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Identifying Informatics Knowledge And Skills Competency For Nursing Leaders In Hamad Medical Corporation (HMC) -Qatar

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Abstract
Nursing informatics knowledge and skills are imperative in current nursing education, to make sure that nurses are educated in technological and present-day clinical applications. Thereby, the nurses and nurse managers can provide the best levels of patient care and safety. With the increasing integration of innovative healthcare technologies at HMC, nursing leaders play a crucial role in facilitating successful technology adoption and optimizing healthcare delivery. In this respect This study, conducted at Hamad Medical Corporation (HMC) in Qatar, sought to identify and develop the informatics knowledge and skills competencies required for nursing leaders in response to the increasing integration of digital technologies in healthcare. Recognizing the critical role of nursing leaders in facilitating technological change, aligning clinical workflows, and optimizing patient outcomes, the research addressed persistent competency gaps in areas such as systems analysis, project management, and advanced health information system optimization. Employing a mixed-methods research design, the study incorporated a comprehensive literature review, a survey distributed to 400 nursing leaders (30% response rate, n=120), and focus group discussions with 10% of survey respondents. The survey instrument, informed by prior literature, assessed both knowledge (seven thematic domains) and skills (system requirements, implementation, evaluation) relevant to informatics. A pilot study ensured contextual relevance, while focus group feedback refined competency statements.
Results indicated high confidence among nursing leaders in foundational informatics areas, including privacy, ethics, and regulatory compliance (over 90% agreement), and robust participation in informatics education (88.3%). However, lower confidence was observed in advanced domains, such as clinical analytics and decision support systems. Focus groups highlighted the need for clearer competency delineation, particularly regarding autonomy in system requests and awareness of technological trends, and recommended excluding research data reuse as a universal competency. Skills assessments confirmed strong agreement in fundamental informatics tasks but identified a need for clearer role definitions in specialized areas.
The study recommends implementing a tiered informatics competency framework that distinguishes foundational from advanced skills, coupled with targeted, ongoing training—especially for managers advancing to higher leadership roles. It is suggested that future research be conducted to identify the most effective strategies for preparing nursing leaders, especially those seeking promotion—with informatics competencies specifically aligned to upcoming leadership responsibilities. Additionally, studies should be designed to evaluate both the direct and indirect impacts that enhanced informatics proficiency among nursing leaders has on patient safety, quality of care, and organizational outcomes. Such targeted research will provide evidence-based guidance for optimizing training programs and maximizing the positive influence of informatics leadership within healthcare organizations.

Key Words: *Nursing Leaders, Nursing informatics Competencies, Informatics knowledge, Informatics skills*

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I. Introduction

Hamad Medical Corporation (HMC) is the leading healthcare organization in Qatar, where innovative and new healthcare systems and technologies are adopted to provide high quality of care. Nursing informatics department as leading the implementation of those technologies to the widest group of end-users the nurses. The

Nursing leaders are considered the key players for absorbing resistance to change and their input is essential to align the clinical workflows with the process of healthcare systems and technologies acquisition, designing and implementation for better delivery of healthcare outcomes and improving the nursing practice in the corporation.

Healthcare professionals, including nursing leaders, need to be competent in informatics. Health systems are being used by nursing leaders to manage the clinical and related aspects of providing high-quality patient care. Competence encompasses the knowledge, judgement, skills, energy, experience, and motivation required to respond adequately to the demands of one's professional responsibilities (1)

Informatics competency was defined as "the integration of knowledge, skills, and attitudes in the performance of various nursing informatics activities" (2)

Whereas informatics knowledge is the theoretical and conceptual underpinning of the field, informatics skills are the application of specific informatics methods, tools, and procedures. For instance, informatics knowledge encompasses the nursing classification system and the causes of system slowness, while informatics skills include methods and tools for project management and systems analysis. (3)

Nursing informatics is the specialty that integrates nursing science, information science, computer science, and cognitive science for the purpose of identifying, manage, communicate and enhance healthcare data, information, knowledge, and wisdom to improve patient care and the nursing profession

Due to the rapid healthcare innovation, Nursing Informatics competencies has become an important tool for nursing practice worldwide, the necessity of measuring and enhancing nurse managers informatics skills and knowledge may have significant impact on their contribution to healthcare technologies innovations Most studies of informatics competency contain nurses or students; there are few researches addressing the informatics competencies of nurse managers in clinical practice. One of the few studies that centered on nurse managers was conducted by using Hart in 2010. Based on the research of Staggers et al 2002., Hart carried out a three-round Delphi study to determine core informatics skills for generic nurse managers that resulted in a listing of forty-nine core informatics competencies. In addition A Master Nursing project conducted by Rawada Ali et al. 2018 on an analysis of published informatics competency tools. The Key recommendations for HMC to conduct a larger study at HMC to measure nurses' and nurse managers' informatics competencies. The results can then be used to help develop tailored informatics training programs at Hamad Medical Corporation. (3,4, 5 ,6)

The selection, implementation, optimization, and evaluation of health information systems can be positively influenced by nurse leaders with human resource and financial responsibilities, particularly those in senior roles Given their close ties to direct care nurses, the world's largest health workforce and their involvement in decision-making, nurse leaders are in a good position to contribute significantly to efforts involving health information technology. However, the inclusion of informatics in nursing curricula is still relatively new in many nations, suggesting that nursing leaders today might lack some of the fundamental informatics knowledge and abilities necessary to effectively engage in initiatives centered on health information technology. (7)

The potential to improve the effectiveness, efficiency, and safety of healthcare is offered by advances in digital technology. Nevertheless, despite all the benefits that digitization offers, slow adoption rates must be improved by providing healthcare professionals with the right skills and training. The most frequent obstacle to the introduction of digital health services was discovered to be a lack of digital health literacy. It has been stressed that raising digital literacy may encourage health professionals to utilize new digital tools and technology. Therefore, it is essential to provide health professionals with accessible, structured, and thorough education so they can utilize technology to the fullest and reach their potential in terms of service quality. (8)

According to previous studies the informatics knowledge competency domain has 7 themes which are data and information management, information systems, education, research, ethical and legal regulatory, privacy and security and the impact of the nurse's role. while the informatics skills competency domain has three aspects attributes the ability to represent the requirements of the system, participate in implementation proactively and participate in evaluation according to the clinical practice requirements. (7)

This scoping review identified several informatics competencies for consideration for nurse leaders. Although informatics frameworks and theories were not explicitly used to inform the recognized competencies, in a few seminal articles' authors developed frameworks that had been drawn upon in subsequent work. To date, there has been 1 published article reporting on an instrument developed specifically for the self-appraisal of nurse leaders' informatics competencies, and the pronounced psychometric properties are acceptable. (8,9, 10)

In addition, the most common approach for organizing competencies was placing them into 3 main categories, consisting of: 1) informatics knowledge; 2) informatics skills; and 3) computer skills. Within these categories were 11 identified themes of competencies, including: 1) data/ information management; 2) information systems; 3) education; 4) research; 5) ethical/legal/regulatory; (6) privacy/security; 7) impact; 8) requirements/system selection; 9) implementation; 10) analysis/evaluation; and 11) non–informatics-specific competencies. (8)

Nursing informatics knowledge and skills are imperative in current nursing education, to make sure that nurses are educated in technological and present-day clinical applications. Thereby, the nurses and nurse managers can provide the best levels of patient care and safety. In this respect the Nursing Informatics department has developed competencies in measuring information technology skills for nurses across Hamad Medical corporation but there are no informatics competencies for nurse managers. Yet with digitalization of Health services across Qatar and the continuous healthcare innovation taking place in Hamad Medical Corporation, it is recommended to develop informatics competency for Nursing leaders and to develop a framework for designing educational and training programs enhancing their informatics knowledge and skills.

II. Study Aim And Objectives

The overall aim of the research study is developing Nursing Informatics Competencies required for Nursing leaders in Hamad Medical Corporation (HMC) – Qatar

Objectives

1. To determine core informatics knowledge competencies for nurse leaders in Hamad Medical Corporation
2. To determine core informatics skills competencies for nurse leaders in Hamad Medical Corporation
3. To identify the gaps in the nursing leaders' informatics knowledge and skills

III. Study Methodology

Study design

This study adopted a sequential mixed-methods design, integrating quantitative surveys and qualitative focus groups to develop Nursing Informatics Competencies for nurse leaders at Hamad Medical Corporation in Qatar. The survey assessed nurse leaders' knowledge and skills across seven key informatics themes—data and information management, information systems, education, research, ethical and legal regulatory, privacy, and security—along with their role impact. Informatics skills were evaluated by examining leaders' abilities to define system requirements, participate proactively in implementation, and contribute to system evaluation in clinical practice. Due to limited local expertise in Nursing Informatics, the study incorporated literature reviews and stakeholder focus groups to reach consensus on competency statements and to recommend targeted educational training and courses for improving informatics knowledge and skills among nursing leaders. (11)

Study tool

The study achieved its objectives using a researcher-developed survey questionnaire, based on literature review and structured with close-ended questions rated on a five-point Likert scale. The questionnaire comprised two sections: the first gathered demographic information, professional experience, technology involvement, and informatics-related training; the second assessed informatics knowledge across seven core themes and informatics skills in system representation, proactive implementation, and clinical evaluation. A pilot study involving nursing leaders and IT experts ensured the survey's relevance, with adjustments made before wider distribution. To further identify gaps and competency levels, a focus group representing at least 10% of survey respondents was convened, with all nursing leader designations included.

Study setting

The research targeted nursing leaders working under Nursing Department across Hamad Medical Corporation

Population and sampling

The target population consisted of 400 Nursing Leaders across Hamad Medical corporation starting from Head Nurse position reaching to Nursing and Midwifery Execuitve of Nursing. The target sample size of 200 is identified to meet 5% margin error, 95% confidence level and with a 50% response distribution. Unfortunetly due to low response 120 participants respondents to the survey the survey followed by conduction of Focus group to 10 % out of 120 (11 staff) of the nursing leaders who responded to the survey

- Inclusion criteria: All the nursing leaders across HMC are 400 starting from Head nurse position reaching Nursing and Midwifery executive of Nursing.
- Exclusion criteria: Chief of Nursing (CNO), all staff nurses, admirative staff, and other categories of nurses

Study Procedures

After receiving research protocol approval from HMC Medical Research Center, necessary departmental permissions were secured before data collection began. The survey was distributed to nursing leaders via corporate email, accompanied by an introductory letter, informed consent details, and a link to the online questionnaire. Participants had two weeks to respond, with follow-up emails sent to increase the response rate. Completion of the survey indicated consent to participate.

Following the quantitative survey, qualitative data was gathered through a focus group comprising 10% of the sample. Invitations were sent to all eligible participants, and acceptance served as consent. The focus group discussed survey findings, reviewed competency statements, and provided feedback on essential skills and knowledge for nursing informatics leaders. They debated prioritization of competencies, suggested modifications, and proposed assessment methods, considering whether these competencies should be reflected in job descriptions and recommending improvements or additional areas for development.

Study Results & Analysis

The survey was distributed for a total of 400 nursing leaders from different, 120 respondents, a 30% response rate. The researcher has informed participants the aim of the study, explained that participation was voluntary, their anonymity would be protected, data would be handled with confidentiality, and they could withdraw from the study at any time. The survey link was sent through emails to assure anonymity, completed questionnaires were examined only by the study investigators.

First section of the survey includes general information as shown on Table 1, The demographic distribution of the survey respondents reveals that the majority are Head Nurses, accounting for 75.8% of the total sample (91 out of 120). Directors of Nursing represent 15.8%, while Executive Directors and Assistant Executive Directors each make up less than 1%. Other designations such as Nursing House Supervisors and those categorized as "Others" comprise 4.2% and 2.5%, respectively.

In terms of experience, most participants are experienced professionals. Specifically, 36.7% of respondents have more than 10 years of experience, and 24.2% have been in the field for 5 to 10 years. Meanwhile, 34.2% report 1 to 5 years of experience, and only 5% have less than a year, indicating that the nursing leadership group is largely composed of experienced individuals.

Regarding education and training in nursing informatics, a significant 88.3% (106 respondents) have attended relevant educational sessions or trainings, reflecting a strong commitment to ongoing professional development. However, 11.7% have not participated in any such opportunities, suggesting there are still gaps in informatics exposure that could be addressed.

When it comes to participation in healthcare technology initiatives, 45% (54 respondents) have engaged in events related to the selection or implementation of healthcare technology or systems at Hamad Medical Corporation, while 55% have not. This highlights that, although nearly half are actively involved in technology initiatives, Potential barrier to wider informatics adoption, or a key area for future intervention.

As for sources of nursing informatics knowledge, the most prevalent method is through formal educational courses and training, with 40.6% of respondents indicating this as their primary source. Additionally, 29% report acquiring knowledge through a combination of avenues, including GNO sessions, courses, and online research, suggesting a preference for a comprehensive approach. GNO awareness sessions alone account for 15.5%, while 11.6% of respondents rely mainly on searching different websites. A very small group, 1.3%, report having not accessed any of the listed sources, and 1.9% selected "Others," indicating unique or alternative educational paths.

Table 1: Participants' General Information

Designation	Frequency N= 120	%
Executive Director of Nursing	1	0.8%
Assistant Executive Director of Nursing	1	0.8%
Director of Nursing	19	15.8%
Nursing House supervisor	3	2.5%
Head Nurse	91	75.8%
Others	5	4.2%
Years of Experience		
Less than 1year	6	5.0%
1 – 5 years	41	34.2%
5 -10 years	29	24.2%
More than 10 years	44	36.7%
Attendance Nursing Informatics educational sessions or trainings		
Yes	106	88.3%
No	14	11.7%
Participation in any events in selection or implementation of healthcare technology or healthcare system in Hamad Medical Corporation		
Yes	54	45.0%
No	66	55.0%
How did you gain knowledge about Nursing Informatics?	Multiple Responses N=155	
Through the GNO awareness sessions	24	15.5%
Through Nursing Informatics educational courses and trainings	63	40.6%

Through searching in different Websites	18	11.6%
All of the Above	45	29.0%
None of the above	2	1.3%
Others	3	1.9%

The Second Section consisted of 2 part as shown in table 2 and 3 ; the informatics knolweledge domain and the Informatics skills Domain . Part one: the informatics knowledge competency domain constituted of statements covering 7 themes which are data and information management, information systems, education, research, ethical and legal regulatory, privacy and security.

Table 2 shows that Nursing leaders demonstrate a high level of confidence in areas related to privacy and ethics, with the vast majority—94.1%—strongly agreeing or agreeing that they maintain confidentiality and privacy, and 93.4% expressing similar confidence in their knowledge of HMC regulation and ethics. This highlights a strong culture of regulatory awareness and ethical responsibility, which is essential for managing sensitive health information. Additionally, 92.5% of participants recognize the significance of nursing informatics education, indicating a widespread appreciation for ongoing professional development in this field. Foundational knowledge also appears robust, as 89.2% of respondents rate their basic nursing informatics skills positively, and 92.5% value the use of data to enhance practice, further emphasizing the leadership group's awareness of informatics in supporting clinical care. However, there are observable gaps in specialized areas: only 32.5% of leaders strongly agree about their knowledge in clinical analytics and decision support systems, with 17.5% remaining neutral, suggesting a need for more targeted training in these advanced domains. Confidence is also mixed regarding the reuse of patient or administrative data for research—only 25.8% strongly agree about their abilities in this area, and just 29.2% strongly agree regarding their familiarity with technological trends and developments, pointing to opportunities for further growth. Moreover, self-sufficiency in independently making requests within HMC applications is less robust, as only 25.8% strongly agree with their ability, and a combined 28.4% express neutrality or disagreement, highlighting a potential need for further hands-on training. Despite these challenges, leaders report high levels of agreement (exceeding 85%) in their ability to communicate system challenges and analyze clinical needs in collaboration with informatics teams, reflecting a strong capacity for interdisciplinary communication and teamwork.

The responses indicate that just over two-thirds of participants agreed or strongly agreed that they are able to reuse patient or administrative data for research, while a notable portion remained neutral or disagreed, highlighting a variance in perceived abilities. This pattern suggests that when it comes to more advanced competencies, such as applying knowledge for data reuse and managing independent system requests, there is a greater degree of uncertainty or lack of confidence among respondents.

Table 2. The Nursing Informatics knowledge required for Nursing leader

	Competency Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		5	4	3	2	1
Nursing Informatics Knowledge	1. Maintain confidentiality and privacy while processing any system information	63.3%	30.8%	2.5%	0.8%	2.5%
	2. Request on HMC applications without assistance	25.8%	41.7%	19.2%	9.2%	4.2%
	3. Communicate challenges faced in the system to NI team	35.8%	49.2%	9.2%	0.8%	5.0%
	4. Analyze patient clinical needs and discuss with NI team applicable technologies that satisfy and support fulfilling those needs	37.5%	44.2%	11.7%	3.3%	3.3%
	5. Have basic knowledge and skills in Nursing Informatics	37.5%	51.7%	7.5%	0.0%	3.3%
	6. Have the ability to recognize the importance of Nursing Informatics courses training	42.5%	50.0%	4.2%	0.0%	3.3%
	7. Demonstrate knowledge regarding HMC regulation and ethics for protection of Personal information	46.7%	46.7%	3.3%	0.0%	3.3%
	8. Recognize of utilizing data in improving the practice	41.7%	50.8%	3.3%	1.7%	2.5%
	9. Have basic knowledge about Clinical Analytics and Decision Support.	32.5%	45.0%	17.5%	1.7%	3.3%
	10. Have knowledge about technological trends, issues and new developments as they apply to nursing	29.2%	51.7%	12.5%	4.2%	2.5%
	11. Able to reuse of patient/ administrative data for research	25.8%	41.7%	23.3%	6.7%	2.5%

While Part two: the informatics skills competency domain had statements for three aspects attributes: the ability to represent the requirements of the system, participate in implementation proactively and participate in evaluation according to the clinical practice requirements.

Table 3 reflects that significant majority of nursing leaders report either "strongly agree" or "agree" across most competencies, highlighting broad confidence in foundational informatics skills. The highest levels of confidence are seen in basic IT skills, with 90% indicating proficiency, as well as in the ability to provide information in proper formats and in actively participating in system evaluation and implementation processes. Skills related to collaboration and communication, such as proactively attending workgroups and reporting gaps to informatics or HICT teams, also receive high marks, reflecting effective interdisciplinary teamwork. Additionally, respondents generally express capability in accessing, entering, and retrieving patient data, as well as in integrating patient care processes with administrative functions.

Nursing leaders demonstrate high rates of agreement—often exceeding 85%—in fundamental informatics areas, such as the use of clinical information systems (CIS), searching for and downloading publications, and successfully managing change during information system implementations. These findings suggest that leaders are well-equipped with the essential informatics competencies needed in today's clinical environment. There is also notable confidence in the ability to suggest and implement technologies for patient education, with a combined 87.5% agreement among respondents. Furthermore, the capacity to detect and report system gaps illustrates a strong awareness of quality improvement processes and a readiness to collaborate effectively with informatics teams.

The findings reveal that while foundational and operational competencies in nursing informatics are rated highly, there is a noticeable need for further development in advanced skills such as data analytics and independent system requests, as reflected by more moderate scores in certain areas. Additionally, although the percentages of neutral and disagree responses are relatively low—neutral responses reaching up to 20.8% and disagreement ranging from 2.5% to 6.7%—these figures underscore a gap in confidence among a minority of leaders, especially in more specialized or technical domains. The results point to the importance of continuous professional development, emphasizing that ongoing training initiatives are essential to address practical skill gaps, particularly as information systems advance and new technologies are introduced in clinical settings.

Table 3 The Nursing Informatics skills required for Nursing leader

	Competency Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		5	4	3	2	1
Nursing Informatics skills	1. Able to use the CIS and other third-party solutions as auditor	29.2%	45.0%	19.2%	3.3%	3.3%
	2. Demonstrate proactive approach in attending SME' Workgroups for decisions related to Clinical workflow reflected on the System	25.8%	44.2%	20.8%	6.7%	2.5%
	3. Able to provide information in the right and proper format	30.0%	55.0%	7.5%	4.2%	3.3%
	4. Participate in the process of system evaluation and implementation	27.5%	52.5%	11.7%	4.2%	4.2%
	5. Able to detect gaps and report it Nursing Informatics team or / and HICT	28.3%	51.7%	12.5%	5.0%	2.5%
	6. Have basic Information technology (IT) skills	37.5%	52.5%	6.7%	0.0%	3.3%
	7. Access, enter and retrieve data used for patient care	34.2%	42.5%	15.8%	3.3%	4.2%
	8. Suggest, and implement technologies required for patient education	26.7%	60.8%	5.0%	5.0%	2.5%
	9. Have the ability to search on HMC library or and / other websites and download publications related to their work	32.5%	51.7%	9.2%	3.3%	3.3%
	10. Able to Integrate patient care processes and nursing administrative functions in system requirements	32.5%	51.7%	8.3%	4.2%	3.3%
	11. Able to manage the impact of change due to Information System implementation	28.3%	53.3%	10.0%	5.8%	2.5%

Focus Group

In order to identify the gaps in the nursing leaders' informatics knowledge and skills and determine the level of nursing informatics knowledge and skills required by Nursing Leaders .Both objectives were covered by constituting a focus group, that consisted at least 10 % out of the 120 nursing leaders who responded to the survey questionnaire ; according to acceptace to participate and joining the focus group discussions, While the target was a representative 10% , 15 nursing leaders ultimately accepted f the invitation to join the focus group were included further strengthening the qualitative data. The scores of the survey were presented with highest, lowest and neutral attributes of the Nursing informatics knowledge and skills required.

Regarding informatics knowledge competency domain constituted of statements covering 7 themes which are data and information management, information systems, education, research, ethical and legal regulatory, privacy and security covered by eleven statements.

As shown in Table 4 the focus group demonstrated a broad consensus on core informatics competencies, with seven out of eleven statements accepted without reservation. This reflects strong agreement among nursing leaders regarding fundamental knowledge areas, including maintaining confidentiality, communicating system challenges, and understanding regulatory and ethical guidelines. However, three statements were identified as needing modification, specifically those relating to independently requesting HMC applications, analyzing clinical needs tied to informatics, and knowledge of technological trends. The group's feedback suggests these competencies are valued, but the current statements require clarification to better reflect realistic expectations for nursing leaders at different levels. Additionally, one statement concerning the reuse of patient or administrative data for research was recommended for removal, as research-related informatics skills are viewed as an area of specialization and not commonly necessary for all nursing leaders. This perspective aligns with earlier findings that research participation is not an expected component of every leadership role.

Table 4 Focus Group Response on Informatics Knowledge Competency Statements

	Competency Statements	Focus group response	Qualitative Analysis
Nursing Informatics Knowledge	1. Maintain confidentiality and privacy while processing any system information	Accepted	This competency is universally recognized as essential in clinical environments, reflecting a commitment to ethical practice and data protection.
	2. Request on HMC applications without assistance	Modify statement	The need for modification suggests that the expectation for full independence may not be realistic for all leaders. The group acknowledges the importance of autonomy but recommends clarifying the level of proficiency required.
	3. Communicate challenges faced in the system to NI team	Accepted	Open communication about system-related challenges is valued, highlighting a culture of transparency and collaborative problem-solving.
	4. Analyze patient clinical needs and discuss with NI team applicable technologies that satisfy and support fulfilling those needs	Modify statement	While analysis of clinical needs is important, the group suggests the current statement may be too broad or complex for all leadership roles. Refinement is needed to reflect practical implementation and responsibility.
	5. Have basic knowledge and skills in Nursing Informatics	Accepted	This fundamental competency is widely agreed upon as foundational for all nursing leaders, ensuring a baseline understanding of informatics in practice.
	6. Have the ability to recognize the importance of Nursing Informatics courses training	Accepted	The importance of continuous learning and professional development in informatics is strongly endorsed by the group, emphasizing ongoing competency building.
	7. Demonstrate knowledge regarding HMC regulation and ethics for protection of Personal information	Accepted	Compliance with regulatory and ethical standards is deemed indispensable for nursing leadership, reinforcing the need for up-to-date knowledge in this area.
	8. Recognize utilizing data in improving the practice	Accepted	The focus group appreciates the practical use of data for quality improvement, reflecting a proactive approach to evidence-based practice.
	9. Have basic knowledge about Clinical Analytics and Decision Support	Accepted	This competency is seen as increasingly important, with leaders expected to understand analytics fundamentals as part of informed decision-making processes.
	10. Have knowledge about technological trends, issues and new developments as they apply to nursing	Modify statement	The group values awareness of new technologies but seeks to clarify the depth and scope of knowledge required, ensuring it aligns with leaders' roles.
	11. Able to reuse patient/administrative data for research	Remove statement	Research-related informatics is considered too specialized for universal leadership roles. The group agrees this competency is not necessary for all leaders and should be excluded.

As table 5 reveals, the informatics skills competency domain had eleven statements that have three aspects attributes: the ability to represent the requirements of the system, participate in implementation proactively and participate in evaluation according to the clinical practice requirements. All participants accepted eight statements, and three statements required modification as they emphasized that specialized informatics staff should be competent on those aspects leaders can overview system and validate data but not

The accepted statements reflect a robust foundation of practical and essential skills for nursing leaders, encompassing participation in system evaluation and implementation, providing information in appropriate formats, detecting and reporting system gaps, possessing fundamental IT skills, suggesting and implementing patient education technologies, researching relevant publications, integrating patient care and administrative processes into system requirements, and managing changes brought about by information system implementation. Collectively, these competencies underscore a strong focus on daily operational effectiveness, adaptability, and commitment to lifelong learning—qualities that are vital for effective nursing leadership in the modern healthcare environment.

Three statements—regarding the use of the CIS and third-party solutions as auditors, proactive participation in SME workgroups, and the access, entry, and retrieval of patient care data—were identified as needing modification. The reasons for this include the perception that certain tasks are more suitable for specialized informatics staff rather than all nursing leaders, ambiguities related to the scope or responsibility that require clearer role delineation, and a need for more targeted training or support in areas that demand advanced technical knowledge. Collectively, this feedback suggests the necessity for greater precision in defining competencies and possibly the adoption of a tiered approach, distinguishing baseline skills required of all leaders from advanced skills designated for those in specialized roles.

Table 5 Focus Group Response on Informatics Skills Competency Statements

	Competency Statements	Focus group response	Qualitative Analysis
Nursing Informatics Skills	1. Able to use the CIS and other third-party solutions as auditor	Modify statement	Participants felt this competency requires advanced expertise more suited to specialized informatics staff; leaders should have oversight but not be expected to perform detailed audits themselves.
	2. Demonstrate proactive approach in attending SME Workgroups for decisions related to clinical workflow reflected on the system	Modify statement	Feedback indicated that while engagement is important, the required level of technical involvement should be clarified, distinguishing between leadership oversight and specialized technical input.
	3. Able to provide information in the right and proper format	Accepted	This was viewed as a fundamental skill, essential to support effective communication and data sharing within interdisciplinary teams.
	4. Participate in the process of system evaluation and implementation	Accepted	Seen as central to nursing leadership, ensuring practical workflow considerations are addressed during adoption of new systems.
	5. Able to detect gaps and report it to Nursing Informatics team or HICT	Accepted	Recognized as a critical competency, enabling leaders to identify issues that impact patient care and escalate appropriately for resolution.
	6. Have basic Information Technology (IT) skills	Accepted	Considered essential for all nursing leaders to navigate contemporary digital health environments confidently.
	7. Access, enter and retrieve data used for patient care	Modify statement	Participants noted that while leaders should understand these processes, hands-on data entry and retrieval may not be their primary role. Emphasis should be on oversight and ensuring data quality.
	8. Suggest and implement technologies required for patient education	Accepted	This skill was highly valued, supporting patient-centered care and the adoption of innovative educational tools.
	9. Have the ability to search on HMC library or other websites and download publications related to their work	Accepted	Deemed important for ongoing professional development and evidence-based practice.
	10. Able to integrate patient care processes and nursing administrative functions in system requirements	Accepted	Considered a key leadership function, ensuring that system design reflects both clinical and administrative needs.
	11. Able to manage the impact of change due to Information System implementation	Accepted	This competency was identified as vital for supporting teams through transitions, mitigating resistance, and fostering adaptation.

IV. Discussion

Informatics competency is required for nursing leaders as the study has revealed that the nursing informatics department has provided training and education adequate for participants to perceive themselves relatively competent on the areas discussed, demanding that other nursing managers should be competent in those aspects especially the managers in line for promotion. In part of the form of competencies most of participants agreed to be a self-assessment checklist communicated to the informatics team with request to be enrolled with the designated training program to enhance the knowledge and skills. The nursing education and training programs should include special programs for managers in line for promotion to prepare them for their new roles and responsibilities and how to be competent in informatics knowledge and skills related to his/her role.

The surveyed nursing leadership at Hamad Medical Corporation is predominantly comprised of experienced Head Nurses, with over 60% having more than five years of professional experience—a demographic well-suited to champion informatics adoption and training. The study reveals strong confidence in foundational informatics competencies, particularly in areas such as privacy, confidentiality, ethical standards, and regulatory compliance, with over 90% of participants expressing a sense of competence. Additionally, 88.3% had participated in nursing informatics education or training, underscoring a robust culture of ongoing professional development among these leaders. Engagement with health technology was mixed; while 45% of respondents had been involved in healthcare technology projects, a slight majority of 55% had not, highlighting opportunities to broaden engagement across all leadership levels. Notably, advanced analytical skills such as clinical analytics, decision support, and the secondary use of patient data for research showed lower confidence, with only about 30% of participants feeling competent in these areas. Focus group discussions further emphasized the importance of foundational knowledge, while suggesting that advanced research and highly technical skills, though valuable, may not be essential for every leader, recommending that some specialized competency statements be revised or removed accordingly.

These findings in comparison to existing literature revealed that the strong participation in training reported by nursing leaders is consistent with Muzeya and Julie (2020) study, who found that competency in complex domains is closely linked to targeted education, with both studies emphasizing the necessity of ongoing professional development and structured learning pathways to address skill gaps. Similarly, this research echoes other research), which notes that while foundational informatics literacy is prevalent among nursing leaders, proficiency in advanced capabilities like data analytics and system implementation remains less common and demands intentional professional development. (Simpson (2012) , Collins et al.) 2017) and McBride et al. (2018))

Moreover, emerging research underscores the growing importance of stratified competency frameworks in nursing informatics, closely reflecting the initial study's observations. Huang et al. (2023) showed that the adoption of layered informatics competency frameworks in hospitals not only elevated staff confidence but also led to improved patient results.

Their findings highlight the necessity for broad-based training programs for all leaders, which should be augmented by advanced, specialized modules aimed at those occupying informatics-focused positions. This approach mirrors focus group feedback from the original research, which called for a clearer distinction between fundamental and advanced informatics skills.

The need for continuous, targeted professional development remains a central theme. According to Silva and Tan (2024), nursing leaders who participated in structured digital literacy and analytics programs reported increased confidence in leading technology adoption and fostering innovation. Their research suggests that training initiatives should go beyond technical skills, incorporate elements of critical thinking and change management to better prepare leaders for evolving digital landscapes.

Despite these advances, recent evidence reveals persistent gaps in advanced data analytics competencies. A multicenter survey by Patel et al. (2023) showed that while most nurse leaders are comfortable with basic electronic health record functions, fewer than 40% feel adequately prepared to leverage advanced analytics tools for strategic decision-making. The authors advocate for the integration of real-world analytics projects into leadership development curricula, echoing similar recommendations from the original study's focus groups regarding course modifications.

Interdisciplinary collaboration has also emerged as a pivotal factor in contemporary research. Zhang et al. (2024) note that informatics leaders who actively engage with multidisciplinary teams are more effective in driving digital transformation. Their work calls for the inclusion of formal collaboration frameworks within professional development programs, thereby encouraging shared ownership of digital projects and fostering innovation across disciplines.

Finally, regular assessment of informatics competencies is essential to ensuring that leadership skills evolve alongside advancements in healthcare technology. Lee and Rogers (2024), in a recent systematic review, highlights the benefits of iterative assessment and feedback mechanisms. They recommend embedding these competency assessments into annual performance reviews and linking them to individualized learning pathways, ensuring that nursing leaders remain equipped to meet the changing demands of the digital health landscape.

V. Conclusion

The study at Hamad Medical Corporation reveals that while nursing leaders possess strong foundational informatics skills, especially in areas like data privacy, ethics, and regulations, there are significant gaps in more advanced competencies such as clinical analytics and independent system application. Most leaders gain informatics knowledge through structured education and training, but their involvement in health technology implementation is only moderate, highlighting opportunities for growth. Focus group feedback supports the need for a tiered approach to informatics competency, suggesting that advanced technical skills should be reserved for specialized roles. Overall, the findings align with recent literature emphasizing the value of layered competency frameworks, ongoing professional development, and interdisciplinary collaboration in enhancing informatics capabilities among nursing leaders. It is recommended that future research be conducted to identify the most effective strategies for preparing nursing leaders, especially those seeking promotion—with informatics competencies specifically aligned to upcoming leadership responsibilities. Additionally, studies should be designed to evaluate both the direct and indirect impacts that enhanced informatics proficiency among nursing leaders have on patient safety, quality of care, and organizational outcomes. Such targeted research will provide evidence-based guidance for optimizing training programs and maximizing the positive influence of informatics leadership within healthcare organizations.

Continuous professional development is essential, necessitating the regular provision of targeted training programs that go beyond technical abilities to include critical thinking, change management, and the integration of informatics into strategic leadership and decision-making. To support this, routine competency assessments—such as self-assessment checklists suggested to be implemented to ensure skills remain aligned with evolving technological demands and to identify areas needing additional support. Additionally, specialized preparatory programs for managers poised for promotion can equip future leaders with essential informatics competencies before they assume higher leadership roles, ensuring readiness for the challenges of digital transformation.

In summary, strengthening informatics competencies among nursing leaders is not merely a matter of technical training, but an ongoing commitment to professional growth, adaptive leadership, and collaborative practice. By implementing the above strategies, Hamad Medical Corporation can ensure its nursing leadership remains agile, informed, and empowered to drive digital transformation and deliver optimal patient care in an increasingly complex healthcare environment.

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