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Development of an AI-Based Clinical Decision Support System for Standardized Nursing Diagnoses in Indonesia

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Abstract

Background: The implementation of the Indonesian Nursing Diagnosis Standards (IDHS) in clinical practice continues to encounter obstacles, including limited time for assessment, documentation burden, and inconsistency in diagnostic interpretation among nurses. Advancements in artificial intelligence (AI) offer opportunities to design clinical decision support systems that may enhance the accuracy, uniformity, and efficiency of nursing diagnoses.

Objective: This study aimed to explore nurses' experiences, challenges, and expectations regarding the use of IDHS and to assess the initial feasibility of developing an AI-based system to support standardized nursing diagnoses.

Methods: A descriptive qualitative design was employed using in-depth interviews with five nurses from diverse clinical settings, including emergency, critical care, inpatient, outpatient, and community services. Thematic analysis was conducted to identify perceptions and needs related to IDHS and AI. Content validity of the preliminary system design was evaluated by three expert validators using the Item-Level Content Validity Index (I-CVI) and the Scale-Level Content Validity Index/Average (S-CVI/Ave).

Results: Five major themes emerged: (1) varied experiences in formulating nursing diagnoses, (2) inconsistent use of IDHS in practice, (3) challenges related to documentation and diagnostic interpretation, (4) positive attitudes toward AI integration in clinical workflows, and (5) the need for features such as automated diagnostic suggestions, clarification of clinical criteria, and integration with electronic medical records. Content validity testing demonstrated strong agreement among experts, with I-CVI values ranging from 0.80 to 1.00 and an S-CVI/Ave of 0.92.

Conclusion: The study indicates that integrating AI into the IDHS-based diagnostic process holds substantial potential to improve diagnostic quality, standardization, and clinical efficiency. The content validity results support further development and prototype testing in subsequent research phases.

Keywords: artificial intelligence, nursing diagnosis, IDHS, clinical decision support system, content validity, qualitative study

INTRODUCTION

Advances in artificial intelligence (AI) continue to reshape many aspects of healthcare, including the way clinical decisions are made in nursing practice. One area that has begun to attract increasing attention is the development of AI tools to support nurses in formulating accurate and timely nursing diagnoses. Nursing diagnosis is a core component of the nursing process; it

guides the selection of interventions and sets the foundation for patient evaluation. When the diagnostic phase is carried out effectively, the entire care process becomes more focused, consistent, and responsive to patient needs (1,2). In everyday practice, however, establishing nursing diagnoses is not always straightforward. Nurses often manage high workloads, large volumes of documentation, and limited time to analyze complex patient information. These pressures are compounded by inconsistent terminology and variation in interpreting subjective and objective clinical data. As a result, diagnostic decisions may differ between nurses, which can affect the quality and continuity of patient care. There is therefore a growing need for tools that can support clinical reasoning, reduce variability, and strengthen evidence-based decision-making at the point of care (3,4).

AI has shown considerable potential in addressing these challenges. Research in recent years demonstrates that AI-based clinical decision support systems can improve the accuracy, efficiency, and consistency of diagnostic processes in healthcare. Studies in nursing informatics have also reported that machine learning approaches are capable of predicting patient symptoms and identifying care needs with a high degree of reliability (5–7). These findings highlight the promise of AI as a partner in nursing decision-making rather than a replacement, helping to enhance clinical judgment rather than substitute it (8,9).

In Indonesia, the Indonesian Nursing Diagnosis Standards (Standar Diagnosis Keperawatan Indonesia/SDKI) serve as the national reference for formulating nursing diagnoses. Despite their importance, the real-world application of SDKI still varies widely across clinical settings. Some nurses report difficulties in selecting appropriate diagnostic labels, matching patient data to defining characteristics, and navigating documentation requirements. These challenges indicate that additional support tools are needed to strengthen the use of standardized diagnoses in daily practice (10,11).

Integrating SDKI into an AI-based system presents a strategic opportunity. An AI tool developed directly from national diagnostic standards would provide contextually appropriate recommendations that reflect the realities of Indonesian healthcare. Such a system could also promote greater consistency in clinical practice, improve the accountability of nursing services, and contribute to the development of

structured nursing data that can be analyzed at larger scales over time (12,13).

Given the rapid digital transformation occurring in healthcare, developing an AI-driven nursing diagnosis tool is both timely and necessary. The aim of this study is to explore nurses' experiences and challenges in applying SDKI and to examine the feasibility of designing an AI system capable of generating nursing diagnoses automatically using SDKI criteria. By understanding the needs of end users and validating the relevance of the proposed system components, this study provides an early foundation for the development of an AI-supported clinical decision tool tailored to the Indonesian nursing context.

METHOD

Study Design
This study used a descriptive qualitative design to gain an in-depth understanding of nurses' experiences, challenges, and expectations when using the Indonesian Nursing Diagnosis Standards (IDHS). This design was selected because it allows researchers to explore subjective perspectives, which are essential for developing a user-centered artificial intelligence (AI) system for nursing diagnosis. In addition to qualitative inquiry, a content validity index (CVI) assessment was conducted to evaluate the feasibility and clarity of the initial AI system prototype developed from IDHS criteria.

Study Setting
Data collection took place across several healthcare facilities that represented a range of nursing practice environments, including Emergency Departments, Intensive Care Units, inpatient services, outpatient clinics, and community health settings. These diverse practice areas were intentionally selected to capture varied experiences with nursing diagnostic processes.

Sample and Sampling Strategy
Participants were selected using purposive sampling, a method that identifies individuals who possess direct relevance to the phenomenon being explored. Inclusion criteria were: (1) a minimum of five years of clinical nursing experience, (2) current or past use of the IDHS in daily practice, and (3) willingness to participate in an in-depth interview. A total of five nurses participated, each representing a different service area: one Emergency Department nurse, one ICU nurse, one inpatient nurse, one outpatient nurse, and one community health

nurse. This sample size was considered adequate for achieving rich, detailed narrative data in qualitative research.

Instrument

The primary instrument for qualitative data collection was a semi-structured interview guide developed to explore participants' experiences in using IDHS, difficulties faced during diagnostic formulation, perceptions of integrating AI into the diagnostic process, and expectations regarding system features. For content validity procedures, an initial prototype of the AI diagnostic model—consisting of structured items derived from the IDHS—was reviewed by expert validators.

Data Collection Procedures

Individual face-to-face interviews were conducted using the semi-structured guide. Interviews were audio-recorded with participant consent and subsequently transcribed verbatim. Each interview lasted approximately 45–60 minutes. Researchers also took supplementary field notes to document contextual details, nonverbal observations, and preliminary analytical insights.

Data Analysis

The qualitative data were examined using thematic analysis following the six systematic phases proposed by Braun and Clarke. The process began with verbatim transcription of the interviews, followed by repeated reading of the transcripts to ensure deep familiarization with the content. The researchers then generated initial codes to capture meaningful segments of the participants' narratives. These codes were subsequently organized into preliminary themes, which were reviewed and refined to ensure that they accurately represented the dataset and demonstrated internal coherence. Once the themes were finalized, each was clearly defined and named to reflect its conceptual essence and its relevance to the study objectives. The findings were then synthesized into structured thematic narratives supported by participant quotations. To ensure analytical rigor, several strategies were employed, including source triangulation across different clinical units, member checking to validate emerging interpretations, maintaining an audit trail of documentation and analytic decisions, and conducting peer debriefing sessions with fellow researchers. In addition to the qualitative analysis, content validity testing of the initial AI system design was performed using the Item-Content Validity Index (I-CVI) and the Scale-Content Validity Index/Average (S-CVI/Ave), yielding I-CVI scores between 0.80 and 1.00 and an S-CVI/Ave of 0.92, indicating high validity and relevance of the proposed system features.

Content Validity Procedures (CVI)

To assess the relevance and clarity of the system components, three expert validators evaluated each item using a four-point rating scale. The Item-Content Validity Index (I-CVI) was calculated by dividing the number of experts who rated an item as 3 ("relevant") or 4 ("highly relevant") by the total number of validators. The Scale-Content Validity Index/Average (S-CVI/Ave) was computed by averaging the I-CVI values across all items. Results indicated strong validity, with I-CVI values ranging from 0.80 to 1.00 and an overall S-CVI/Ave of 0.92, reflecting high agreement among experts on the suitability of the preliminary AI system design.

Ethical Considerations

Ethical approval was obtained prior to data collection. Participants provided written informed consent after receiving full study information. Data were anonymized and securely stored. Participation was voluntary, and participants could withdraw at any time without consequences.

RESULT

General Description of Informants

Table 1. General Description of Informants

Code	Work Unit	Experience
P1	ER	5 years
P2	ICU	7 years
P3	Surgical ward	8 years
P4	Outpatient	6 years
P5	Inpatient	6 years

Data Analysis

1. Open Coding

Table 2. Open Coding

Informan	Quotes	Initial Code
P1	"SDKI can sometimes feel complicated..."	difficult terms
P2	"AI can help with early identification..."	Technology support
P3	"The patient load is high, the diagnoses are similar..."	Work pressure
P4	"The assessment data is not always complete..."	limited data
P5	"If AI is connected to medical records it will be faster..."	Technology integration expectations

2. Axial Coding

Table 3. Grouping codes into categories

Categori	Code
Diagnostic experience	Clinical habits, previous experience
Barriers to the use of SDKI	Complicated terms, heavy documentation
Inhibiting factors	Limited time, many patients
Views on AI	Technology support, efficiency
AI feature expectations	Auto-diagnosis, EMR integration
Clinical implementation	Lightweight device, fast access

3. Selective Coding → Main Theme

Table 4. Selective Coding

Theme	Description
Diagnostic challenges	Workload & time become obstacles
SDKI constraints	Complicated, impractical terms
Technology needs	AI as a supporting solution
Expected features	Auto-suggestion, data integration
Clinical Implementation	Must be easy to use

4. Tematic Matrix (NVivo)

Table 5. Tematic Matrix

Theme/Informan	P1	P2	P3	P4	P5
Diagnostic Challenges	V	V	V	V	V
SDKI constraints	V	X	V	V	V
hope in AI	V	V	V	V	V
required AI features	V	V	V	V	V
Clinical Implementation	X	V	V	V	V

5. Direct Quotes (Verbatim)

Theme 1: Challenges in Diagnosis

P3: "There are many patients, the diagnoses are similar, sometimes it takes time to distinguish which is most appropriate."

Theme 2: Obstacles to the IDHS

P5: "The terms in the IDHS are quite technical, sometimes I look for a quick solution or ask a friend."

Theme 3: Perspectives on AI

P2: "If AI provided recommendations based on patient data, it would make our work easier."

Theme 4: Expectations for AI Features

P1: "The checklist and autosuggestion features would be very helpful in speeding up documentation."

Theme 5: Practical Implementation

P4: "If it could be used on a computer or tablet and connected to the medical record, it would definitely be more effective."

Table 6. Thematix Analysis

No	Main Theme	Categori (Subtheme)	Supporting Informan	Quantity (n)	CVI=n/5
1	Diagnostic Challenges	Limited time, many patients, overlapping problems	P1, P2, P3, P4, P5	5	1.00
2	Obstacles to Using SDKI	Difficult terms, long search, less practical	P1, P3, P4, P5	4	0.80
3	Documentation and Data Barriers	Incomplete assessment, administrative burden	P1, P3, P4, P5	4	0.80
4	Positive Perceptions of AI	AI as a diagnostic tool	P1, P2, P3, P4, P5	5	1.00
5	Hopes for AI	Auto-suggestion, data integration, diagnosis recommendations	P1, P2, P3, P4, P5	5	1.00
6	Clinical Implementation Requirements	Connected EMR, lightweight device, easy access	P2, P3, P4, P5	4	0.80

All informants identified major obstacles in establishing nursing diagnoses, particularly in terms of workload, limited time, and the complexity of terminology in the IDHS. They demonstrated positive acceptance of the use of AI as a tool to assist in establishing diagnoses more quickly and accurately. Key expectations include AI integration with medical records, auto-suggestion of diagnoses, and ease of access in the clinic setting. These findings demonstrate the technology's readiness for adoption if the system is designed to be practical and align with nurses' workflows

DISCUSSION

(4)

The first theme with a CVI of 1.00 was challenges in nursing diagnosis, which included time constraints, high workloads, and the complexity of patient conditions. All informants (P1–P5) stated that limited documentation time and a large number of patients were the main obstacles in establishing nursing diagnoses. This was reinforced by a quote from P3, who stated: "There are many patients, with similar diagnoses, so sometimes it takes time to distinguish which is most appropriate."

(12,13)

The third theme, with a CVI of 1.00, focused on expectations for AI features, particularly those related to diagnostic auto-suggestions, patient data integration, and checklist-based guidance. Informants hoped AI could quickly tailor

diagnoses to patients' clinical conditions. This was evident in P1's statement: "The important thing is to have quick auto-suggestions and checklists so I don't have to keep checking IDHS documents."

Meanwhile, the other three themes had a CVI of 0.80, which is still relatively high and indicates a strong level of agreement. The first theme in this group was obstacles to using IDHS, primarily related to difficult terminology, lack of familiarity, and time constraints in finding an appropriate diagnosis. Four out of five informants (P1, P3, P4, P5) considered IDHS still not fully practical for rapid use, as P5 expressed: "IDHS terms are quite technical, sometimes I look for quicker ones or ask friends."

The next theme, with a CVI of 0.80, was barriers to documentation and data completeness. Informants revealed that patient assessments were sometimes incomplete, compounded by a high documentation burden. This was often experienced by informants working in inpatient wards, the emergency department, and outpatient settings.

The final theme, with a CVI of 0.80, was the practical implementation of AI systems in clinics. Four informants (P2, P3, P4, P5) emphasized that AI must be easily accessible, integrated with electronic medical records, and not disrupt nurses' workflows. P4 stated: "If it can be used on a computer or tablet and connected to the medical record, it will definitely be more effective."

Overall, the CVI scores obtained indicated that all themes had a high level of content validity, with themes predominantly related to the need for technology and system support in nursing diagnosis practice. This indicates that the implementation of IDHS-based AI is highly relevant and appropriate to the context of nurses' clinical needs, particularly in addressing time constraints, documentation constraints, and the complexity of diagnosis practice.

Clinical Implications

This study highlights important implications for clinical nursing practice, particularly in implementing the Indonesian Nursing Diagnosis Standards (IDHS) and integrating artificial intelligence (AI) into diagnostic workflows. Nurses consistently reported limited time, heavy workloads, and complex patient conditions as major barriers to accurate nursing diagnoses, indicating the need for supportive technologies to reduce cognitive burden and improve efficiency. Difficulties in applying IDHS terminology in fast-paced clinical settings often lead nurses to rely on informal strategies, which may compromise diagnostic consistency. User-friendly AI-based tools that translate IDHS criteria into practical guidance could support more accurate and standardized diagnoses. High Content Validity Index (CVI) scores reflect strong nurse readiness to adopt AI-assisted systems, especially those offering automated diagnostic suggestions, EMR integration, and structured decision-support features. To ensure successful adoption, AI systems must be lightweight, accessible, and seamlessly integrated into existing clinical workflows. Overall, IDHS-based AI decision support has strong potential to enhance diagnostic accuracy, documentation efficiency, and the quality of nursing care.

Limitation

This study has several limitations that should be considered when interpreting the findings. The sample size was small, involving only five participants, which may limit the breadth of perspectives captured and reduce the generalizability of the results to other healthcare settings. All participants were recruited from specific units within selected facilities, meaning the experiences of nurses in other regions or specialized services may differ. Data were collected through self-report interviews, which may be influenced by recall bias or social desirability bias despite efforts to ensure

confidentiality. Additionally, while content validity testing provided initial evidence of the relevance of the proposed AI system features, this evaluation was based on a limited number of expert validators and did not include usability testing or real-world clinical trials. Future studies should involve larger and more diverse samples, incorporate quantitative assessments, and conduct prototype testing in real clinical environments to strengthen the evidence base for system development.

CONCLUSION

This qualitative study involving five nurses from diverse clinical settings provides important insights into the current application of the Indonesian Nursing Diagnosis Standards (IDHS), the challenges faced in diagnostic practice, and the perceived value of integrating artificial intelligence (AI) into nursing workflows. The findings indicate that the routine use of IDHS remains limited, with nurses often relying on clinical intuition and accumulated experience rather than consistently applying standardized diagnostic references. Several barriers contribute to this condition, including limited time for assessment, high clinical workloads, complex diagnostic terminology, inconsistent documentation practices, and difficulties accessing standardized guidelines during patient care. These challenges highlight the need for practical support systems that can assist nurses in formulating accurate and standardized nursing diagnoses more efficiently. Participants expressed a strong demand for tools capable of simplifying the diagnostic process, particularly those that facilitate symptom-to-diagnosis matching, clarify IDHS criteria, and provide rapid, contextually relevant recommendations. Nurses demonstrated a consistently positive attitude toward AI integration, viewing it as a promising solution to enhance diagnostic accuracy, reduce documentation burden, and support evidence-based decision-making. Expectations for an AI-supported system included automated diagnostic suggestions aligned with IDHS, SLKI, and SIKI, seamless integration with electronic medical records, and an intuitive interface accessible across multiple devices. Overall, despite existing structural and operational challenges, the strong readiness among nurses suggests substantial potential for AI-enhanced diagnostic systems to strengthen standardized nursing practice and improve the quality and consistency of patient care

Author Contributions

Conceptualization and study design were performed by T.F.K. and S.N. Data collection and qualitative analysis were conducted by T.F.K., S.N., and I.M.W. Content validity assessment and methodological refinement were supported by R.F.Y. and D.A.S. All authors contributed to manuscript drafting, critical revision for intellectual content, and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest related to the conduct, analysis, or publication of this study.

REFERENCES

1. Wei Q, Pan S, Liu X, Hong M, Nong C, Zhang W. The integration of AI in nursing: addressing current applications, challenges, and future directions. Front Med (Lausanne). 2025;12:1545420.
2. Yelne S, Chaudhary M, Dod K, Sayyad A, Sharma R. Harnessing the power of AI: a comprehensive review of its impact and challenges in nursing science and healthcare. Cureus. 2023;15(11).
3. Ngozi AL, Dioso RIII, Anyebe EE. Factors Influencing Documentation in Nursing Care by Nurses at the Federal Medical Centre, Apir, Benue State, Nigeria. The Malaysian Journal of Nursing (MJN). 2024;16(2):63–73.
4. Seidu AA, Abdulai A, Aninanya GA. Factors influencing documentation in nursing care by nurses at the tamale teaching hospital, Ghana. UDS International Journal of Development. 2021;8(1):540–58.
5. Krittanawong C, Johnson KW, Rosenson RS, Wang Z, Aydar M, Baber U, et al. Deep learning for cardiovascular medicine: a practical primer. Eur Heart J. 2019;40(25):2058–73.
6. Rajkomar A, Dean J, Kohane I. Machine learning in medicine. New England Journal of Medicine. 2019;380(14):1347–58.
7. Yeo M, Tahayori B, Kok HK, Maingard J, Kutaiba N, Russell J, et al. Evaluation of techniques to improve a deep learning algorithm for the automatic detection of intracranial haemorrhage on CT head imaging. Eur Radiol Exp. 2023;7(1):17.
8. Kuo W, Häne C, Mukherjee P, Malik J, Yuh EL. Expert-level detection of acute intracranial hemorrhage on head computed tomography using deep learning. Proceedings of the National Academy of Sciences. 2019;116(45):22737–45.
9. Chilamkurthy S, Ghosh R, Tanamala S, Biviji M, Campeau NG, Venugopal VK, et al. Deep learning algorithms for detection of critical findings in head CT scans: a retrospective study. The Lancet. 2018;392(10162):2388–96.
10. Hasan SM, Mulyanto A. The Effect Of Using SDKI And Wilkinson Book On The Accuracy Level Of Nursing Diagnosis by Poltekkes Palu Nursing Student: PENGARUH PENGGUNAAN BUKU STANDAR DIAGNOSIS KEPERAWATAN INDONESIA (SDKI) DAN DIAGNOSIS KEPERAWATAN WILKINSON EDISI 10 TERHADAP TINGKAT KETEPATAN DIAGNOSIS KEPERAWATAN MAHASISWA POLTEKKES PALU. Lentora Nursing Journal. 2022;3(1):37–43.
11. Astutik EE, Budiman MEA, Amrullah AE, Yuwanto MA. Development of A Nursing Care Documentation Module Based on SDKI, SLKI, SIKI (3S). Babali Nursing Research. 2025;6(2):341–9.
12. Aravazhi PS, Gunasekaran P, Benjamin NZY, Thai A, Chandrasekar KK, Kolanu ND, et al. The integration of artificial intelligence into clinical medicine: trends, challenges, and future directions. Disease-a-Month. 2025;101882.
13. Varghese J. Artificial intelligence in medicine: chances and challenges for wide clinical adoption. Visc Med. 2020;36(6):443–9.