3, worked primarily in private hospitals, with only a small number of HIS users in government hospitals or community health centres. The figure indicates that a significant number of Filipino nurses are currently utilizing the electronic data management system. Nevertheless, it is impossible to determine whether many of the respondents are from Philippine institutions, as the survey was accessed by both local and international participants. In contrast, few nurses are not exposed to HIS, including those employed in community health nursing in the Philippines and those employed in institutions with levels 1 and 2 accreditations. To achieve the same level of HIS utilization, the public health sector in the Philippines may require targeted support, including funding, infrastructure, and capacity development. Although the aggregate 90% usage rate is encouraging and consistent with global trends toward digital health transformation, the 9.76% gap still indicates areas for improvement.

Level of Nursing Informatics Competency of Registered Filipino Nurses

The distribution of individual scores by competency level as well as the mean score of the group is presented in table 4. The group mean at 3.132 indicates the high overall competency of registered Filipino nurses qualitatively described as *experts* in nursing informatics. Although some individual scores are falling below the mean, because of those participants who have no access to automated information system and those who have access but are still newbies in hospital practice. This implies that while most scores cluster around the mean (3.132), some variability exists, possibly reflecting differences in training, access to technology, or years of experience. A standard deviation of 0.631 indicates moderate variability in competency levels. The very small standard deviation indicates that most scores are very close to

the mean which only shows homogeneity of performances, proving the validity of the result.

Figure 2 showing the large area of probability of finding the scores of the participants above the mean confirms the findings. Results presented in table 3 can also be used to corroborate these said findings. In as much as more than majority of the respondents are already using the electronic system of data management, it added that majority of them are exposed to the system for more than 3 years, it is not surprising therefore that most of the nurses are labeled as *experts*. The very low percentage of novices reflects successful integration of informatics into nursing education or continuing professional development. Ongoing assessment should be encouraged to monitor improvements and adapt training interventions.

Significant Differences Between Selected Variables

The profile of the participants was classified and grouped according to how the variables have affected their level of competency. To establish the degree of differences between variables, t-Test was used. The following pair of variables were selected: a) the competencies of nurses who worked in hospitals and those connected in public health facility; b) nurses who had taken Nursing Informatics during their college years and those that do not have the background of the course; c) those that have worked for less than 6 months and those that have gained the experience for more than 3 years; d) nurses educational background; and e) those that utilized HIS compared to those who don't have the opportunity of using HIS in the workplace.

Area of Practice and Nurses' Competency Level

Table 5 shows that nurses working in hospitals and public health facilities have the same level of competence in applying Nursing Informatics. The t-value of 1.247 is lower than the critical value of 1.717 at 5% level of significance, indicating *no significant difference* between the two groups. However, the results cannot be conclusive due to the limited number of participants from government hospitals and community health clinics.

Background in Nursing Informatics and Nurses' Competency Level

The t-Test result (table 5) show *no significant difference* between nurses' background in Nursing Informatics and their competency level, indicating that prior knowledge from their baccalaureate degree did not affect their competency in applying the course. Nursing informatics is technology-driven, making it accessible to the younger generation and kids. Basic computer literacy and exposure to real-world of work enhance nurses' competency. The gap in knowledge is reinforced by actual experience, with most participants using the application for over three years. Experience is cited as one of the factors affecting nurses' competency, as supported by Almarwani and Alzarani (2023).

Utilization of HIS and Competency Level

The data suggests (table 5) positive impact of workplace infrastructure or utilization of HIS on nurses' competency. A t-Test analysis revealed a significant difference between the two groups, indicating that nurses who are consistently exposed to HIS perform better in integrating Nursing

Informatics. This is since even if nurses have basic understanding of the subject, their knowledge becomes unusable without practical application. This aligns with the concept of dialectical materialism by Karl Marx and Friedrich Engels as cited by Duignan (2025), which suggests that human knowledge is socially acquired through practice. In this study, nurses with constant exposure to HIS become more knowledgeable and skilled than those who do not practice. This highlights the importance of HIS in improving nurses' competency in healthcare settings.

Educational Background and Nurses' Competency Level

When the educational background of nurses was compared to their competency level (table 5), results showed that the t-value of 4.1655 at 5% level of significance is higher than the critical value at 1.664. This means that, the two variables are *significantly different*, with those holding higher educational qualifications, in a much better position than those only earning baccalaureate degrees. In comparison to the undergraduate students, graduate and post graduate nursing students frequently exhibits superior nursing informatics competencies as a result of more comprehensive curriculum and experience in advanced nursing positions (Choi & Martinis, 2013). In the Philippines, nursing informatics was first introduced in 2005 in the masteral program (Sumabat, 2010) as cited by Delaney et al. (2022). Hence, being ahead in terms of prior knowledge, these nurses were likewise more advanced in terms of length of service and their exposure to the application of nursing informatics, give them the competitive edge.

Length of Experience and Competency Level

Length of experience has significant positive association to their level of competency (table 5). When the competency of those serving 6 months or less was compared to nurses serving for more than 3 years, it shows that the t-value at 3.0794 is higher than the critical value at 1.976 which implies that the two variables are *significantly different*. Nurses who are serving for more than 3 years are already adept in the use of automated information system than those who are new to the service. Nurses' years of experience can have a favourable impact on their nursing informatics expertise. More experienced nurses use technology and manage patient data more effectively (Elsayed et al., 201; Kinnunen et al., 2019). Although bought variables gained their knowledge and skills via experience, the length of experience allows them to refine their abilities with each year of practice.

Factors Affecting their Competency in Nursing Informatics

The competency of nurses in nursing informatics is adversely affected by the factors listed in Table 6. When questioned, the availability of HIS in the workplace is the most significant factor that could potentially impact their competency in nursing informatics, followed by adequate training and attitudes toward computerization. Lack of government support is the clamors of those working in public health which could also be related to lack of technical support as expressed by other participants. It is a fact that most nurses in government service are stationed at local health centers and community hospitals. Some of them, especially those under the Nurses Deployment Program (NDP) of the Department of Health (DOH) often go to Geographically Isolated and

Disadvantaged Areas (GIDA) to serve the underprivileged and marginalized members of society. Hence, they lack the opportunity of sophisticating their information system. Lastly, generation gap is expressed by those aged 41 and above. This response could also be related to attitude towards computerization because younger generation are more adept to technology than older ones. According to one of the participants, “younger nurses who have grown up with technology, may adapt more easily to HIS”. Generational divide was also mentioned by Dash, et al (2023). Attitude towards technology plays a role in the technological divide between generations. Younger generations tend to view technology as integral part of their lives while older generations may be more skeptical of its benefits and may not see its value in their lives.

5. Limitations of the Study

The investigators have found some observed weaknesses that may serve as guide for future researchers to explore. The following are: a) the overall findings of being “expert” in nursing informatics of registered Filipino nurses may not represent the competency of nurses working in the Philippines, in as much as, the survey also covers Filipino nurses working abroad; b) although, there was no significant difference in nursing informatics competency between public and private health nurses, result may not be conclusive because the participating public health nurses is only 5.88% of the total participants; and finally, c) online survey doesn’t give all registered Filipino nurses equal access to computers and the internet, since, some nurses involved in community health nursing specially those under the Nurse Deployment Program in the Philippines are assigned in geographically isolated and disadvantaged areas (GIDA).

6. Conclusions and Recommendations

Registered Filipino nurses are generally *experts* in nursing informatics. Factors such as; exposure to electronic information system applications, years of experience and advanced knowledge in informatics of those having graduate and post graduate studies are contributors in honing their knowledge and skills in nursing informatics. On the other hand, prior knowledge and area of practice, were found to have no direct influence in the development of knowledge and skills of nurses. Instead, practical application rather than theoretical knowledge is more effective in developing nursing informatics competency. Hence, the importance of experiential learning in the nursing program of schools to prepare nursing students for greater tasks ahead, providing the future health working force with able and competent nurses.

The study can serve as basis for future researchers to explore on the following: a) assessment of nursing informatics competency of registered Filipino nurses working in the Philippines in order to determine the status of nursing informatics utilization in Philippine setting; b) comparative competency assessment in nursing informatics between private and government hospitals in the Philippines, to serve as basis of either institutions to upgrade their information system towards computerization; and, c) construction and validation of upgraded and standardized competency assessment on nursing informatics using advanced

competencies such as AI technology management and utilization, virtual nursing and others.

References

- [1] Abatol, GM (2013). Issues on Nursing Informatics in the Philippines. [Accessed: April 10, 2025]. <https://prezi.com/z0bowoehsbwp/issues-on-nursing-informatics-in-the-philippines/>
- [2] Almarwani, A. M., & Alzahrani, N. S. (2023). Factors affecting the development of clinical nurses' competency: A systematic review. *Nurse education in practice*, 73, 103826. <https://doi.org/10.1016/j.nepr.2023.103826>
- [3] American Nurses Association. *Nursing: Scope and standards of Practice*. (2018a). American Nurses Association.
- [4] Bivona-Tellez, C. M., Hebda, T., Newbold, S. K., VanderKooi, M., Tietze, M., Rivard, M., Clarke, M., & Pordeli, L. (2024). Informatics competency assessment of nursing faculty. *CIN: Computers, Informatics, Nursing*, 42(8), 555–556. <https://doi.org/10.1097/cin.0000000000001184>
- [5] Borycki, E. (2025). 2024: A year of nursing informatics research in Review. *JMIR Nursing*, 8. <https://doi.org/10.2196/74345>
- [6] Charan, J., & Biswas, T. (2013). How to calculate sample size for different study designs in medical research. *Indian journal of psychological medicine*, 35(2), 121–126. <https://doi.org/10.4103/0253-7176.116232>
- [7] Choi, J., & De Martinis, J. E. (2013). Nursing informatics competencies: assessment of undergraduate and graduate nursing students. *Journal of clinical nursing*, 22(13-14), 1970–1976. <https://doi.org/10.1111/jocn.12188>
- [8] Connelly L. M. (2008). Pilot studies. *Medsurg nursing: official journal of the Academy of Medical-Surgical Nurses*, 17(6), 411–412.
- [9] Dash, S., Sarkar, S., Tiwari, S., & Tejeswani, S. N. (2023). Mind the gap: Investigating the technological divide between generations. *International Journal of Novel Research and Development*, 8(5), 103–104. Retrieved from <https://www.ijnrd.org/papers/IJNRD2305215.pdf>
- [10] Delaney, C. W., Weaver, C. A., Sensmeier, J., Pruinelli, L., Weber, P., Trautman, D., Mate, K., & Catton, H. (2022). *Nursing and Informatics for the 21st Century – Embracing a Digital World, 3rd Edition, Book 1*. <https://doi.org/10.4324/9781003054849>
- [11] Dhingra, D., & Dabas, A. (2020). Global Strategy on Digital Health. *Indian pediatrics*, 57(4), 356–358.
- [12] Duignan, M. (2025). *Events and Society: Bridging Theory and Practice*. Routledge Publishing, New York. <https://doi.org/10.4324/9781003488729>
- [13] Elsayed, W. A. (2017). Relation between nursing informatics competency and nurses' attitude toward evidence-based practice among qualified nurses at Mansoura Oncology Center. *International Journal of Nursing Didactics*, 7(6). <https://doi.org/10.15520/ijnd.2017.vol7.iss6.229.26-33>

- [14] Fernandes, S., von Gunten, A., & Verloo, H. (2024). Using AI-Based Technologies to Help Nurses Detect Behavioral Disorders: Narrative Literature Review. *JMIR nursing*, 7, e54496. <https://doi.org/10.2196/54496>
- [15] Forman, T. M., Armor, D. A., & Miller, A. S. (2020). A Review of Clinical Informatics Competencies in Nursing to Inform Best Practices in Education and Nurse Faculty Development. *Nursing education perspectives*, 41(1), E3–E7. <https://doi.org/10.1097/01.NEP.0000000000000588>
- [16] Groeneveld, S., Bin Noon, G., den Ouden, M. E. M., van Os-Medendorp, H., van Gemert-Pijnen, J. E. W. C., Verdaasdonk, R. M., & Morita, P. P. (2024). The Cooperation Between Nurses and a New Digital Colleague "AI-Driven Lifestyle Monitoring" in Long-Term Care for Older Adults: Viewpoint. *JMIR nursing*, 7, e56474. <https://doi.org/10.2196/56474>
- [17] Hess, S., & Alper, C. (2024). Nursing Informatics: The Vital Nursing Link Between Technology And Patient Care. *HCA healthcare journal of medicine*, 5(5), 513–516. <https://doi.org/10.36518/2689-0216.2003>
- [18] Hunter, K., McGonigle, D., Hebda, T., Sipes, C., Hill, T., & Lamblin, J. (2015). Tiger-based assessment of Nursing Informatics Competencies (TANIC). *Advances in Intelligent Systems and Computing*, 171–177. https://doi.org/10.1007/978-3-319-16486-1_17
- [19] Jedwab, R. M., McDonald, I., Redley, B., Dobroff, N., & Mekonnen, A. (2025). Nurses' Experiences of Using Nursing Care Plans in the Electronic Medical Record in an Acute Medical Setting: A Mixed-Methods Study. *Computers, informatics, nursing: CIN*, 10.1097/CIN.0000000000001316. Advance online publication. <https://doi.org/10.1097/CIN.0000000000001316>
- [20] Kinnunen, U. M., Kuusisto, A., Koponen, S., Ahonen, O., Kaihlanen, A. M., Hassinen, T., & Vehko, T. (2023). Nurses' Informatics Competency Assessment of Health Information System Usage: A Cross-sectional Survey. *Computers, informatics, nursing : CIN*, 41(11), 869–876. <https://doi.org/10.1097/CIN.0000000000001026>
- [21] Nashwan, A. J., Cabrega, J. A., Othman, M. I., Khedr, M. A., Osman, Y. M., El-Ashry, A. M., Naif, R., & Mousa, A. A. (2025). The evolving role of nursing informatics in the era of artificial intelligence. *International nursing review*, 72(1), e13084. <https://doi.org/10.1111/inr.13084>
- [22] Sagastume, R., & Peterson, J. (2023a). The virtual nurse program in a community hospital setting. *OJIN: The Online Journal of Issues in Nursing*, 28(2). <https://doi.org/10.3912/ojin.vol28no02man02>
- [23] Taylor B, Hobensack M, Niño de Rivera S, Zhao Y, Masterson Creber R, Cato K. (2024). Identifying depression through machine learning analysis of omics data: scoping review. *JMIR Nurs*. 7:e54810. doi: 10.2196/54810.
- [24] Woo, B. F. Y., Goh, Y. S., & Zhou, W. (2022). Understanding the gender gap in advanced practice nursing: A qualitative study. *Journal of nursing management*, 30(8), 4480–4490. <https://doi.org/10.1111/jonm.13886>