▪ *Basic Research*

Challenges Toward Using Artificial Intelligence and Overcoming Strategies as Perceived by Oncology Nurses

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Abstract

Background: Artificial Intelligence can improve the quality and efficiency of oncology nursing care at every stage, from diagnosis to palliative care, highlighting the need to study its effective integration to enhance patient outcomes. **Aim:** To assess challenges toward using artificial intelligence and overcoming strategies as perceived by oncology nurses. **Design:** A descriptive study. **Subjects:** 60 oncology nurses were participated in the study. **Setting:** At the oncology center affiliated to Ain Shams University Hospital in Cairo, Egypt. **Tools of data collection:** One tool namely Self-administered questionnaire. **Results:** The study findings revealed that more than one-fifth of the oncology nurses reported a low perception, over half exhibited a moderate perception level, whereas they demonstrated a high perception level of challenges toward using artificial intelligence. In addition, more than one-fifth of the oncology nurses reported a low perception level, over half exhibited a moderate perception level, whereas they demonstrated a high perception level of overcoming strategies. **Conclusion:** This study addressed the challenges and their overcoming strategies as perceived by oncology nurses. Also, there was a significant relationship between age, computer skills of both the perceived level of challenges toward using AI and the perceived effectiveness of strategies to overcome these challenges. **Recommendations:** Implement regular, hands-on training sessions to improve nurses' familiarity and confidence with AI tools.

Keywords: Artificial Intelligence, Challenges, Oncology Nurses, Overcoming Strategies

Introduction

Artificial Intelligence (AI) has become an increasingly prominent tool in the healthcare sector, offering innovative solutions to improve patient care, streamline clinical workflows, and optimize resource allocation. As healthcare systems worldwide face growing demands, AI provides opportunities to enhance diagnostic accuracy, predict patient outcomes, and support clinical decision-making, ultimately contributing to safer and more efficient care delivery (**Liaw, 2023).**

AI in healthcare refers to the application of advanced computational techniques that mimic aspects of human intelligence, such as learning, reasoning, and problem-solving, to perform tasks that traditionally require human intervention **(Ramadan et al.,2024).** Common AI technologies include machine learning algorithms, deep learning models, and natural language processing, which can analyze vast amounts of medical data, identify patterns, and generate insights to support evidence-based practice (**Cheng et al., 2024).**

Within oncology nursing, AI holds particular promise for addressing the complex and evolving needs of cancer patients across the care continuum. By facilitating early detection, personalizing treatment plans, predicting complications, and improving symptom management, AI can help oncology nurses deliver high-quality, patient-centered care. Moreover, AI-driven tools can reduce administrative burdens, allowing nurses to devote more time to direct patient care and emotional support **(Al Khatib & Ndiaye, 2025).**

Despite its potential, integrating AI into oncology nursing practice is not without challenges. Social barriers include misconceptions about AI capabilities, resistance to change, and fear of job displacement. Economic barriers involve high implementation costs, ongoing maintenance expenses, and the need for sustainable funding models. Technological challenges such as lack of transparency in AI algorithms, data privacy concerns, and interoperability issues further complicate widespread adoption. Other AI challenges are data, organizational, ethical and legal challenges.**(Hassan & El-Ashry, 2024).**

Addressing these barriers requires multi-level strategies. Education and training programs can help nurses and other healthcare professionals develop AI literacy and confidence in using new technologies. Policies and guidelines that ensure ethical AI use, data security, and algorithm transparency are essential. Financial investments and partnerships with technology developers can make AI tools more affordable and adaptable to various healthcare settings **(Kotp et al., 2025).**

Overcoming these challenges is crucial to fully realize AI's benefits in oncology nursing. By addressing social, economic, and technological barriers, healthcare organizations can create an environment where AI enhances — rather than complicates — nursing practice. Successful integration will empower nurses to use AI effectively, improving care quality, patient safety, and overall health outcomes for individuals living with cancer **(Le Lagadec et al., 2024).**

Oncology nurses play a central role in the successful adoption of AI technologies. They act as mediators between patients and AI systems, ensuring that technological tools complement — not replace — compassionate, human-centered care. Nurses' insights are vital in selecting, customizing, and evaluating AI applications to align with patients' unique needs and preferences, making their involvement essential for ethical and effective implementation **(Ramadan et al.,2024).**

Studying the challenges and strategies related to AI integration is important to identify practical solutions that support oncology nurses in their evolving roles. Understanding these factors helps inform policy development, curriculum design, and organizational planning, ensuring that AI adoption aligns with nurses' professional values and enhances rather than disrupts care delivery **(Al-Sabawy, 2023).**

Theoretical framework

The theoretical foundation of this study is primarily based on the Technology Acceptance Model (TAM), originally proposed by Davis and later expanded for nursing by scholars such as **Ramadan et al. (2024)** through the TAM-AIN (Technology Acceptance Model for Artificial Intelligence in Nursing).

This model posits that nurses' acceptance of AI is influenced by their perceptions of its usefulness and ease of use, which are shaped by factors like digital literacy, training, and institutional support **(Ramadan et al., 2024; Bani Issa et al., 2024).** Nurses who perceive AI as beneficial and manageable are more likely to adopt it in practice, while those who see it as complex or disruptive tend to resist its use. Behavioral intention, a key TAM component, links these perceptions to actual usage behavior, providing a useful lens for understanding technology uptake in oncology settings **(Ronquillo et al., 2021).**

In addition, this study is informed by Cognitive Appraisal Theory **(Lazarus & Folkman, 1984),** which explains how individuals assess and respond to stressors, such as the integration of AI in clinical practice. In this context, oncology nurses adopt coping strategies—either reactive (e.g., workarounds, informal help-seeking) or proactive (e.g., training, leadership participation)—based on how they appraise the challenges **(Esmaeilzadeh, 2020; Seibert et al., 2021).** Furthermore, the Organizational Readiness for Change framework by Weiner (2009) is relevant in understanding how institutional factors such as leadership support, ethical policies, and infrastructure readiness can either facilitate or hinder the effective use of AI **(Ahmed et al., 2023; Laukka et al., 2022).** Together, these frameworks offer a multidimensional understanding of how personal and organizational factors influence the perception of AI-related challenges and the strategies used to address them. As presented in conceptual model figure (1).

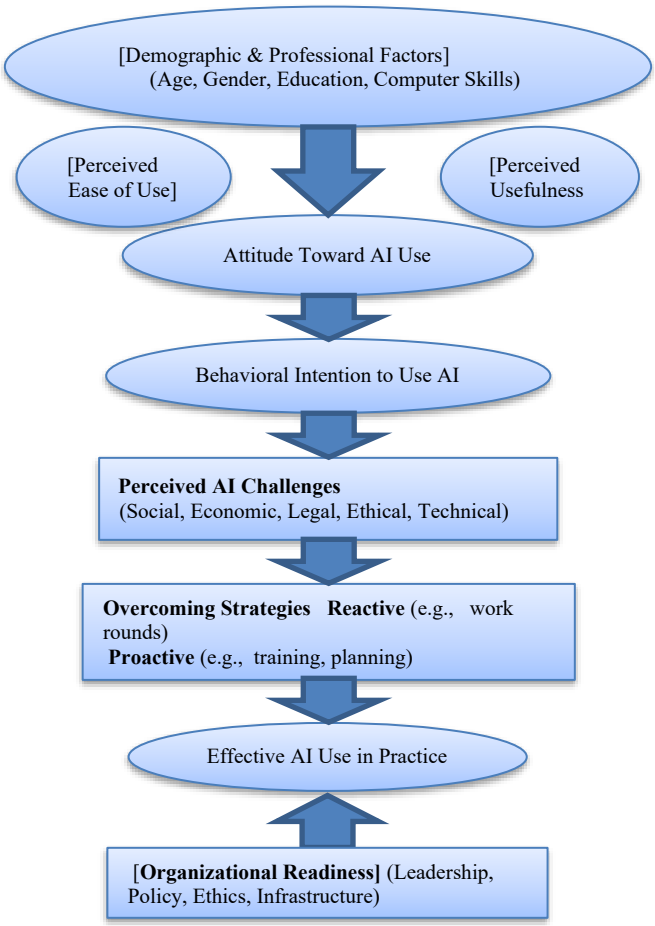

Figure (1): Conceptual model

Study significance

The inclusion of COVID-19 as a catalyst for AI adoption in healthcare is both timely and relevant. During the pandemic, AI-driven technologies such as telehealth platforms and chatbots enabled remote diagnosis, treatment, education, and follow-up, which helped reduce hospital overcrowding and minimize virus exposure **(Liaw, 2023).** Recent studies have explored AI applications in nursing practice more broadly. For example, Al **Khatib and Ndiaye (2025) and Cheng (2024)** conducted scoping reviews highlighting AI's roles in documentation, nursing diagnoses, care planning, patient monitoring, outcome prediction, and wound management. While these functions are especially pertinent to oncology nursing, where AI can enhance care throughout diagnosis, treatment, survivorship, and palliative phases, they primarily examine AI from a general nursing perspective.

Effective AI integration in oncology nursing depends not only on frontline use but also on how nurse managers develop strategies to overcome implementation challenges, facilitate interdisciplinary collaboration, and ensure safe, patient-centered use. However, no studies have specifically analyzed strategic approaches for addressing AI barriers from a nursing management perspective — a critical gap given that nurse managers play a key role in shaping policies, allocating resources, and supporting staff competencies **(Alenezi, 2024; Kotp et al., 2025)**. By addressing this gap, the present study aims to provide practical

insights that can guide nursing leaders in harnessing AI's full potential to improve oncology care.

Operational definitions:

Challenges in this study refer to the social, economic, technological, data, organizational, ethical and legal barriers that limit or hinder the effective implementation and integration of Artificial Intelligence (AI) in oncology nursing practice.

Overcoming Strategies in this study refer to the specific actions, interventions, or organizational approaches proposed or implemented by nursing managers and other stakeholders to address and reduce the identified challenges related to AI integration.

Aim

To assess challenges toward using artificial intelligence and overcoming strategies as perceived by oncology nurses.

Research Questions:

- What are the challenges toward using artificial intelligence as perceived by oncology nurses?
- What are the overcoming strategies toward using artificial intelligence as perceived by oncology nurses?

Design:

Descriptive research was utilized in this study. This design was used to systematically identify and describe the challenges associated with AI integration in oncology nursing practice and the strategies employed to overcome these barriers. It allows the researchers to capture detailed, context-specific information from participants, providing a comprehensive understanding of the phenomenon without manipulating any variables.

Study Setting:

At oncology center -Ain shams hospital affiliated to Ain shams university, Cairo, Egypt. theses hospital includes different categories of nursing staff and required prolonged duration at each stage of cancer care and it had interdisciplinary care team is necessary to support people with cancer. The research was conducted across all units of the hospital, which has a bed occupancy rate of approximately 100 beds.

Subjects

A purposive sampling strategy was used to recruit sixty (60) out from 100 oncology nurses.

Inclusion criteria:

1. Oncology nurses who provide comprehensive care for patients with cancer.

2. Nurses with direct experience and involvement in applying Artificial Intelligence technologies within oncology nursing practice.

Exclusion criteria:

1. Nurses with less than one year of oncology nursing experience.
2. Nurses who do not have any direct involvement with AI technology in their practice.

Data collection tools

A **Self-administered questionnaire** was adopted for data collection**.** It was developed by the researchers based on recent literature review **(Sun&Medaglia,2019), (Taylor, 2021), (Aggar et al., 2022) & (Cınar Yucel et al., 2022) & (Ramadan et al., 2024),** validity and reliability of this tool was tested. It was consisted of three sections:

I: Characteristics: it investigated personal and job data such as (age, sex, education, marital status, current job title, years of experience, computer skills, and receiving training course related to AI).

II: Challenges **Toward Using Artificial Intelligence,** this part was aimed to assess challenges toward using Artificial Intelligence as perceived by oncology nurses. It was consisted of 35 items which divided into seven basic challenges namely; Social Challenges (5 items). Example; Artificial intelligence decreases interaction between patients and nurses. Economic Challenges (5 items). Example; Artificial intelligence can include wastage of money and time to apply it.

Technological Challenges (5 items). Example; Artificial intelligence requires competent nurse in computer skills. Data Challenges (5 items). Example; Artificial intelligence requires large datasets to accurately perform different tasks. Organizational Challenges (5 items). Example; Artificial intelligent can make an error and full responsibility lies on nurses. Ethical Challenges (5 items). Example; Using artificial intelligence exposes patient's data to biases. Legal challenges (5 items). Example; Artificial intelligence needs availability of regulation and legislations to be applied.

Scoring system

The response of study sample was check against 5-point Likert scale as follow: five refers to strongly agree, four= agree, three means neutral, two mean disagree, and one was strongly disagree. The total score was categorized into three levels of percepion: high (>75%), moderate (60--75%), and low (<60%). **(Ramadan et al., 2024).**

III: Overcoming Strategies Toward Using Artificial Intelligence, this part was aimed to assess overcoming challenges toward using Artificial Intelligence as perceived by oncology nurses. It was consisted of 30 items categorized into two basic strategies namely; **First section,** proactive strategies (15 items). Example; building mutual trust between nurses and patients, train nurses effectively, etc…

Second section, reactive strategies (15 items). Example; Supporting standardization and collaboration with data networks, establishing collaborations through cooperation with academic centers and encompass experts who have the required knowledge, use of algorithms or face validity checks rules to improve quality and usability etc…

Scoring system

The response of study sample was check against 5-point Likert scale as follow: (5) strongly agree, (4) agree, (3) neutral, (2) disagree, (1) strongly disagree. The total score was categorized into three levels of perception: high (>75%), moderate (60--75%), and low (<60%) (**Cınar Yucel et al., 2022).**

Validity and reliability

The questionnaire items were developed based on an extensive review of relevant literature, including previous studies and theoretical frameworks related to AI implementation in nursing practice. Items were adapted from validated tools where appropriate and modified to fit the specific context of oncology nursing and the study objectives. Additional items were generated to address any gaps identified in existing instruments. The tool parts were tested and evaluated for face and content validity by jury category. The five experts were professors in the nursing with different specialties from Nursing Administration, Psychiatric/Mental Health Nursing, medical/surgical nursing and critical care nursing to ascertain relevance, clarity, and comprehensiveness of the tools. Experts elicited responses were either disagree or agree for the face and validity. The required modifications were performed. The elements gained 95% or more of the experts agreement were involved in the proposed tool.

The reliability of the tool parts was performed through measuring the internal consistency via Cronbach alpha coefficient, which proved to be high as follows:

Table (1) Validity and reliability

Cronbach's Alpha Cofficient			
Parts	**Scale reliability**	**Face validity**	**Statistical validity**
Challenges Toward Using Artificial Intelligence,	0.86	0.98	0.95
Overcoming challenges Toward Using Artificial Intelligence,	0.88	0.97	0.96

Ethical Considerations

The Research Ethics Committee (REC) at the Faculty of Nursing, Modern University for Technology and Information (MTI), granted approval for the study FAN /129/2025 (March/17/2025). Also, an official letter outlining the study's title and objectives was sent from the Dean of the Faculty of Nursing to The Director of Ain Shams University Hospital to secure authorization from the hospital administrators for data collection. Additionally, written consent for participation was obtained from the nurse managers and staff nurses after providing comprehensive information about the study.

All data collected were anonymized by assigning unique codes to each participant instead of using names or any identifying information. Completed questionnaires were stored securely in password-protected files accessible only to the principal researcher. During data analysis and reporting, all information was presented in aggregate form to ensure that no individual participant could be identified.

All participants were fully informed about the purpose of the study, their voluntary participation, and their right to withdraw at any time without penalty. Written informed

consent forms were provided and signed by each participant before data collection. The consent forms outlined the study procedures, potential risks and benefits, confidentiality measures, and how the data would be used and stored.

Pilot study

It enrolled 10% of the oncology nurses to test the applicability and evaluate the feasibility and clarity of the tools. It also helped estimate that the time required to complete the study instruments was between 30 and 45 minutes. The oncology nurses of pilot study were involved in the main work sample, because of there was no modifications were done.

Field work

Data collection took place two-month period, from April 2025 to the end of May 2025. The data collection was obtained from the self-administered questionnaire was conducted with official authorization from the Faculty of Nursing at MTI University. The researchers were present during morning and afternoon shifts, five days a week, to gather data. They began by introducing themselves to the nursing staff and explaining the aim and nature of the research. After providing written consent from each oncology nurse, the researchers distributed copies of the questionnaires.

Oncology nurses took approximately 30–45 minutes to complete the questionnaires, the researchers attended during filling of the questionnaire to clarity any ambiguity and answer any inquiry, then the researchers collected the questionnaires and checked them for completeness.

Statistical design

The retrieved data from the subjects was coded and entered into "statistical package for social sciences (SPSS version 24)." Presentation of the data was done using the frequencies (%) for non-numerical data, means and standard deviations and range for numerical one. Quantitative elements were compared using chi square test.
Cronbach's Alpha coefficient was estimated to identify the reliability of the tools. Pearson correlation coefficient test (r) was used to conduct correlation matrix. Multiple linear regression was applied to identify the independent predictors of variables scores, and significance was considered at P- value <0.05, whereas high significance was at P-value<0.001.

Results

Table 2 The results indicate that the majority of participants were aged between 30 and 40 years (50%), with a notable proportion (71.7%) being female. More than half (58.4%) were married. The highest proportion of nurses were nursing institute graduates and had between 5 to 10 years of experience (41.7%). Additionally, 70% were staff nurses, 53.3% had only basic computer skills, and the majority (83.3%) had not attended any courses related to artificial intelligence.

Table 3 reveals that 33.3% of the nurses reported a low perception level of social challenges, whereas 65% reported a moderate perception level of economic challenges. Additionally, 35% of the participants demonstrated a high perception of legal challenges.

Figure 2 shows that more than one-fifth (23.3%) of the participants reported a low perception level of challenges related to using artificial intelligence. Over half (55%) exhibited a moderate perception level, whereas 21.7% demonstrated a high perception level of these challenges.

Table 4 indicates that 65% of the nurses reported a moderate perception level of reactive strategies, while 16.7% demonstrated a high perception level of proactive strategies.

Figure 3 illustrates that more than one-fifth (25%) of the participants reported a low perception level of overcoming strategies. Over half (63.3%) exhibited a moderate perception level, whereas 11.7% demonstrated a high perception level of overcoming strategies.

Table 5 shows a significant relationship between age, computer skills, and the perceived level of challenges toward using AI.

Table 6 demonstrates a potential relationship between age, years of experience, computer skills, and the perceived level of overcoming strategies for challenges related to AI.

Table 7 presents the multiple linear regression analysis findings to identify the predictors of challenges toward using artificial intelligence among staff nurses. The model indicates that age ($B = 0.094$, $p = 0.000$), gender ($B = 0.141$, $p = 0.007$), education ($B = 0.241$, $p = 0.007$), and basic computer skills ($B = 0.323$, $p = 0.000$) are statistically significant predictors.

Table 8 reveals that age ($B = 0.144$, $p = 0.000$), years of experience ($B = 0.121$, $p = 0.002$), and training courses ($B = 0.243$, $p = 0.000$) are significant predictors of overcoming strategies for challenges related to using artificial intelligence.

Table (2): Distribution of characteristics of the oncology nurses (n= 60).

Personal and job characteristics data	No.	%
Age(years)		
Less than 20-30	13	21.7
30-40	30	50
40-50	12	20
50-60	5	8.3
Mean± SD 35.33± 4.97		
Gender		
Male	17	28.3
Female	43	71.7
Marital Status		
Single	20	33.3
Married	35	58.4
Divorced	5	8.3
Level of education		
Technical Nursing Institute	32	53.4
Bachelor's in Nursing	20	33.3
Postgraduate Studies in Nursing	8	13.3
Experience in years		
Less than 5	14	23.3
5-10	25	41.7
10-15	15	25
More than 15	6	10
Basic computer skills		
Yes	32	53.3
No	28	46.7
Have you attended previous training about artificial intelligence?		
Yes	10	16.7
No	50	83.3

Table (3): Distribution of challenges toward using artificial intelligence by studied oncology nurses (n = 60)

Dimensions	Perception					
	Low		Moderate		High	
	NO	%	NO	%	NO	%
Social Challenges	20	33.3	35	58.4	5	8.3
Economic Challenges	15	25	39	65	6	10
Technological Challenges	8	13.3	32	53.4	20	33.3
Data Challenges	18	30	25	41.7	17	28.3
Organizational Challenges	10	16.7	30	50	20	33.3
Ethical Challenges	15	25	37	61.7	8	13.3
Legal challenges	11	18.3	28	46.7	21	35

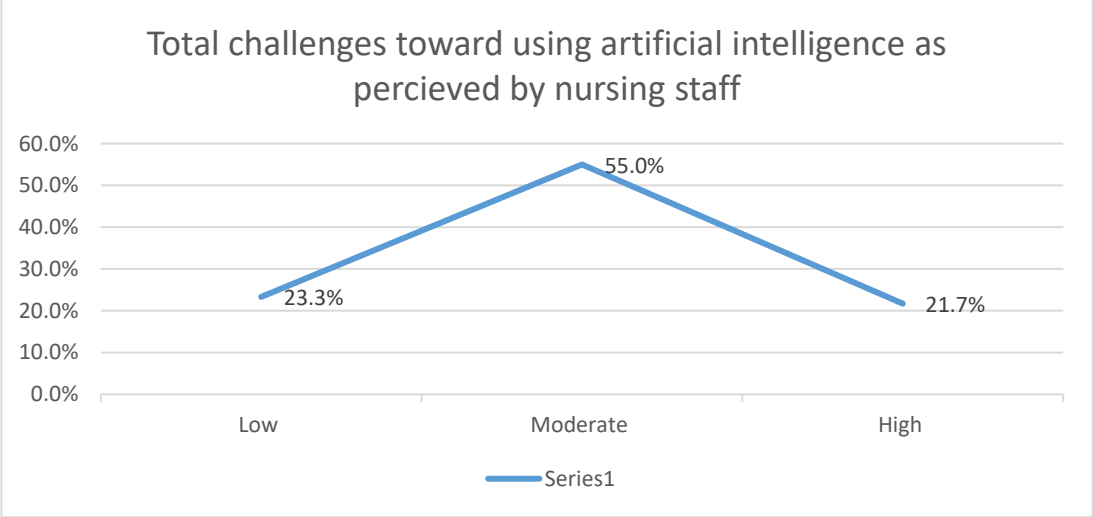

Figure (2): Distribution of total challenges toward using artificial intelligence as perceived by studied oncology nurses (n = 60).

Table (4): Distribution of overcoming strategies for challenges

Dimensions	Perception					
	Low		Moderate		High	
	NO	%	NO	%	NO	%
Proactive strategies	13	21.6	37	61.7	10	16.7
Reactive strategies	16	26.7	39	65	5	8.3

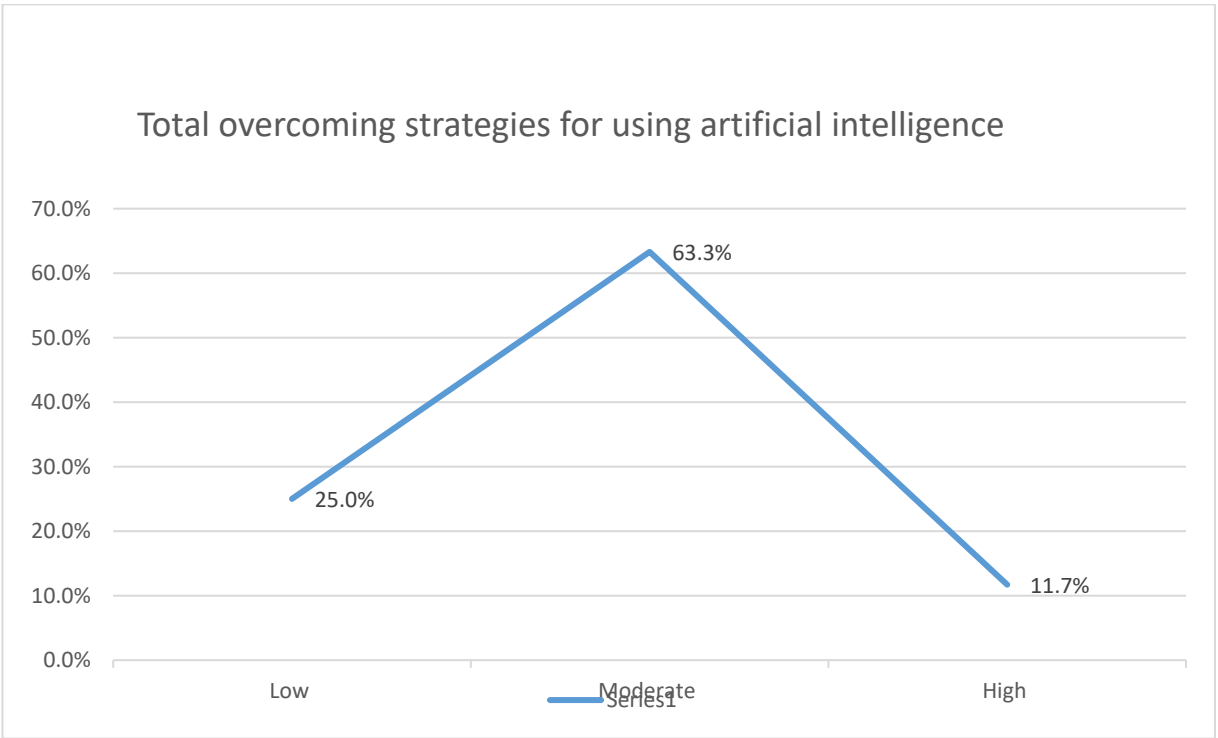

Figure (3): Distribution of total overcoming strategies for challenges as perceived by studied oncology nurses (n = 60).

Table (5): Relation between characteristics and AI challenges of studied oncology nurses (n= 60).

Characteristics	Perception level of AI challenges							
	Low		Moderate		High			
	No.	%	No.	%	No.	%		
Age(years)								
Less than 20-30	1	1.7	10	16.7	2	3.3	10.00	.030*
30-40	11	18.3	10	16.7	9	15		
40-50	6	10	4	6.7	2	3.3		
50-60	0	0	3	5	2	3.3		
Gender								
Male	10	16.7	4	6.7	3	5	1.53	.19
Female	20	33.3	13	21.7	10	16.6		
Marital Status								
Single	14	23.3	3	5	3	5	6.10	.190
Married	15	25	4	6.7	18	30		
Divorced	1	1.7	2	3.3	0	0		
Level of education								
Technical Nursing Institute	18	30	12	20	2	3.4	9.88	.345
Bachelor's in Nursing	2	3.5	8	13.3	10	16.7		
Postgraduate Studies in Nursing	3	5	2	3.3	3	5		
Experience in years								
Less than 5 years	7	11.7	5	8.3	2	3.3	8.16	.789
5-10 years	10	16.7	11	18.3	4	6.7		
10-15 years	7	11.7	8	13.3	0	0		
More than 15 years	1	1.7	2	3.3	3	5		
Basic computer skills								
Yes	10	16.7	20	33.3	2	3.3	18.04	.020*
No	6	10	16	26.7	6	10		
Have you attended previous training about artificial intelligence?								
Yes	6	10	4	6.7	0	0	9.11	.778
No	22	36.7	20	33.3	8	13.3		

***Significant p < 0.05. **highly significant p < 0.001.**

Table (6): Relation between characteristics and overcoming strategies of oncology nurses (n= 60).

Characteristics of Personal data	Perception level of overcoming strategies							
	Low		Moderate		High			
	No.	%	No.	%	No.	%		
Age(years)								
Less than 20-30	7	11.7	6	10	0	0	7.12	.000*
30-40	4	6.7	15	25	16	26.7		
40-50	4	6.7	6	10	2	3.3		
50-60	1	1.7	2	3.3	2	3.3		
Gender								
Male	4	6.7	10	16.7	3	5	1.18	.103
Female	15	25	18	30	10	16.7		
Marital Status								
Single	7	11.7	11	18.5	3	5	12.10	.801
Married	9	15	10	16.7	16	26.7		
Divorced	1	1.7	2	1.7	0	0		
Level of education								
Technical Nursing Institute	9	15	20	33.3	3	5	15.23	.231
Bachelor's in Nursing	2	3.3	8	13.3	10	16.7		
Postgraduate Studies in Nursing	1	1.7	4	6.7	3	5		
Experience in years								
Less than 5 years	5	8.3	7	11.7	2	3.3	3.16	.02*
5-10 years	9	15	12	20	4	6.7		
10-15 years	4	6.7	11	18.3	0	0		
More than 15 years	2	3.3	2	3.3	2	3.3		
Basic computer skills								
Yes	4	6.7	20	33.3	8	13.4	10.01	.01*
No	2	3.3	20	33.3	6	10		
Have you attended previous training about artificial intelligence?								
Yes	5	8.3	5	8.3	0	0	16.11	.234
No	15	25	27	45	8	13.3		

***Significant p < 0.05. **highly significant p < 0.001**

Table (7): Multiple linear regression for challenges of using artificial intelligence score (n=60).

	Unstandardized Coefficients		Standardized Coefficients	t	P
	B	Standard error	Beta		
Constant	1.650	0.141		11.695	0.000**
Age	0.094	.034	-.144	-2.733	0.007*
Gender	0.141	.052	-.131	-2.730	0.007*
Educational level	0.241	0.055	-0.355	-4.361	0.000**
Basic computer skills	0.323	0.046	-0.490	-7.009	0.000**

(**) highly y significant at P <0.01.
(*)significant at P <0.05.
r-square=0.653 Model ANOVA: F=56.552, p=0.000

Table (8): Multiple linear regression for overcoming strategies for challenges of using artificial intelligence (n=60)

	Unstandardized Coefficients		Standardized Coefficients	t	P
	B	Standard error	Beta		
Constant	1.352	0.122		11.065	0.000**
Age	0.144	0.030	-0.222	-4.820	0.000**
Gender	-.107	.045	0.100	2.391	0.238
Marital status	-0.083	0.069	0.080	1.199	0.232
Years of experiences	-0.121	0.048	0.180	2.535	0.002*
Training course	0.243	0.040	0.372	6.091	0.000**

(**) highly significant at P <0.01.
(*)significant at P <0.05.
r-square=0.735 Model ANOVA: F=83.003, p=0.000

Discussion

The present study examined the challenges that oncology nurses face in using artificial intelligence (AI) and the strategies they perceive as effective for overcoming these barriers.

Challenges toward using artificial intelligence

Social challenges

The findings revealed notable variations in perceived AI-related challenges among oncology nurses. About one-third reported low perception of social challenges, suggesting many do not view AI as a threat to their interpersonal roles or relational roles in their work place environment. This aligns with **Peltonen et al., 2019; Ronquillo et al., 2021** who found that nurses often feel able to integrate new technologies without compromising patient-nurse relationships. Conversely, **van Wynsberghe (2021)** argued that some healthcare professionals perceive AI as potentially depersonalizing patient care, which might suggest that the low social concern found in this study reflects a local cultural or institutional difference at Ain Shams University Hospital.

Economic and technological challenges

Regarding economic challenges, nearly two-thirds of oncology nurses reported moderate concern about the financial feasibility as a challenge to AI in clinical settings. Also, slightly more than one third of them reported technological challenges as high. This aligns with **Ramadan et al. (2024),** who found that outdated IT infrastructure that the lack of technological readiness and limited funding are major barriers to AI implementation. About two-thirds of their participants cited high upgrade costs as a key obstacle. Nurses with under-resourced settings felt frustrated by the gap between their institutions and technologically advanced ones, viewing AI as distant and inaccessible.

This aligns closely with the Egyptian context, especially in public hospitals like Ain Shams University Hospital, where budgetary constraints, aging infrastructure, and competing healthcare priorities often limit investment in new digital technologies. Although the oncology nurses in this study did not express high-level economic concerns, their moderate perception may reflect a realistic acknowledgment of both the potential and the limitations of current institutional resources. Moreover, participants in both studies highlight that addressing economic barriers requires targeted investment, not only in hardware and software but also in staff training, policy alignment, and interdepartmental coordination. These findings suggest that equitable AI adoption across Egypt's healthcare system depends heavily on national-level funding strategies, policy reforms, and phased implementation plans, particularly in resource-limited hospitals.

Legal challenges

Notably, minimally more than one-third of the nurses perceived legal challenges as highly problematic. This suggests a heightened awareness among participants regarding legal and ethical concerns related to AI, such as data privacy, liability, and accountability in clinical decision-making. This highlights the need for clear guidelines and ethical frameworks to govern AI use in nursing, ensuring that patient welfare and professional integrity remain paramount. This came in the same line with **Abou Hashish and Alnajjar (2024)**; **Laukka, Hammarén, and Kanste (2022)** who mentioned in their study that, it is essential to implement robust data protection measures to ensure the privacy and security of this information. Security breaches can have serious consequences for patients, so strict data management policies must be established.

Also, in another study by **Rahman et al. (2024)**, found that nurses highlighted the potential risks associated with storing vast amounts of patient data in AI systems, particularly the possibility of breaches or misuse of information. Participants emphasized the importance of implementing robust security measures to protect patient confidentiality and ensure compliance with legal and ethical standards. **Panch et al., (2019)** also stressed the need for clear policies on privacy, ownership, and consent, noting that their subjects must understand these challenges to apply AI responsibly in practice.

Organizational challenges

it is noteworthy that slightly more than one third of oncology nurses in this study perceived organizational challenges as high. This indicates that a considerable portion of participants might encountered structural and administrative challenges that hinder the adoption or integration of AI in the clinical environment. These findings are supported by **Topaz et al. (2020)**, who highlighted that the absence of a clear leadership vision, weak interdepartmental

communication, and a lack of institutional policies for AI use are major obstacles to effective adoption in healthcare settings.

In the context of a large public hospital like Ain Shams University Hospital, the complexity of the organizational structure may further complicate AI adoption especially in the presence of insufficient institutional support, limited coordination between nursing and IT teams, and unclear roles and responsibilities concerning AI integration. This aligns with findings by **Liu et al. (2021)**, who noted that a lack of strategic institutional readiness often leads to confusion among staff and potential resistance to incorporating AI into clinical decision-making.

Moreover, **Alami et al. (2020)** emphasized the importance of implementing robust change management strategies and ensuring leadership engagement at every stage. Organizational readiness including leadership commitment, workflow redesign, training, and staff engagement is a critical factor for the successful adoption of AI in healthcare. Therefore, addressing organizational challenges goes beyond merely resolving technical issues. It requires a comprehensive institutional approach that fosters a culture of collaboration, supports innovation, and provides a well-structured and prepared environment for digital transformation in nursing practice.

Strategic perceptions

This research revealed that two-thirds of oncology nurses in this study viewed reactive strategies as moderately effective in overcoming challenges related to the use of artificial intelligence (AI) suggesting a tendency to respond after issues arise, this possibly might be due to due to limited anticipation skills, lack of institutional guidance, or absence of formal AI policies. This aligns with **Esmaeilzadeh (2020),** who reported that in many healthcare settings, nurses tend to rely on reactive responses such as informal workarounds or seeking help from colleagues rather than employing structured problem-solving approaches. Similarly, **Bani Issa et al. (2024)** reported that over two-thirds of health profession students, including Egyptians, had limited AI-related curricular exposure, indicating a lack of proactive preparation in nursing education to face any challenges related to information technology.

Conversely, only small proportion of nurses perceived proactive strategies as highly effective, this low level of proactive engagement may be due to insufficient training in AI and a lack of leadership initiatives that promote anticipatory thinking. In contrast, **Ronquillo et al. (2021)** who reported that nurses working in more technologically mature environments were more likely to engage in proactive strategies—such as participating in AI-related pilot projects, policy development committees, and leadership roles in AI planning. Also, they emphasized the importance of meaningful nurse involvement throughout the AI lifecycle, from development to implementation. Similarly, **van Wynsberghe (2021)** highlighted the role of ethical and organizational frameworks as enabling proactive engagement. These findings underscore the need for systemic readiness in Egypt through structured training, awareness efforts, and inclusion of nurses in AI planning to foster strategic, anticipatory roles.

This study results revealed that there was a significantly relation between AI challenges and some characteristics of oncology nurses as age and basic computer skills. Older nurses and those with limited computer proficiency reported greater challenges. These results align with broader literature showing that demographic and skill-based factors shape readiness for digital transformation. Previous studies also link age, and technological experience to nurses'

behavioral intentions toward health information technology **(Ifinedo, 2012; Kummer et al., 2013; Lin et al., 2016; Phichitchaisopa & Naenna, 2013; Song et al., 2015)**.

Older nurses had lower effort expectancy and greater susceptibility to social influence, indicating more resistance to new technologies (**Ifinedo, 2012; Song et al., 2015)**. Similarly, those with limited computer experience perceived greater barriers to HIT use **(Shoham & Gonen, 2008; Lin et al., 2016)**. Although some studies noted mixed or moderated effects, the overall trend supports current findings: nurses with limited digital literacy face more challenges in AI adoption. This underscores the need for tailored training that addresses demographic and skill-level differences to ensure equitable and effective AI integration in clinical settings.

These findings have important practical implications. First, AI-related training must be tailored by age group and skill level. For example, modular, hands-on workshops that use clinical simulations and case scenarios are more effective for older nurses than lecture-based sessions. Training should emphasize step-by-step guidance, gradual skill development, and repeated practice using real-world nursing tasks. Research by **Tubaishat and Habiballah (2016)** supports this, showing that scenario-based training significantly enhanced eHealth literacy and confidence. Additionally, integrating peer mentoring programs where tech-savvy junior nurses support their senior colleagues can promote learning while preserving hierarchical trust.

Regarding the adoption of strategies to overcome AI-related challenges among oncology nurses, there was a statistically significantly relation between AI adopted age, years of experience, and training participation were significantly predictors in this study. Older and more experienced nurses, especially those with training, were better equipped to implement effective coping strategies likely due to their clinical expertise and familiarity with system workflows.

These findings are supported by **Khalifa and Alswailem (2007)**, who reported that nurses with greater computer experience showed more positive attitudes toward health information systems. **Tubaishat and Habiballah (2016)** similarly found that training enhanced eHealth literacy and confidence. **Kwak et al. (2022)** emphasized that AI-related self-efficacy and training influenced students' behavioral intentions, while **Al-Salameh et al. (2019)** found that involving nurses in digital planning and offering training improved acceptance and reduced resistance. Altogether, this highlights the need for structured AI training, particularly for mid-career and senior nurses, to strengthen their leadership in digital transformation.

As such, AI training should be a continuous process rather than a one-time event. Periodic refresher courses, access to AI 'sandbox' environments for safe experimentation, and inclusion of AI content in continuing nursing education are recommended strategies. Moreover, institutions should prioritize involving older nurses in AI-related decision-making and planning. This participatory approach not only improves adoption rates but also affirms their clinical judgment and role in shaping digital workflows. As shown by **Al Salameh et al. (2019)**, involving frontline nurses in planning reduces resistance and increasest acceptance.

However, evidence suggests that organizational and ethical factors may outweigh demographics in shaping AI adoption. **Ramadan et al. (2024)** found that 70% of nurses viewed leadership support, infrastructure, and training as more critical than individual traits which effects on organizational readiness and ethics. **Ahmed et al. (2023)** similarly reported

that ethical and structural barriers often surpass demographic influences in predicting resistance.

Thus, while individual factors aid initial adaptation, lasting AI integration requires supportive institutional environments, ethical governance, and leadership engagement. Understanding and addressing the most relevant barriers is essential for designing effective, real-world strategies **(Ahmed et al., 2023)**.

Conclusion

Based on our findings, the study revealed that nurses experienced moderate levels of challenges, especially in technological, economic, ethical, and organizational dimensions. Similarly, most nurses reported moderate reliance on reactive strategies, with fewer nurses engaging in proactive measures. Notably, age, basic computer skills, years of experience, and prior training emerged as significant predictors of both perceived challenges and strategy adoption. Significant predictors such as age, computer skills, and training highlighted the importance of tailoring AI-related training to nurses' demographic and skill profiles. These insights emphasize the need for structured, continuous education and organizational support to enhance nurses' confidence, digital readiness, and involvement in AI adoption.

Limitations of the study

While the study provides valuable implications for nursing practice and management particularly in workforce training and policy development it is limited by its single-center setting and relatively small sample size (n=60).

Recommendations

- Provide regular, hands-on AI training programs tailored to different levels of digital literacy to build nurses' confidence and technical competence.
- Establish structured mentorship or peer-learning models, pairing experienced or digitally fluent nurses with those needing additional support.
- Upgrade outdated IT infrastructure and ensure sustained financial investment in AI systems, including hardware, software, and maintenance.
- Develop and disseminate clear institutional policies and protocols defining nurses' roles, ethical standards, legal safeguards, and responsibilities in AI usage.
- Foster an organizational culture that encourages AI adoption by promoting openness to innovation, leadership engagement, and nurse participation in technology planning.

For Future Research:

- Conduct comparative studies across healthcare systems or countries to distinguish universal vs. context-specific AI implementation challenges and strategies.
- Explore how nurses perceive and navigate ethical dilemmas related to AI at different health sectors.
- Examine the impact of organizational leadership, support systems, and institutional culture on the success or failure of AI integration in nursing practice.

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الملخص العربي

التحديات التي تواجه استخدام الذكاء الاصطناعي واستراتيجيات التغلب عليها كما يدركها ممرضين الأورام

الخلفية: يُبشر دمج الذكاء الاصطناعي في الرعاية الصحية، وخاصةً في مجال التمريض، بتحسين جودة وكفاءة ودقة تقديم الرعاية. في مجال تمريض الأورام، يُمكن للذكاء الاصطناعي تسهيل الرعاية الصحية طوال مراحل التشخيص والعلاج والنجاة والرعاية التلطيفية.

الهدف: تقييم التحديات التي تواجه استخدام الذكاء الاصطناعي واستراتيجيات التغلب عليها من وجهة نظر ممرضات الأورام. التصميم: دراسة ارتباطية وصفية. المشاركون: شارك في الدراسة 60 ممرضة أورام.

مكان الدراسة: مركز الأورام التابع لمستشفى جامعة عين شمس في القاهرة، مصر.

أدوات جمع البيانات: أداة واحدة وهي الاستبيان الذاتي. النتائج: كشفت نتائج الدراسة أن أكثر من خُمس ممرضات الأورام أفادوا بإدراك منخفض، وأظهر أكثر من النصف مستوى إدراك متوسط، في حين أظهروا مستوى إدراك مرتفعًا للتحديات المتعلقة باستخدام الذكاء الاصطناعي. بالإضافة إلى ذلك، أفاد أكثر من خُمس ممرضات الأورام بمستوى إدراك منخفض، وأظهر أكثر من النصف مستوى إدراك متوسط، في حين أظهروا مستوى إدراك مرتفع لاستراتيجيات التغلب عليها.

الخلاصة: تناولت هذه الدراسة التحديات واستراتيجيات التغلب عليها كما يراها ممرضو الأورام. كما أن هناك علاقة مهمة بين العمر ومهارات الكمبيوتر لكل من مستوى التحديات المتصور تجاه استخدام الذكاء الاصطناعي والفعالية المتصورة للاستراتيجيات للتغلب على هذه التحديات. **التوصيات:** تنفيذ جلسات تدريبية عملية منتظمة لتحسين إلمام الممرضات وثقتهن بأدوات الذكاء الاصطناعي.

الكلمات المفتاحية: الذكاء الاصطناعي، التحديات، ممرضات الأورام، استراتيجيات التغلب