

PILOT STUDY OPEN ACCESS

Nurse Practitioner Students' Perceptions of an Artificial Intelligence Differential Diagnosis Tool: A Pilot Study

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Correspondence: Nilufeur McKay (n.mckay@ecu.edu.au)**Received:** 30 December 2024 | **Revised:** 25 January 2026 | **Accepted:** 2 March 2026**Keywords:** AI in healthcare | clinical reasoning | diagnostic reasoning | education | nurse practitioner | nursing and healthcare | professional competence**ABSTRACT**

Aim: The aim of this study is to assess nurse practitioner students' perceptions and engagement with Isabel's artificial intelligence (AI) based differential diagnosis tool to support their decision-making skills during their theoretical and clinical placement training.

Design: This pilot study used a cross-sectional design.

Methods: Twenty-six nurse practitioner students provided feedback on their use of an AI differential diagnosis tool in both academic and clinical contexts. This survey used the Post-Study System Usability Questionnaire to assess the engagement levels and usability of the AI tool. Additional questions were included to evaluate the usage patterns, adequacy in training and confidence in diagnosis.

Results: There were mixed engagement levels: 44.4% ($n = 8/18$) used Isabel in two subjects—typically one or both clinical placement units—and 27.8% ($n = 5/18$) in one subject; students most often used the tool to confirm differential diagnoses. Usability was rated positively with the disease ranking, red flag diagnosis and link to national guideline features demonstrating the highest student usage. While most students found the tool beneficial to use during clinical placement and completing university assignments, some reported challenges due to insufficient training, impacting confidence in clinical application.

Conclusion: Isabel has potential as a valuable educational tool in Nurse Practitioner programs, but successful implementation depends on adequate training and support. The findings highlight the importance of comprehensive training and support to maximise AI tool utilisation, with direct implications for programme curricula, clinical education strategies and potential improvements in diagnostic reasoning skills for future nurse practitioners.

Implications for the Profession and/or Patient Care: This study provides an example of integrating artificial intelligence (AI) guided clinical decision-making training in nurse practitioner (NP) education. The findings can be used by educational institutions to trial similar AI-integrated learning approaches, enhancing diagnostic competence and potentially improving patient care outcomes.

Reporting Method: The Study adhered to the STROBE checklist for reporting.

Patient or Public Contribution: No patient or public contribution was made to this study.

1 | Introduction

Artificial Intelligence (AI) and machine learning (ML) is rapidly transforming the healthcare industry and is poised to play

a crucial role in health practitioner education. The recent literature review (Montejo et al. 2024) shows that AI applications can serve as practical healthcare sub-competencies, particularly critical for nurses as frontline healthcare providers. In nursing

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What Does This Paper Contribute to the Wider Global Clinical Community?

- The findings from this study demonstrate the need for tailored training on the use of new artificial intelligence (AI) differential diagnosis platforms to enhance student engagement and learning. This is vital as we transition to more AI-driven health technologies to provide clinical care.
- This study has highlighted a novel method to integrate AI-based differential diagnosis tools into nurse practitioner curriculum through interactive application and assessment design.

education today, it is critical for nurses at both entry and advanced practice levels to have the necessary skills to effectively utilise such technologies, and for educators to integrate AI education effectively into higher education programmes (Montejo et al. 2024). The use of AI in nursing and medical education can enhance the student experience by providing personalised learning opportunities, improving student engagement and facilitating the development of clinical decision-making skills (Ahmad and Jenkins 2022; Chang et al. 2022). AI encompasses a broad range of computerised systems that mimic and learn from human intelligence. While terms like machine learning, deep learning and AI are often used interchangeably, each refers to distinct types of algorithms and learning methods (Habebeh and Gohel 2021). Although there is a big appetite for higher education institutions to adopt AI platforms into their curriculum, the training and implementation process is still in its infancy. Moreover, there is an urgent need for research that presents practical implementations of AI platforms and systems within higher education and evaluates their effectiveness in enhancing teaching and learning processes (O'Dea and O'Dea 2023). These circumstances provide the impetus to research how educators can incorporate AI into healthcare practitioner curriculum while maintaining a student-centred approach.

2 | Background

The 2023 Clinician of the future report (Elsevier 2023), a global survey completed by 2838 clinicians in 111 countries, highlighted that 70% of the clinicians across the globe agree the use of digital health technologies will enable a positive transformation of healthcare with 56% of clinicians predicting they will base most of their clinical decisions using tools that utilise AI. Within the same report clinicians stressed the need to incorporate digital health technology into medical and nursing training to keep pace with the rapid rate of technological advances (Elsevier 2023). Machine learning recommender systems are revolutionising clinical diagnosis and education by enhancing diagnostic accuracy and personalised learning (Shaikh et al. 2022; Sibbald et al. 2022). These systems analyse vast amounts of data to offer tailored suggestions, helping nursing and medical practitioners improve clinical decision-making skills efficiently. Machine learning can aid cognitive loads by providing streamlined, relevant information, which boosts learning outcomes in clinical practice and ensures better patient-centred care (Gannod et al. 2019).

There are several differential diagnosis tools and software platforms that currently utilise machine learning to assist health practitioners with complex clinical decision making (McParland et al. 2020). One example that also provides a clinical educator feature is an 'Isabel' (available at <https://www.isabelhealthcare.com/>). Isabel was first developed in 1999 by a company now known as Isabel Healthcare is a web-based differential diagnosis support tool designed to assist clinicians in refining their diagnostic hypotheses by generating a list of probable diagnoses based on a patient's clinical symptoms (John et al. 2012). Isabel uses machine learning, particularly natural language processing and pattern recognition, to interpret and compare patient data with an extensive database of clinical knowledge. The method of differential diagnosis generation adopted in the Isabel is a method of machine learning where symptoms and diagnostic findings are collated and entered to the database which uses specific statistical modelling to recognise patterns and generate the most likely diagnosis and/or medication side effects (Ramnarayan et al. 2003). This approach allows Isabel to generate a likelihood ranked list of differential diagnoses, significantly improving diagnostic accuracy and reducing human error (Ramnarayan et al. 2003). Prior testing of the software has demonstrated high accuracy rates in both hypothetical and real cases, making it a potential tool for complex or ambiguous cases (Graber and Mathew 2008; Ramnarayan et al. 2003).

While AI and machine learning are recognised for enhancing clinical decision-making and educational experiences in nursing, there remains a research gap in evaluating the effectiveness and perceived impact of specific AI tools within NP training (Rony et al. 2024). Although Isabel supports diagnostic accuracy by leveraging machine learning for differential diagnosis (Graber and Mathew 2008; Ramnarayan et al. 2003), there is limited research on how often and in what contexts NP students use such tools and whether these interactions effectively build diagnostic confidence and usability perceptions. The Elsevier (2023) *Clinician of the Future* report highlights a global demand for integrating digital health technology into medical and nursing education. However, current evidence lacks insights on students' training experiences and perceptions, especially regarding whether AI-enhanced learning tools align with their needs and support their development in clinical reasoning (Ahmad and Jenkins 2022; Chang et al. 2022).

A systematic review by Raymond et al. (2022) demonstrated that nurse practitioners (NPs) utilise AI based clinical decision making and predictive tools in primary, hospital and emergency care settings. This underscores the importance of including AI based clinical tools into the NP training curriculum. NPs are advanced practice nurses who undertake further education (minimum master's degree) to complete advanced health assessments, diagnose and treat conditions using evidence informed guidelines (Schober et al. 2020). As nurses undertake further graduate studies to become a NP, one of the challenging skills to master is the development of a differential diagnosis. The integration of AI differential diagnosis tools into NP curriculum can support students in developing clinical reasoning skills and digital skills, thereby making nursing education more efficient and impactful (Raymond et al. 2022). In Australia, the first two NPs were authorised to practice in the year 2000. Since then, only 2900 NPs have been licenced to practice by the federal regulator.

This corresponds to a ratio of 11 NPs per 100,000 population, compared to 106 per 100,000 in the United States of America (American Association of Nurse Practitioners 2023; Nursing and Midwifery Board of Australia 2024). Only eleven universities in Australia offer the NP programme and have small numbers of graduates annually (Nursing and Midwifery Board of Australia 2024). This corresponds to the low sample size of students to conduct teaching and learning research.

By undertaking this study, we aim to gain a clearer understanding of whether current training methods for using Isabel, an AI-driven differential diagnosis platform, are effective and if NP students perceive the platform as beneficial to their learning experience. Specifically, this research will explore how the frequency and context of Isabel usage among NP students influence their confidence in diagnostic decision-making and their perceptions of the system's usability.

3 | The Study

The aim of this pilot study is to assess NP students' perceptions of and engagement with Isabel's AI-based differential diagnosis tool to support their decision-making skills during their theoretical and clinical placement training.

3.1 | Pilot Objectives

1. Explore how NP students utilise the AI differential diagnosis tool with academic and clinical activities, including assignment completion, clinical placement and clinical practice.
2. Investigate how the AI differential diagnosis tool influences NP students' engagement and confidence during clinical placements, considering differences in usage frequency and study contexts.
3. Identify specific features of the Isabel tool that NP students perceive as influential in developing their clinical decision-making skills.
4. Examine NP students' perceptions of the adequacy of the training resources provided for using the AI differential diagnosis tool, considering variations in their demographics and course progression.
5. Evaluate NP students' ratings of the system's usability (how easy is it to use the programme) and how this usability impacts their diagnostic confidence.

4 | Methods

4.1 | Design and Conceptual Framework

This pilot study employed a cross-sectional descriptive survey design. The study was guided by the Technology Acceptance Model (TAM) to guide the exploration of NP student perceptions of the AI differential diagnosis tool for clinical decision making in nursing education. The Technology Acceptance Model (TAM) by Davis (1989) which was further explored across fields

(Venkatesh et al. 2003), including nursing (Ramadan et al. 2024), provides a framework that aligns with study objectives of evaluating the perceived usefulness, ease of use (engagement and confidence to use) and external variable. The perceived usefulness of the Isabel AI platform links to Objectives 1 and 2; the perceived ease of use links to NP students' engagement and perceived training adequacy—Objectives 3 and 5; and the external variable is the placement environment and training resources provided by the university—Objectives 2 and 4. AI-assisted tools used during clinical placement allow nursing students to reflect in real-time feedback received, which in this case can confirm or refute a diagnosis. This can enhance clinical reasoning and judgement, which is linked to Experiential Learning (Kolb and Kolb 2018). TAM will also guide the measure of diagnostic confidence, which is an educational outcome for NP students' ability to actively monitor and adjust their thinking (metacognition) to perform better in clinical decision making when using AI tools. This framework provides a structured approach to examining Isabel's impact on students' clinical decision-making confidence and integration into their academic and clinical experiences. In this study, perceived usefulness maps to students' reported use of Isabel across academic and placement activities and the influence of features on diagnostic formulation (Objectives 1–2, 4), while perceived ease of use maps to confidence in using the system and satisfaction/usability (Objectives 3, 5). We additionally drew on experiential learning principles, where real-time feedback during placements supports reflection and diagnostic reasoning. These mappings guided item selection and our choice of outcomes (Post-Study System Usability Questionnaire (PSSUQ); confidence) (Vlachogianni & Tselios, 2023), and informed the non-parametric analyses given small, non-normal samples.

4.2 | Study Setting and Participant Recruitment

The setting for the study was a Master of Nurse Practitioner course at an Australian university. Students had the opportunity to use Isabel while completing theory and clinical placement subjects during the course. The accredited NP programme is offered over a year and a half full time or two and a half years part time. The programme content consists of one subject on health assessment, two pharmacology subjects, two clinical placement subjects (which also include theoretical content relating to primary care, diagnostic testing, diagnostic reasoning and clinical medicine), two research subjects, a cultural studies subject and a transition to practice subject. For this study it was assumed that students were more likely to use the Isabel tool in the clinical placement and health assessment subjects. All NP students enrolled in the course at the time of the evaluation, totalling $n = 75$, were eligible to participate. Participants were NP students at two different stages of the programme (health assessment; clinical placements), reflecting distinct exposure to diagnostic reasoning. The participants are a distinct cohort enrolled into the NP course who are required to meet specific entry requirements. There was no exclusion criteria as all students actively enrolled in the course were invited to participate. Participants were recruited using the university's Learning Management System (LMS). Via the LMS, all students enrolled in each subject emailed an announcement about the study, which included a link to the online platform hosting the study survey. At the online survey site, students were able to download and read a copy of the study participation

The screenshot displays the Isabel platform interface, divided into three steps: Step 1: Clinical features, Step 2: Checklist, and Step 3: Resources. Step 1 includes input fields for 'Age of the patient', 'Patient's sex at birth' (Female/Male), and 'Patient's travel history' (Australasia). It also has a text input for symptoms and a 'Get Checklist' button. Step 2 features a search box for the 'MSD MANUAL Professional Version' and a 'Search' button. Step 3 features a search box for 'Isabel' and a 'Search' button.

FIGURE 1 | Isabel platform interface appearance. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/jocn.70287)]

and information sheet and provide their consent to participate. Students were advised that completing the survey was optional and was anonymous. No information that would otherwise identify the student (e.g., name, student ID, contact details) were collected via the survey.

4.3 | Description and Implementation of Isabel Health

The Isabel clinical decision support software was first integrated into the NP curriculum in 2022. This AI-powered differential diagnosis tool has been part of the NP curriculum for 2 years, and this study is the first to examine the training provided by academic staff and students' experiences using the tool as a learning aid. The AI differential diagnosis generating software was incorporated into student assessments to support clinical decision-making skills. Students were expected to identify a patient's abnormal physical examination findings and diagnostic results then enter the patient's age, gender, key abnormal physical exam findings and laboratory results into the tool (Figure 1), which generates a list of possible differential diagnoses. The red flag differentials are highlighted, and all diagnoses can be linked to clinical resources such as UpToDate, Australian Therapeutic Guidelines, Medline and MSD Manual (Figure 2). The assumption was made that the use of the AI tool during NP clinical placement encouraged critical thinking and could be utilised to prompt appropriate clinical documentation. The Isabel platform interface is demonstrated below in Figure 1.

All students enrolled in the NP course have access to the Isabel platform and are encouraged to use the tool to complete

assignments, case study presentations, and while on clinical placement for complex clinical cases to encourage developing a differential diagnosis and clinical decision-making skills. Isabel provides instructional videos embedded in the online software platform that students can access at any time while using the tool. There are additional instructional handouts and practice cases on various clinical scenarios that the students can work through and utilise the tool to determine the diagnosis. In addition to the above resources, the NP academic staff facilitates a live online training session with a clinical advisor/product expert from Isabel Healthcare at the beginning of the semester. The 1-h online training session provides an overview of the clinical decision-making software and an opportunity for students to use the tool live while the session is in progress. This hands-on experience provides examples of how the software can be used by the NP students and opportunities to ask questions. In addition to this, the students have continued access throughout the teaching period to the platform's resources and customer service support from Isabel Healthcare. Attendance at the live session and individual uptake of training resources were not systematically tracked for analysis. Although platform engagement metrics were available, their ad-hoc capture meant we excluded them a priori from analyses and instead reported this as a study limitation.

4.4 | Data Measurement and Collection

Data was collected from participants using an online survey hosted on the Qualtrics platform. The survey consisted of questions specifically developed for the study and a standardised psychometric scale to measure NP student satisfaction with the

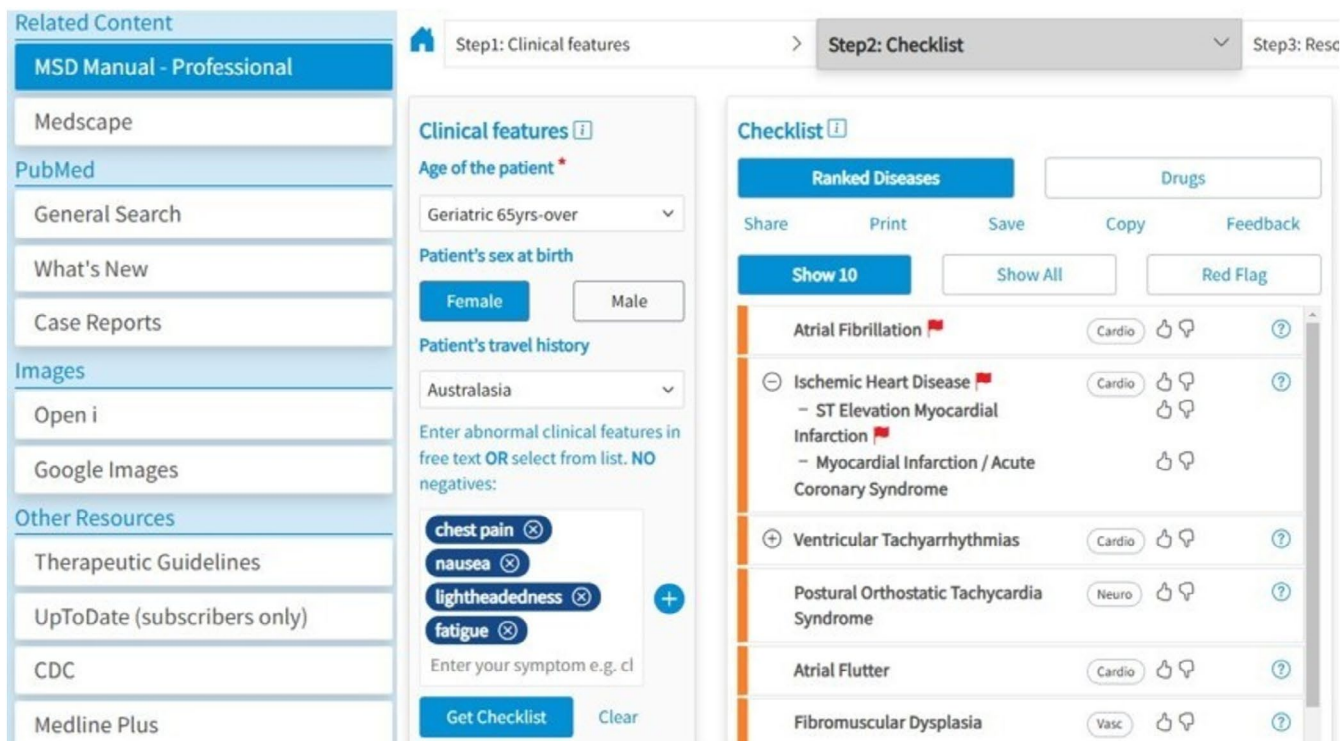


FIGURE 2 | Isabel second step interface checklist view. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

Isabel software and systems (see Appendix S1 for the survey instruments). Part One of the survey focussed on the students' use of the Isabel Health software (e.g., frequency of use; in what study subjects and clinical placement; reasons for use; impact on decision making and formulating diagnoses) by collecting data using ordinal-scale and nominal-scale answers, and their perceptions of the usefulness of the software when used during NP clinical placements (e.g., facilitating engagement with the placement; ease of use when with a patient; approval from preceptors for the use of the software; impact of the software on confidence to make a diagnose) by using ordinal-scale answers and 5-Likert agreement scale. Participants who reported not having used Isabel were asked to select the reason they had not used the software from the given nominal-scale answers, including a text 'other' option, after which they exited the survey.

Part Two of the survey focussed on the students' use of the available Isabel training resources (e.g., online webinar; information sheets; case study videos) by collecting data using 5-Likert usefulness scale with a 'Did not use' option, their recommendations for additional training resources, confidence in using the software by using 5-Likert confidence scale, and satisfaction with the software. Satisfaction with the software was measured using the Post-Study System Usability Questionnaire (PSSUQ) (Vlachogianni & Tselios, 2023). This 16-item, 7-point Likert scale (Strongly Agree to Strongly Disagree) is a validated and reliable measure of the perceived usability of a technological interface or hardware (Vlachogianni & Tselios, 2023). The PSSUQ provides an overall score of system usability (all 16 items, Reliability Alpha=0.96) and three sub-scale scores: System Usefulness (6 items, Reliability alpha=0.96), Information Quality (6 items, Reliability Alpha=0.92) and Interface Quality (3 items, Reliability Alpha=0.83) (Lewis 2002) with lower

scores indicating greater usability (1=strongly agree and 7=strongly disagree). The PSSUQ has also been shown to be an effective multi-item questionnaire with a sample size as small as 15 (Sauro 2019), making it suitable for this study. To support content validity for custom items, expert review (senior learning advisor; AI specialist) and feedback from four NP alumni informed item wording and clarity. Part Three of the survey required participants to provide information on their years of nursing registration and number of semesters of the Master of Nurse Practitioner course completed (e.g., semesters completed and current unit enrolments). The approximate median time to complete the survey was 6 min.

Once the questionnaire was developed, feedback was sought and incorporated from a Senior Learning Advisor within the University Centre for Teaching and Learning on the wording, readability and appropriateness. To ensure the survey questions were not leading and provided an opportunity for honest response to the utility and usability of the tool, feedback was sought from four NP alumni students who had used the tool. External feedback was obtained from the Vice President of Client Services of Isabel Healthcare who is a registered nurse and engineer. This feedback ensured the terminology and resources provided within the platform were accurate. Data collection was undertaken from February to October 2024.

4.5 | Data Analysis

The online survey responses were exported from Qualtrics into SPSS (Version 29.0.1.0). Data were cleaned and re-coded where necessary. Given the small sample and non-normal distributions, we used non-parametric tests (Fisher's Exact; Kruskal-Wallis).

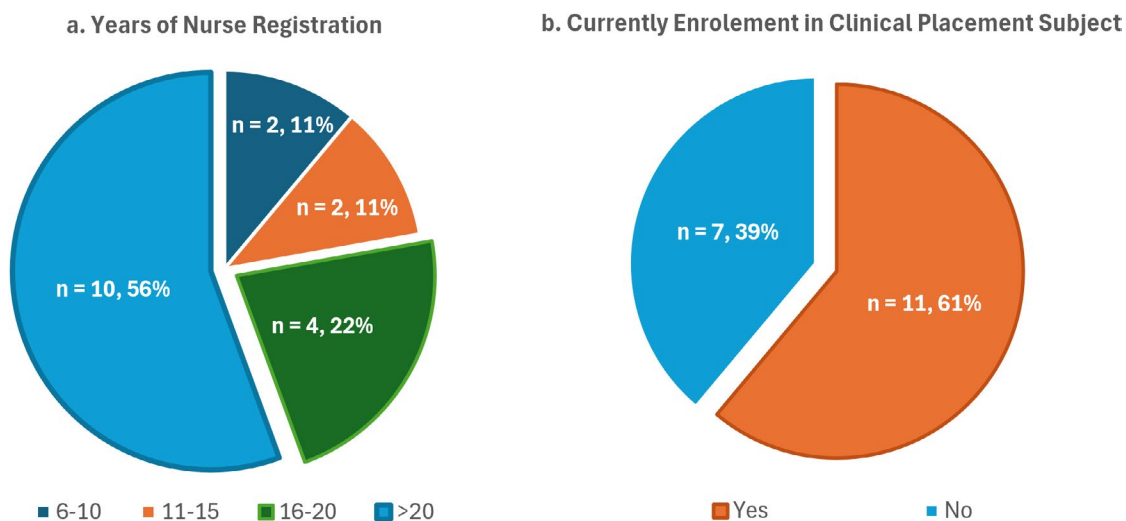


FIGURE 3 | Participant demographics and course status ($n=18$). [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/jocn.15627)]

Analyses used available-case data (pairwise deletion); we report denominators per analysis. The full scale and the three sub-scale scores for the PPSUQ were calculated as per instructions provided by Sauro (2019) and Lewis (2002).

4.6 | Ethical Considerations

The study was reviewed and approved by the Human Research Ethics Committee of the educational institution of the lead investigator (2024–05232). Participants were presented with a consent question at the beginning of the online survey to indicate their consent to participate. When they chose not to provide consent, they were automatically exited from the survey and no data was collected from them.

5 | Results

5.1 | Participant Demographics and Course Status Information

A total of $n=75$ students enrolled in the Master of Nursing Practitioner course were invited to participate, with $n=26$ students consenting to participate in the study (Access rate: 34.6%). Demographic and course status information was available for $n=18$ (69%) of the 26 participants (Figure 3). Most participants had practiced as a registered nurse for more than 20 years and were currently enrolled in a clinical placement subject.

5.2 | Use of Isabel Health

5.2.1 | Frequency of Use

Twenty-one participants provided information on their use of Isabel while enrolled in the course. Three participants (11.5%) reported they had not used the software: two participants indicated they had not used the software due to a 'lack of time' with the other stating they 'did not know the resource was

available' for use. Of the remaining 18 participants, $n=12$ (66.7%) reported they had used Isabel five or more times, with $n=2$ (11.2%) having used it three to four times. Twenty-two percent ($n=4$) could not recall how often they had used it. A Fisher's Exact test was conducted to examine the relationship between the year of experience and the frequency of use. The result indicated no significant association between them, $p=0.864$ (two-tailed).

Of the five study units (two clinical placements; two clinical pharmacology; one health assessment) in which students could have used Isabel Health, $n=8$ (44.4%) of the 18 students used it in two subjects, with a further $n=5$ (27.8%) using it in one subject only (Table 1). Isabel Health was most frequently used in one or both clinical placement subjects, followed by the health assessment subject in combination with one or both clinical placement subjects.

5.2.2 | Scenarios of Use

Students were asked what specific scenarios they were most likely to use the tool (Table 2). Nearly 90% ($n=16/18$) reported using it often (50% four or more times) to confirm their most likely differential diagnosis or to provide evidentiary support for a diagnosis. Participants were least likely to have used the tool to support their understanding of subject material (50%, $n=9$) or for non-student purposes (44.4%, $n=8/18$).

Students' ($n=18$) awareness and use of programme features is presented in Table 3. The *Ranked Disease-Differential Diagnosis* and *Red Flag Diagnosis* features of the AI programme were used most often and were rated by $n=6$ (33.3%) of students as having a substantial to significant level of influence on the formulation of a provisional or final diagnosis. In contrast, the *Links to Medline* and its use was the feature students were aware of but least likely to have used ($n=6$, 33.3%). The *Drug-Related Causes Tab* was the feature students were most likely to be unaware of ($n=4$, 22.2%). Fisher's Exact tests were conducted to examine the relationship between the year of experience and the level of influence by programme features. The result indicated

TABLE 1 | Isabel usage in specific course subject type.

Number of subjects Isabel was used	Course subject ^a					Total <i>n</i> (%)
	Health assessment	Pharmacology 1	Pharmacology 2	Clinical placement 1	Clinical placement 2	
In 1 subject	2	1	0	0	2	5 (27.8)
In 2 subjects	0	0	0	3	3	8 (44.4)
	0	0	1	1	0	
	1	0	0	1	0	
	3	0	0	3	0	
In 3 subjects	1	1	0	1	0	3 (16.7)
	2	0	0	2	2	
In 4 subjects	2	2	2	2	0	2 (11.1)

^a*n* each course subject represents the number of students who used Isabel while undertaking that specific subject or combination of subjects.

TABLE 2 | The utility of Isabel for specific academic and clinical scenarios.

Scenario	Frequency of use in this scenario				
	Not used	Used at least once	Used 2–3 times	Used 4–5 times	Used more than 5 times
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
To confirm the most likely differential diagnosis	2 (11.1)	3 (16.7)	5 (27.8)	2 (11.1)	6 (33.3)
Unable to identify a provisional diagnosis or any differential diagnoses	6 (33.3)	1 (5.6)	4 (22.2)	4 (22.2)	3 (16.7)
To find evidence or resources to support my diagnosis	2 (11.1)	2 (11.1)	5 (27.8)	4 (22.2)	5 (27.8)
In my usual place of practice (my non-student role)	8 (44.4)	2 (11.1)	6 (33.3)	1 (5.6)	1 (5.6)
To complete university assignments	7 (38.9)	1 (5.6)	5 (27.8)	1 (5.6)	4 (22.2)
To understand content covered in course subjects(s) for example, online learning, course readings, lectures	9 (50.0)	2 (11.1)	4 (22.2)	1 (5.6)	2 (11.1)
For unfamiliar patient symptoms or examination findings	5 (27.8)	0 (0.0)	9 (50.0)	2 (11.1)	2 (11.1)

no significant association between them, $p=0.590$ for Ranked disease, $p=0.331$ for Red flag diagnoses, $p=0.914$ for Drug-related causes tab, $p=1.00$ for Links to eTG, $p=0.709$ for Links to UpToDate, $p=0.105$ for Links to Medline (two-tailed).

Overall, of the students who used the tool, the majority ($n=8$, 44.4%) considered it had a minor to moderate influence on their decision making, with a further $n=6$ (33.3%) stating that it had a substantial to significant influence. While $n=4$ (22.2%) students stated that using Isabel did not influence their decision making at all, three of the four, however, reported that one or more of the features they used had a minor to moderate influence on the formulation of a diagnosis. There were also several students that reported they were unaware of some of the features and links within the platform or did not use the feature (Table 3).

5.3 | Students' Perceptions of Isabel Training Resources

The training demonstration webinar and the 'how to' videos—both provided by Isabel—were the most frequently used resources cited by the $n=18$ students, with $n=10$ (55.6%) and $n=8$ (44.5%) of students respectively rating the resources as very useful to extremely useful (Table 4). The 'Real Case Study' videos were least likely to have been used by students though were rated as very useful to extremely useful by $n=4$ students (22.2%).

Only $n=3$ (16.7%) students who used Isabel considered that additional training would be useful. When asked to provide suggestions for further training, only one of the three students offered a practical recommendation: 'a possible introduction

TABLE 3 | Students' awareness and use of programme features and level of influence on the formulation of a provisional or final diagnosis.

Programme feature	Level of Influence						
	Unaware of this feature	Did not use this feature	None	Minor	Moderate	Substantial	Significant
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Ranked diseases—differential diagnosis list	1 (5.6)	0 (0.0)	4 (22.2)	3 (16.7)	4 (22.2)	4 (22.2)	2 (11.1)
Red flag diagnoses	0 (0.0)	0 (0.0)	1 (5.6)	6 (33.3)	5 (27.8)	4 (22.2)	2 (11.1)
Drug-related causes tab	4 (22.2)	4 (22.2)	3 (16.7)	2 (11.1)	4 (22.2)	1 (5.6)	0 (0.0)
Links to Therapeutic Guidelines (eTG)	3 (16.7)	4 (22.2)	2 (11.1)	2 (11.1)	4 (22.2)	2 (11.1)	1 (5.6)
Links to UpToDate	2 (11.1)	4 (22.2)	3 (16.7)	4 (22.2)	3 (16.7)	1 (5.6)	1 (5.6)
Links to Medline	2 (11.1)	6 (33.3)	4 (22.2)	1 (5.6)	3 (16.6)	1 (5.6)	1 (5.6)

TABLE 4 | Students' ratings of the usefulness of the training resources.

	Level of Usefulness					
	Did not use	Not at all	Slightly	Moderately	Very	Extremely
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Demonstration webinar with academic and Isabel Healthcare staff (live or recording)	3 (16.7)	0 (0.0)	3 (16.7)	2 (11.1)	5 (27.8)	5 (27.8)
PDF Information Sheets/handouts	7 (38.9)	2 (11.1)	3 (16.7)	2 (11.1)	3 (16.7)	1 (5.6)
Recorded 'How to and when to use Isabel' training videos	3 (16.7)	1 (5.6)	4 (22.2)	2 (11.1)	5 (27.8)	3 (16.7)
'Real case study' videos		1 (5.6)	1 (5.6)	1 (5.6)	2 (11.1)	2 (11.1)

to it on orientation day [to the course], via a quick case study and introduction video would have been useful...'. One other student commented that perhaps their limited use of the programme may have contributed to their uncertainty about the '...practical benefit of the tool...' and as such, they were '...not sure if additional training [was] needed or not...'. The final student commented that they '...would prefer to take more time to get to know the system once I have time...'.

5.4 | System Usability

This study's PSSUQ demonstrated high internal reliability, comparable to that of the original scale. The reliability of the overall score with 16 items was $\alpha = 0.99$; System Usefulness = 0.99; Information Quality = 0.96; and Interface Quality = 0.91. Descriptive statistics for the full scale and sub-scales of the PSSUQ for the $n = 18$ students are presented in Table 5; the frequency distribution of scale items responses is presented in Appendix S2. Median scores are presented for all scales due to the small sample size ($n = 18$ students) and the non-normal distribution of scores. The full-scale median score of 2.16 indicates that overall, participants strongly

TABLE 5 | Descriptive statistics for the Post-Study System Usability Questionnaire full scale and sub-scales.

PSSUQ	Median score	Interquartile range	Range (min–max)
Full scale	2.16	2.21	5.27 (1.00–6.27)
System usefulness	2.08	2.33	6.00 (1.00–7.00)
Information quality	2.54	2.02	4.60 (1.00–5.60)
Interface quality	2.67	2.67	5.00 (1.00–6.00)

Note: Reverse Likert score (1 to 7) survey with 1 indicating strongly agree (1) to strongly disagree (7).

endorsed the usability of the Isabel AI program. This endorsement was consistent across the sub-scales of System Usefulness (Md = 2.08), Information Quality (Md = 2.54) and Interface Quality (Md = 2.67), where the median scores and interquartile ranges were similar across the three subscales.

Kruskal-Wallis tests showed that there was not a statistically significant difference in the full and three-sub scale scores between the different years of experience, $\chi^2(3) = 5.60, p = 0.133$ for the full scale score, $\chi^2(3) = 2.40, p = 0.494$ for the system usefulness score, $\chi^2(3) = 5.60, p = 0.133$ for the information quality score and $\chi^2(3) = 5.89, p = 0.117$ for the interface quality score.

Students rated the Isabel program as 'highly usable' with $n = 8$ (44.5%) reporting they were very confident to extremely confident in their ability to use the programme, with an equal proportion (44.5%, $n = 8$) stating they were slightly confident to moderately confident. Two (11.1%) students reported they were not confident at all in their ability to use the programme. Further investigation of the survey responses of these two students showed that both had indicated a need for further training (as reported above). One student did not use any of the available training resources and required more time to '...get to know the system...', while the second student reportedly accessed all four available training resources but considered all were only 'slightly useful'. A Fisher's Exact test was conducted to examine the relationship between the year of experience and the confidence level. The result indicated no significant association between them, $p = 0.076$ (two-tailed).

6 | Discussion

6.1 | Main Findings

Objective 1–2 (use & engagement): Of students reporting usage, 44.4% ($n = 8/18$) used Isabel in two subjects—commonly the placement units—and 27.8% ($n = 5/18$) used it in one subject; students most often used Isabel to confirm differential diagnoses. Objective 3–4 (features & training): Ranked Differential and Red Flag features most influenced formulation, whereas awareness/uptake of some links (e.g., Medline) was lower. Objective 5 (usability): PSSUQ medians indicated positive usability. The data demonstrates that students used the tool predominately during the first clinical placement. In this course the first clinical placement is in a primary care setting and the second is in the student's area of speciality. The difference in usage of the tool between the two-placement subject is potentially attributable to several reasons, including that as primary care is an unfamiliar setting to many students, the variation in clinical presentations, less understanding of assessment findings to formulate a diagnosis. In the second placement students have had more exposure to formulating a diagnosis, diagnostic reasoning and diagnosis refinement in addition to being in their specialist area. This may explain the reduced use of the AI tool, however, cannot be explicitly confirmed. This highlighted the need for improved integration of the tool into the students learning and clinical placement. Usability was positively rated, with the majority reporting satisfaction with the platform's features. Notable functions like the 'Ranked Disease-Differential Diagnosis' and 'Red Flag Diagnoses' were highlighted for their influence on decision-making. However, a subset of students (22%) felt the tool had limited effect on their diagnostic confidence, often linked to insufficient engagement with training resources. This is consistent with Table 3, where 22.2% ($n = 4/18$) indicated no

influence on decision-making overall, although most still reported feature-level minor–moderate influence. Additionally, some students who reported discomfort with the platform had not accessed available training materials. These findings underscore a need for structured training sessions, ideally conducted close to practical application, to optimise student confidence and enhance the integration of AI tools in clinical learning environments. These findings are compatible with the findings of Gray et al. (2022), which reported the opinion of healthcare educational experts' ideas and plans to integrate AI into educational activities. This study highlighted that meaningful implementation of AI and machine learning platforms should be done through specialised training courses, problem based learning approach and include ethical considerations when using AI in healthcare (Gray et al. 2022).

Although the usability of the system based on the PSSUQ rated relatively high, there was clearly a confidence gap for students to use the Isabel tool to refine their diagnosis findings. This was evident regardless of the years of nursing experience. Although this cannot be explicitly extracted from the results, there is a component of digital literacy that may have influenced a student's engagement with the platform. As more studies are demonstrating the apprehension and anxiety associated with the use of AI in nursing education (Maraş et al. 2024) and practice (Pare et al. 2025; Raymond et al. 2025), regardless of demographics or clinical experience, the need for more tailored training is apparent. Although our pilot study had a low number of participants, the popularity of in-person demonstration webinars was the preferred method of learning how to use the AI platform over written material. However, as suggested by Raymond et al. (2025), nursing training programmes need to go beyond teaching technical skills but also influence nurses' beliefs and attitudes. This is important in postgraduate nursing programmes and highlights the need for wider studies that evaluate effective methods to influence both attitudes and practice.

6.2 | Study Strengths and Limitations

This study is strengthened by its focus on a specific AI tool, Isabel, within a real-world clinical education context, offering practical insights into its application for NP students. The structured methodology, including the use of the PSSUQ for usability evaluation, lends validity to the findings of students' perceptions and usability of the tool, which research has not previously addressed in the NP education context but has in other health education contexts (Jung 2023; Srinivasan et al. 2024). The PSSUQ is validated to be used in small sample sizes under 20. Additionally, the study highlights valuable data on training adequacy, which informs future instructional design improvements.

The study's limitations include a small sample size, as less than 30 students from a single institution participated, potentially affecting the generalisability of findings. However, this must be interpreted in the context outlined above regarding the small number of NP students nationally. Further, usage patterns varied significantly among students, and some did not complete sections of the survey, which impacted the data completeness.

The study did not measure the student's engagement with the training resources, which was a further limitation. The limited context in which Isabel was used during placements may also restrict broader insights into its applicability across diverse clinical scenarios. There is an added potential for social desirability bias in self-reported usability scores that needs to be considered. Findings may also be affected by recall bias and item-level missingness, which we handled via available-case analyses as noted in Section 4.5. Addressing these limitations in future research could enhance the robustness of findings.

6.3 | Implications for Policy and Practice

The use of AI in NP education, exemplified by tools like Isabel, could enhance clinical reasoning by offering real-time diagnostic support and helping students manage complex cases (Topol 2019). Programmes should explicitly mitigate over-reliance by framing Isabel as a decision support tool that augments—not replaces—clinical reasoning, with assessment tasks requiring independent justification. However, this study indicates a need for a greater level of structured training to maximise AI's effectiveness in clinical education. A significant portion of students did not engage consistently with the tool, underscoring the necessity for comprehensive onboarding to develop proficiency and confidence with the use of such tools. This is further confirmed by a study conducted by Alanazi et al. (2023) which evaluated physicians' perspectives on the use of electronic health records (EHR) to assist in formulating a differential diagnosis. There was a statistically significant difference in the proficiency of the users based on IT knowledge and training for practitioners to utilise the EHR to enhance the quality and accuracy of the differential diagnosis (Alanazi et al. 2023). Evidence suggests that AI-enhanced training can boost diagnostic accuracy and streamline the decision-making process (Jain et al. 2021), thus preparing NPs for AI-integrated healthcare environments. To meet the growing demand for tech-savvy healthcare professionals, NP programmes must not only integrate AI tools but also align their training approaches to ensure students are equipped for future digital healthcare landscapes. Integrating AI clinical decision tools into nurse practitioner education and practice will require a collaborative approach by education providers, health systems, clinicians and government agencies. As outlined by Rony et al. (2024), these approaches need to have a patient-centred approach that is ethical and regulated. Barriers and existing policies to integrate AI tools need to be reviewed, and further funding and research are required to measure clinical and educational outcomes.

6.4 | Recommendations

To enhance the efficacy of the Isabel tool within NP education, this study recommends implementing structured, hands-on training sessions early in the programme to improve familiarity and confidence with the system. Integrating an orientation module focusing on Isabel's core features and practical application in clinical scenarios would better support students' learning and engagement. Additionally, refresher sessions throughout the curriculum could reinforce skills and encourage consistent use, particularly in clinical placements where diagnostic tools are

most relevant. Collaboration with clinical preceptors to align expectations and facilitate supportive use of the tool in practicum settings could further enhance student experiences. It is critical however to enforce that this is a tool to support practice and not one to replace students need to learn the skill of diagnosis formation and refinement, and that clinical knowledge is essential to interpret suggestions of the tool in the individual patient context rather than relying on it as the only source of truth. These opinions are shared by practicing NPs who see the necessity for comprehensive training in AI clinical platforms that includes robust ethical and regulatory guidelines to ensure responsible integration into healthcare practice (Bumbach et al. 2023; Rony et al. 2024). AI diagnostic tools such as Isabel should be used to complement traditional educational techniques rather than attempt to replace them completely to enhance clinical ability and knowledge. Finally, expanding the variety of case studies within Isabel to cover diverse clinical presentations would provide students with a broader, more comprehensive diagnostic practice, aligning the tool's functionality more closely with real-world healthcare environments. These steps could optimise the tool's educational impact and clinical applicability.

6.5 | Future Research Directions

Future research should focus on evaluating the long-term impact of AI diagnostic tools like Isabel on clinical decision-making and patient outcomes among NPs. Studies could explore whether sustained use of AI tools throughout the NP training enhances diagnostic accuracy and how these tools affect clinical confidence in varying real-world settings. Additionally, research should investigate optimal training methods for integrating AI in healthcare education, particularly assessing the effects of repeated hands-on practice and the impact of preceptor-led guidance on students' tool proficiency (Gray et al. 2022). Comparative studies examining outcomes between students who actively engage with AI diagnostic aids and those who rely solely on traditional resources could provide insights into the tool's effectiveness. Finally, expanding research to include diverse healthcare settings and larger sample sizes would improve the generalisability of findings, ensuring the tool's application is aligned with the needs of an increasingly digital healthcare environment.

7 | Conclusion

This study highlights the potential of AI diagnostic tools, such as Isabel, to improve diagnostic accuracy and clinical reasoning in NP education. While students reported enhanced diagnostic confidence and usability, inconsistent engagement with training resources affected some outcomes. These findings are tempered by the relatively small number of study participants recruited over a short study period. Accordingly, results should be interpreted as hypothesis-generating and require multi-institutional replication. To maximise the educational impact of AI tools, structured, ongoing training sessions are essential. Additionally, integrating AI usage closely within practical placements can foster familiarity and confidence. Addressing these areas will support the effective adoption of AI in NP training, equipping students with critical diagnostic skills for increasingly digital healthcare environments.

Author Contributions

Nilufeur McKay: conceptualization, methodology, formal analysis, investigation, resources, data curation, formal analysis, writing – original draft, writing – review and editing, supervision and funding acquisition. Peter Palamara: methodology, data curation, formal analysis, writing – original draft; writing – review and editing. Adam McCavery: provision of resources, creation of research tool, writing – original draft, review and editing. Kaoru Nosaka: formal analysis, writing – review and editing. Wai Hang Kwok: methodology, resources, writing – original draft, writing – review and editing.

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Ethics Statement

Ethical approval was provided by the Human Research Ethics Committee at Edith Cowan University 2024–05232-MCKAY. Participants were presented with a consent question at the beginning of the online survey to indicate their consent to participate. When they chose not to provide consent, they were automatically exited from the survey, and no data was collected from them. The statistics were checked prior to submission by an expert statistician: Professor Lukman Thalib, Professor of Biostatistics; Edith Cowan University; email: l.thalib@ecu.edu.au.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

- Ahmad, S., and M. Jenkins. 2022. "Artificial Intelligence for Nursing Practice and Management: Current and Potential Research and Education." *Computers, Informatics, Nursing* 40, no. 3: 139–144. <https://doi.org/10.1097/CIN.0000000000000871>.
- Alanazi, A., A. Almutib, and B. Aldosari. 2023. "Physicians' Perspectives on a Multi-Dimensional Model for the Roles of Electronic Health Records in Approaching a Proper Differential Diagnosis." *Journal of Personalized Medicine* 13, no. 4: 680. <https://doi.org/10.3390/jpm13040680>.
- American Association of Nurse Practitioners. 2023. "NP Fact Sheet." <https://www.aanp.org/about/all-about-nps/np-fact-sheet>.
- Bumbach, M. D., J. M. Carrington, R. Love, R. Bjarnadottir, H. Cho, and G. Keenan. 2023. "The Use of Artificial Intelligence for Graduate Nursing Education: An Educational Evaluation." *Journal of the American Association of Nurse Practitioners* 36, no. 9: 486–490. <https://doi.org/10.1097/JXX.0000000000001059>.

- Chang, C. Y., G. J. Hwang, and M. L. Gau. 2022. "Promoting Students' Learning Achievement and Self-Efficacy: A Mobile Chatbot Approach for Nursing Training." *British Journal of Educational Technology* 53, no. 1: 171–188. <https://doi.org/10.1111/bjjet.13158>.
- Davis, F. D. 1989. "Technology Acceptance Model: TAM." *Information Seeking Behavior and Technology Adoption* 205, no. 219: 5. <https://quod.lib.umich.edu/b/busadwp/images/b/1/4/b1409190.0001.001.pdf>.
- Elsevier. 2023. "Clinician of the Future Report." <https://elsevier.com/connect/clinician-of-the-future>.
- Gannod, G. C., K. M. Abbott, K. Van Haitsma, N. Martindale, and A. Heppner. 2019. "A Machine Learning Recommender System to Tailor Preference Assessments to Enhance Person-Centered Care Among Nursing Home Residents." *Gerontologist* 59, no. 1: 167–176. <https://doi.org/10.1093/geront/gny056>.
- Graber, M. L., and A. Mathew. 2008. "Performance of a Web-Based Clinical Diagnosis Support System for Internists." *Journal of General Internal Medicine* 23, no. Suppl 1: 37–40. <https://doi.org/10.1007/s11606-007-0271-8>.
- Gray, K., J. Slavotinek, G. L. Dimaguila, and D. Choo. 2022. "Artificial Intelligence Education for the Health Workforce: Expert Survey of Approaches and Needs." *JMIR Medical Education* 8, no. 2: e35223. <https://mededu.jmir.org/2022/2/e35223/>.
- Habehh, H., and S. Gohel. 2021. "Machine Learning in Healthcare." *Current Genomics* 22, no. 4: 291–300. <https://doi.org/10.2174/1389202922666210705124359>.
- Jain, A., D. Way, V. Gupta, et al. 2021. "Development and Assessment of an Artificial Intelligence-Based Tool for Skin Condition Diagnosis by Primary Care Physicians and Nurse Practitioners in Tele dermatology Practices." *JAMA Network Open* 4, no. 4: e217249. <https://doi.org/10.1001/jamanetworkopen.2021.7249>.
- John, R. M., E. Hall, and S. Bakken. 2012. *Use of the Isabel Decision Support System to Improve Diagnostic Accuracy of Pediatric Nurse Practitioner and Family Nurse Practitioner Students*. NI 2012: 11th International Congress on Nursing Informatics, June 23–27, 2012.
- Jung, S. 2023. "Challenges for Future Directions for Artificial Intelligence Integrated Nursing Simulation Education." *Korean Journal of Women Health Nursing* 29, no. 3: 239–242. <https://doi.org/10.4069/kjwhn.2023.09.06.1>.
- Kolb, A., and D. Kolb. 2018. "Eight Important Things to Know About the Experiential Learning Cycle." *Australian Educational Leader* 40, no. 3: 8–14. <https://doi.org/10.3316/informit.192540196827567>.
- Lewis, J. R. 2002. "Psychometric Evaluation of the PSSUQ Using Data From Five Years of Usability Studies." *International Journal of Human-Computer Interaction* 14, no. 3–4: 463–488. <https://doi.org/10.1080/10447318.2002.9669130>.
- Maraş, G., E. Albayrak Günday, and Y. Sürme. 2024. "Examining the Anxiety and Preparedness Levels of Nurses and Nurse Candidates for Artificial Intelligence Health Technologies." *Journal of Clinical Nursing*, 1–9. <https://doi.org/10.1111/jocn.17562>.
- McParland, C., M. Cooper, and B. Johnston. 2020. "Exploring Differential Diagnosis Decision Support Systems for Trainee Advanced Practitioners in Primary Care." *Primary Health Care* 30, no. 6: 27–34. <https://doi.org/10.7748/phc.2020.e1665>.
- Montejo, L., A. Fenton, and G. Davis. 2024. "Artificial Intelligence (AI) Applications in Healthcare and Considerations for Nursing Education." *Nurse Education in Practice* 80: 104158. <https://doi.org/10.1016/j.nepr.2024.104158>.
- Nursing and Midwifery Board of Australia. 2024. "Registrant Data." <https://www.nursingmidwiferyboard.gov.au/about/statistics.aspx>.
- O'Dea, X., and M. O'Dea. 2023. "Is Artificial Intelligence Really the Next Big Thing in Learning and Teaching in Higher Education?:"

A Conceptual Paper.” *Journal of University Teaching and Learning Practice* 20, no. 5: 1–17. <https://doi.org/10.53761/1.20.5.05>.

Pare, G., L. Raymond, and F. A. Etindele Sosso. 2025. “Nurses’ Intention to Integrate AI Into Their Practice: Survey Study in Canada.” *JMIR Nursing* 8: e76795. <https://doi.org/10.2196/76795>.

Ramadan, O. M. E., M. M. Alruwaili, A. N. Alruwaili, M. G. Elsehrawy, and S. Alanazi. 2024. “Facilitators and Barriers to AI Adoption in Nursing Practice: A Qualitative Study of Registered Nurses’ Perspectives.” *BMC Nursing* 23, no. 1: 891. <https://doi.org/10.1186/s12912-024-02571-y>.

Ramnarayan, P., A. Tomlinson, A. Rao, M. Coren, A. Winrow, and J. Britto. 2003. “ISABEL: A Web-Based Differential Diagnostic Aid for Paediatrics: Results From an Initial Performance Evaluation.” *Archives of Disease in Childhood* 88, no. 5: 408–413. <https://doi.org/10.1136/adc.88.5.408>.

Raymond, L., A. Castonguay, O. Doyon, and G. Pare. 2022. “Nurse Practitioners’ Involvement and Experience With AI-Based Health Technologies: A Systematic Review.” *Applied Nursing Research* 66: 151604. <https://doi.org/10.1016/j.apnr.2022.151604>.

Raymond, L., G. Paré, O. Doyon, and G. Wagner. 2025. “Understanding Nurses’ Intention to Use Artificial Intelligence Technologies in Their Clinical Practice: A Survey-Based Configurational Analysis.” *Journal of Advanced Nursing*, 1–11. <https://doi.org/10.1111/jan.70307>.

Rony, M. K. K., S. M. Numan, F. t. Johra, et al. 2024. “Perceptions and Attitudes of Nurse Practitioners Toward Artificial Intelligence Adoption in Health Care.” *Health Science Reports* 7, no. 8: e70006. <https://doi.org/10.1002/hsr2.70006>.

Sauro, J. 2019. “10 Things to Know About the Post Study System Usability Questionnaire.” <https://measuringu.com/pssuq/>.

Schober, M., D. Lehwaldt, M. Rogers, et al. 2020. “Guidelines on Advanced Practice Nursing.” https://www.icn.ch/system/files/documents/2020-04/ICN_APN%20Report_EN_WEB.pdf.

Shaikh, S. G., B. Suresh Kumar, and G. Narang. 2022. “Recommender System for Health Care Analysis Using Machine Learning Technique: A Review.” *Theoretical Issues in Ergonomics Science* 23, no. 5: 613–642. <https://doi.org/10.1080/1463922X.2022.2061078>.

Sibbald, M., S. Monteiro, J. Sherbino, A. LoGiudice, C. Friedman, and G. Norman. 2022. “Should Electronic Differential Diagnosis Support Be Used Early or Late in the Diagnostic Process? A Multicentre Experimental Study of Isabel.” *BMJ Quality and Safety* 31, no. 6: 426–433. <https://doi.org/10.1136/bmjqs-2021-013493>.

Srinivasan, M., A. Venugopal, L. Venkatesan, and R. Kumar. 2024. “Navigating the Pedagogical Landscape: Exploring the Implications of AI and Chatbots in Nursing Education.” *JMIR Nursing* 7: e52105. <https://doi.org/10.2196/52105>.

Topol, E. J. 2019. “High-Performance Medicine: The Convergence of Human and Artificial Intelligence.” *Nature Medicine* 25, no. 1: 44–56. <https://doi.org/10.1038/s41591-018-0300-7>.

Venkatesh, V., M. G. Morris, G. B. Davis, and F. D. Davis. 2003. “User Acceptance of Information Technology: Toward a Unified View.” *MIS Quarterly* 27: 425–478. <https://doi.org/10.2307/30036540>.

Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Appendix S1:** jocn70287-sup-0001-AppendixS1.docx. **Appendix S2:** jocn70287-sup-0002-AppendixS2.docx. **Appendix S3:** jocn70287-sup-0003-AppendixS3.docx.