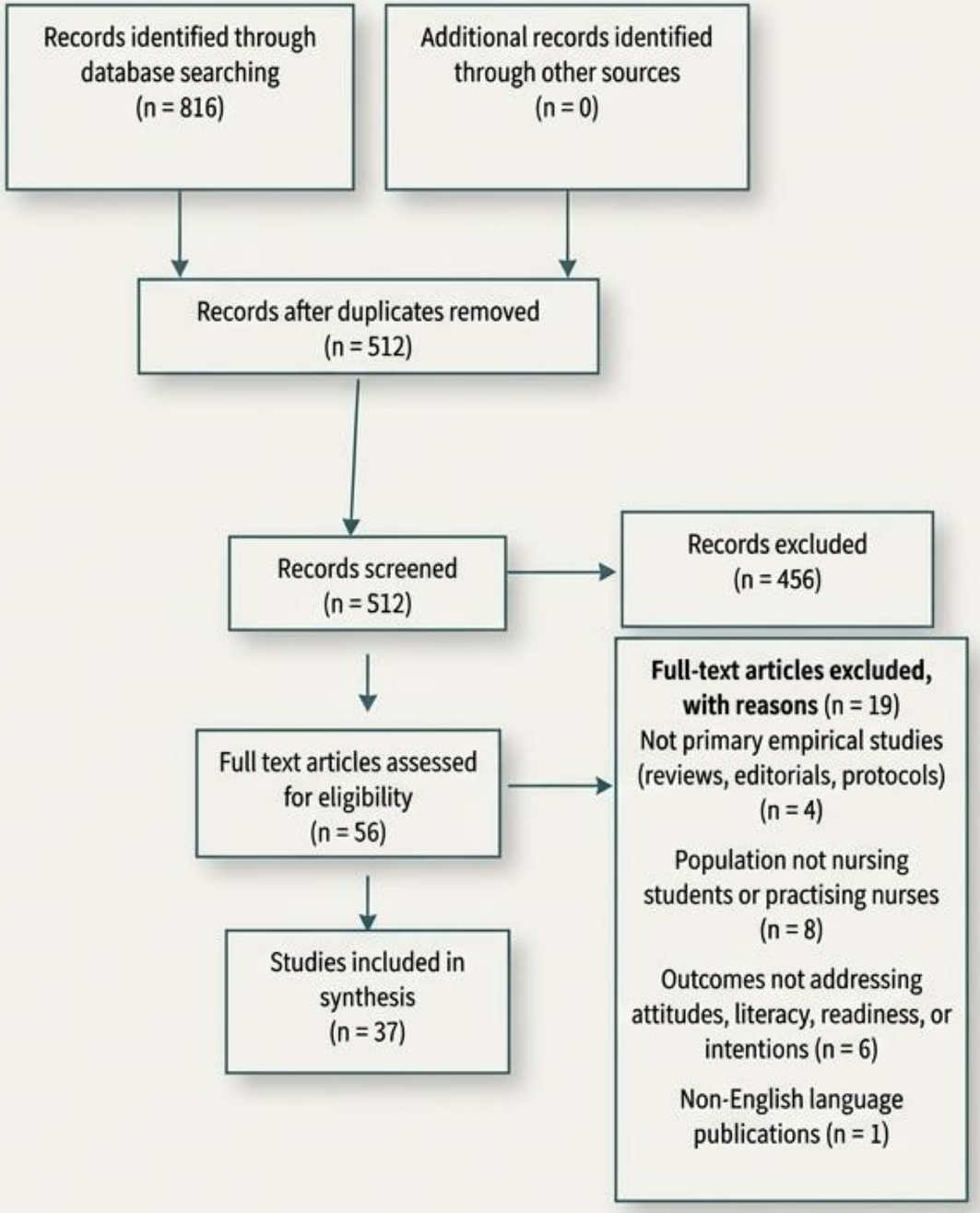
強化護理學生與臨床護理師對AI的態度、素養、準備度與採用意圖，能否提升人工智慧於護理領域應用之成效?

基於 37 項跨國研究、涵蓋逾
10,000 名護理從業人員的
系統性文獻回顧與行動指南

2026.03.17

湯梅芬督導團隊

張家佩護理長 / 蔡淑君護理長
魯啟玉護理長 / 林怡君護理長
黃彥睿護理長 / 陳祐蓉護理長



37 項嚴謹研究

包含 28 項橫斷面調查、8 項質性研究與 1 項準實驗研究。

N ≈ 10,290

涵蓋全球各地的護理學生、臨床護理師與護理主管。

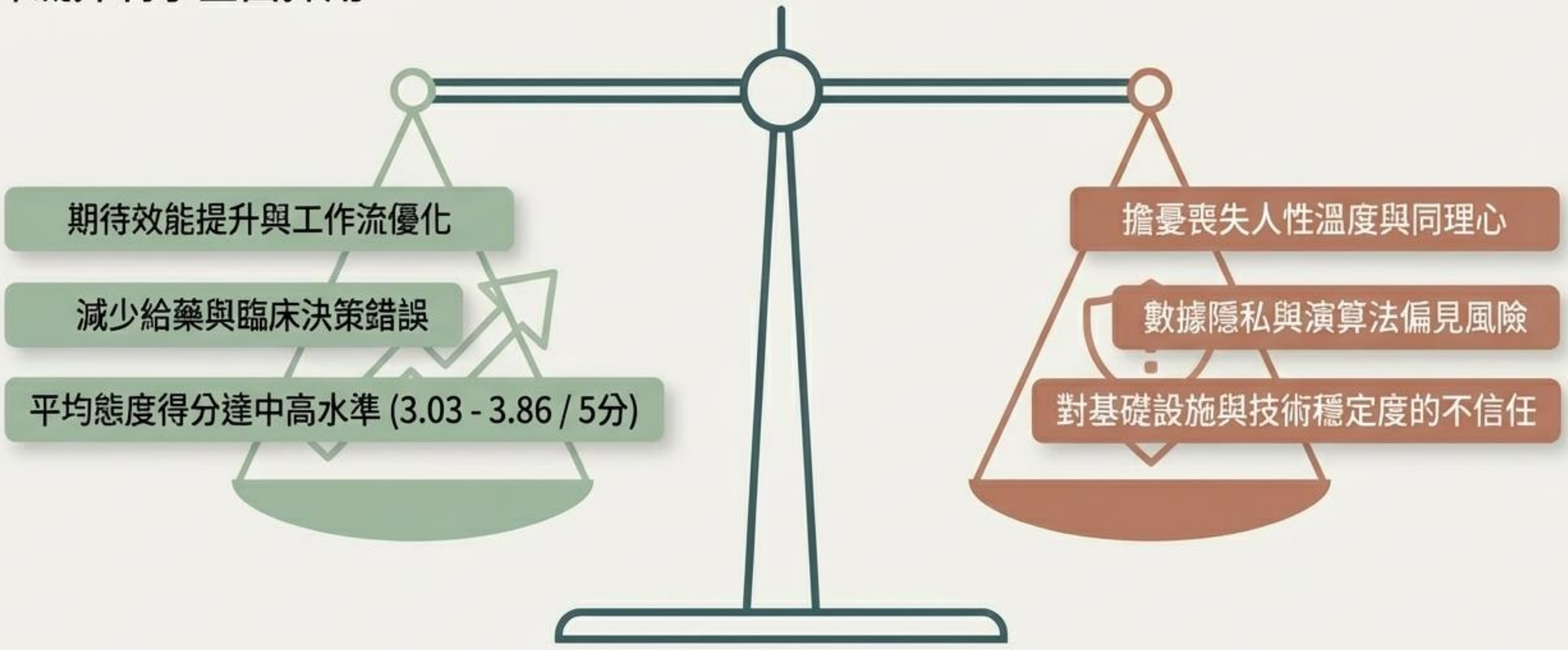
核心痛點

護理人員是醫療照護的第一線，他們對科技的「接受度」與「素養」，將直接決定醫療 AI 系統落地的成敗。

註：數據主要集中於中東、北非與土耳其等地區，凸顯不同資源脈絡下的真實挑戰。

宏觀洞察：護理界的「審慎樂觀」

全球護理人員對 AI 展現出中度至高度的正向態度與基礎素養，但深層的焦慮與系統性障礙抑制了全面採用。



態度剖析：未來人才與臨床主力的視角差異

護理學生

- **趨勢**：高年級生（大三/大四）的AI素養與積極度顯著高於低年級生。
- **性別差異**：男性學生的正向態度得分普遍較高（差異約 0.6–0.8 分）。
- **驅動力**：高度看重 AI 帶來的工作效能提升（Performance Expectancy）。

臨床護理師

- **趨勢**：年輕世代的從業人員展現出顯著較高的樂觀程度。
- **關鍵考量**：態度極度取決於「**臨床實用性**」— 認為 AI 能減少醫療錯誤的護理師，態度得分高達 4.04/5。
- **高階職位**：具備碩士學位與 15 年以上資歷的護理主管，展現更高的 AI 準備度。

AI素養與準備度：單次培訓不足以維持長效改變

高度關聯：受過 AI 培訓或常規使用者的素養得分，顯著優於未受訓者 (62.67 vs. 57.32) 。AI 知識與正向態度呈顯著正相關 ($r \approx 0.40–0.52$) 。

建立一次性的工作坊成效顯著，但必須搭配週期性的「強化模組 (Booster sessions)」與實務演練，才能將短期記憶轉化為持久的數位素養。

驅動科技接受度的核心心理機制

基於 TAM 與 UTAUT 模型研究，以下三大因素可解釋高達 30%–56% 的 AI 採用意願變異：

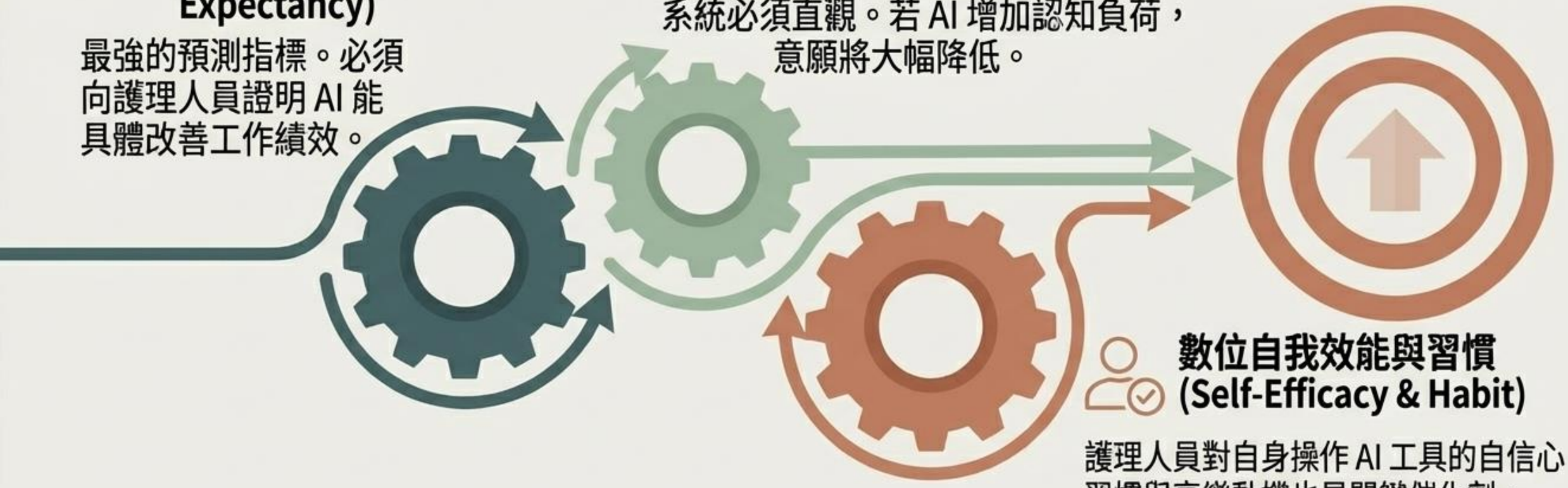
感知有用性 (Performance Expectancy)

最強的預測指標。必須向護理人員證明 AI 能具體改善工作績效。

努力期望與易用性 (Effort Expectancy)

系統必須直觀。若 AI 增加認知負荷，意願將大幅降低。

採用意願 (Adoption Intention)



數位自我效能與習慣 (Self-Efficacy & Habit)

護理人員對自身操作 AI 工具的自信心。習慣與享樂動機也是關鍵催化劑。

擋在門前的阻力：基礎設施痛點與科技焦慮

系統與資源受限：老舊的硬體、系統故障率與互操作性差。

「系統當機時，我們該如何兼顧病患安全？」

科技焦慮與技能退化：高度焦慮會大幅降低準備度（r = −0.549）。學生與護理師皆擔憂過度依賴 AI 會削弱自身的臨床批判性思維。

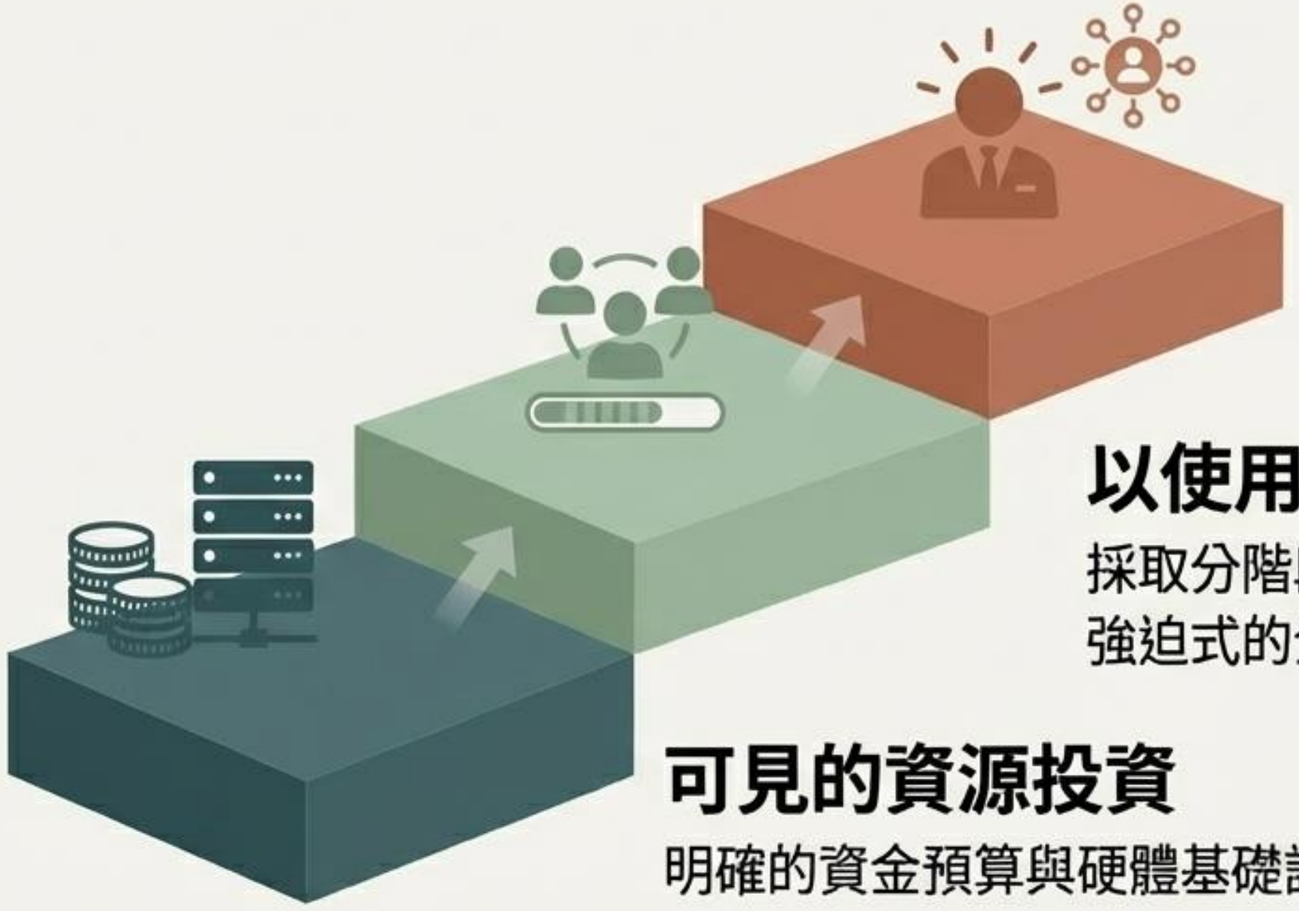
「我們擔心，過於依賴 AI 會讓我們失去獨立思考的能力。」

道德、隱私與信任危機：數據保護協議不明。

機構可能不道德使用AI的擔憂達 2.88 / 5 分

「數據安全和隱私保護是我們最大的顧慮。」

70% 的護理師強調，清晰的高層領導支持是推動 AI 參與的最關鍵決定因素。



設立 AI 倡導者

在第一線選拔並培育對科技友善的護理同儕作為種子導師，帶動單位文化。

以使用者為中心的推廣

採取分階段試點（Phased deployment），而非強迫式的全面上線。

可見的資源投資

明確的資金預算與硬體基礎設施升級。

質性洞察：設立「防護牆」以守護護理核心價值

輔助而非取代

「AI 應該作為『第二意見』，協助我們交叉比對，而非取代人類的臨床專業判斷。」

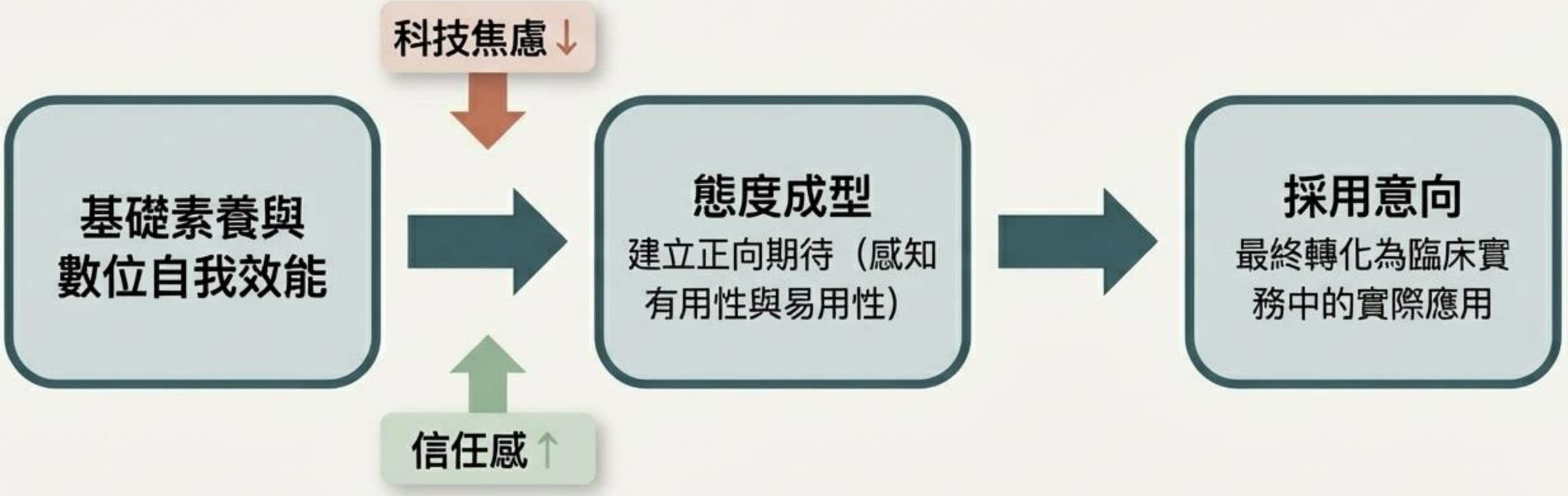
護理本質

「科技無法提供同理心。在擁抱 AI 的同時，我們必須維持以家庭為中心與病患倡導的核心角色。」

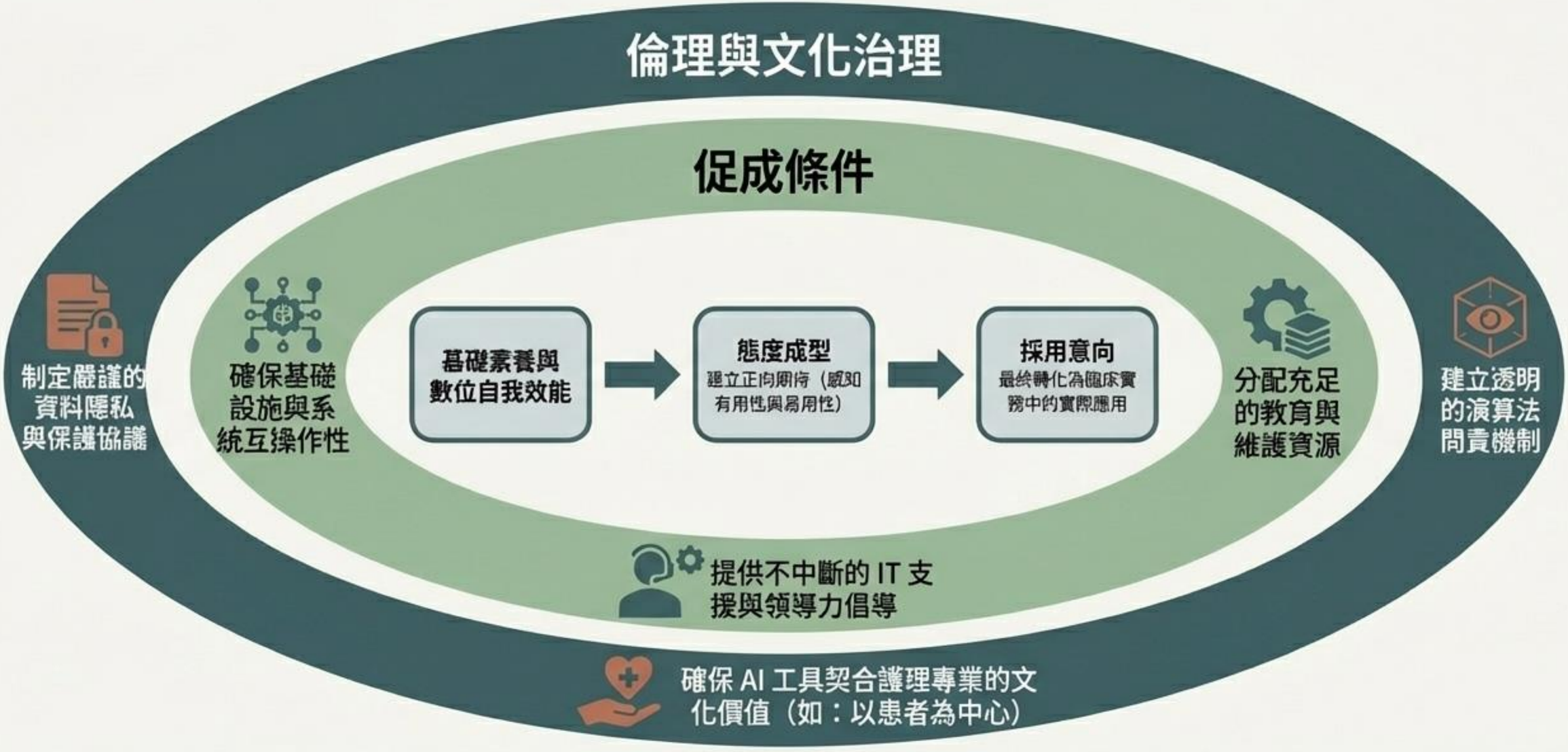
倫理防護牆

「我們迫切需要建立『保護牆』—— 明確的問責制、演算法透明度與知情同意規範，以維繫醫病信任。」

護理 AI 採用多層次概念框架：核心演進路徑



護理 AI 採用多層次概念框架：環境與治理脈絡

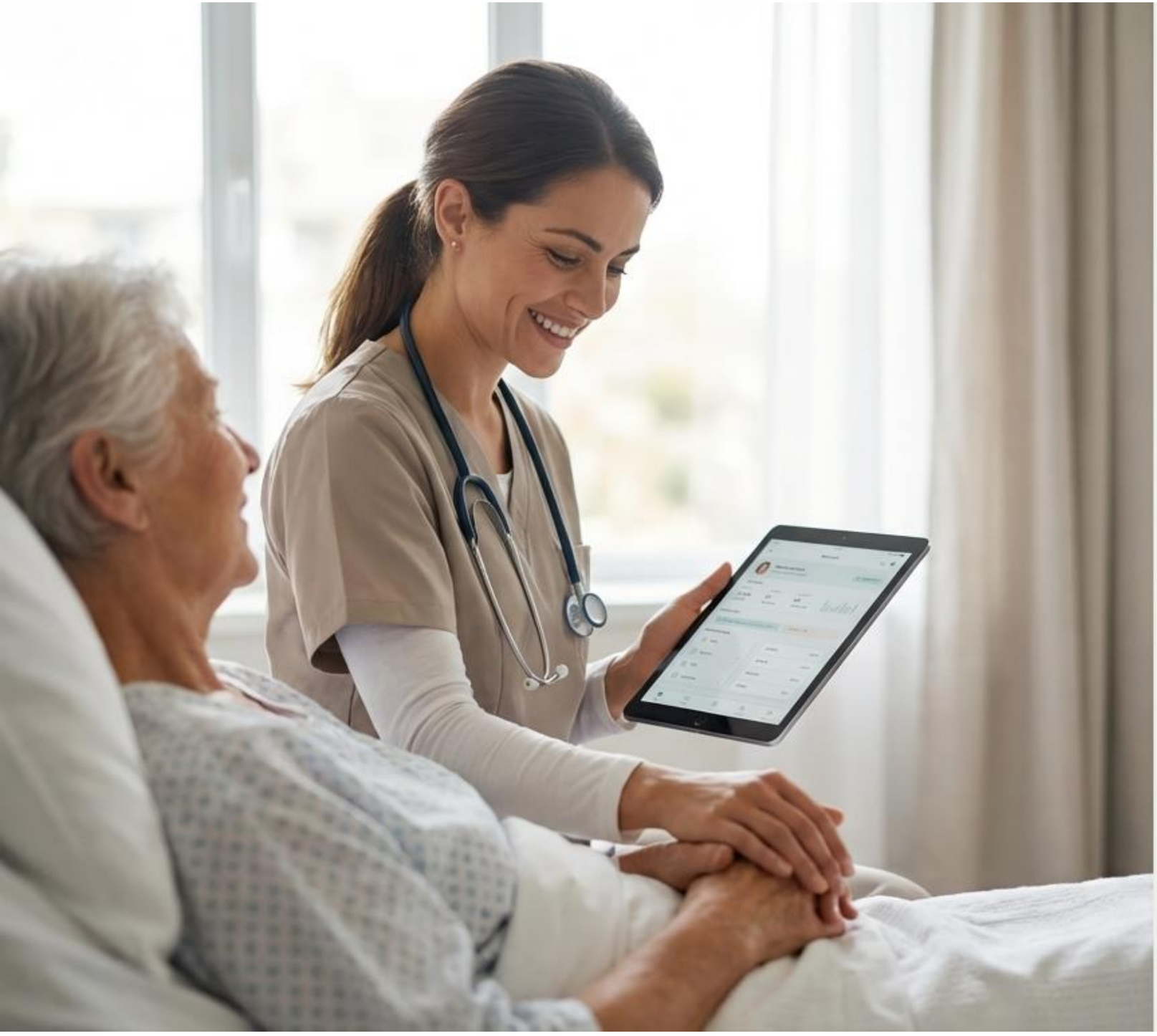


策略行動 I：重塑護理教育體系

- **融入縱向課程**：摒棄單次講座，將 AI 概念從大一基礎理論，逐步延伸至大四的臨床實習與決策模擬。
- ✓ **強化實機模擬**：提供安全的沙盒環境，讓學生實際操作 AI 決策支援系統，建立數位自信並學習識別演算法錯誤。
- ✓ **緩解科技焦慮**：針對女性、低年級等焦慮感較高的次群體，提供針對性的輔導與循序漸進的實作機會。
- ✓ **賦能教育者**：投資教師培訓，並在教學大綱與校級政策中中明確納入 AI 指引，產生倍數效應。

策略行動 II：優化臨床實務與領導

- **無縫整合工作流：**確保 AI 工具與現有電子病歷（EHR）系統高度互通，避免增加護理人員額外的數據登打負擔。
- **建立「AI 倡導者」機制：**於各病房指派受過進階訓練的種子護理師，提供即時的同儕指導與心理支持。
- **迭代式在職培訓：**將 AI 素養納入常規年度考核與繼續教育積分，實施週期性的「強化訓練」，防止技能衰退。
- **真實成本編列：**管理層預算必須涵蓋教育訓練、系統整合與後續 IT 維運，而非僅購買軟體授權。



終極願景：
擴增人性，
而非取代人類

在健全的教育體系、現代化的基礎設施與嚴謹的倫理防護網之下，AI 才能真正成為「擴增」護理同理心與照護品質的最佳利器。

護理的未來不是與演算法競爭，而是掌握 AI 工具，將更多寶貴的時間還給病患，創造醫療安全與工作流的雙贏。

文獻介紹

Artificial intelligence in nursing: a systematic review of attitudes, literacy, readiness, and adoption intentions among nursing students and practicing nurses

El Arab, R. A., Alshakihs, A. H., Alabdulwahab, S. H., Almubarak, Y. S., Alkhalifah, S. S., Abdrbo, A., Hassanein, S., & Sagbakken, M

2025 Sep 25:7:1666005. doi: 10.3389/fdgth.2025.1666005

Appraisal sheets(FAITH)

- **Appraisal Tool**
  - [統合分析 Meta-analysis]
    - **步驟1：研究探討的問題為何 (PICO)**
    - 步驟2：研究的品質如何 (內在效度)
    - 步驟3：研究結果之意義為何 (效益)

NotebookL

步驟 1：系統性文獻回顧探討的問題為何？

研究族群 / 問題 (Population/ Problem)：

- 護理人員及護理系學生

介入措施 (Intervention)：

- 人工智慧(AI)相關接觸

比較 (Comparison)：

- 無特定對照組

結果 (Outcomes)：

- 科技接受度(對AI 的態度、素養、準備度、採用意圖)

NotebookL

Appraisal sheets(FAITH)

- **Appraisal Tool**
  - [統合分析 Meta-analysis]
    - 步驟1：研究探討的問題為何 (PICO)
    - **步驟2：研究的品質如何 (內在效度)**
    - 步驟3：研究結果之意義為何 (效益)

NotebookL

步驟 2：系統性文獻回顧的品質如何?(FAITH)

• 【F】研究是否找到 (Find) 所有的相關證據？

良好的文獻搜尋至少應包括二個主要的資料庫(如：Medline, Cochrane 考科藍實證醫學資料庫, EMBASE 等)，並且加上文獻引用檢索(參考文獻中相關研究、Web of Science, Scopus或 Google Scholar)、試驗登錄資料等。文獻搜尋應不只限於英文，並且應同時使用 MeSH字串及一般檢索詞彙(text words)。

We searched PubMed/MEDLINE, Embase, CINAHL, Scopus, Web of Science, and IEEE Xplore, to capture peer-reviewed and emerging preprint literature in biomedical, nursing, and technology domains. Our strategy combined controlled vocabulary (MeSH/Emtree terms for “Artificial Intelligence”, “Machine Learning”, “ChatGPT” etc.) with keywords for nursing roles (“nurs*”, “nursing student*”) and acceptance constructs (“attitude*”, “readiness”, “UTAUT2”, “TAM”).

TABLE 2 Inclusion and exclusion criteria.

Inclusion criteria
Publication type: Primary empirical studies (analytical cross-sectional surveys; quasi-experimental trials; qualitative studies; mixed methods)
Focus: Investigation of one or more of the following in relation to artificial intelligence in clinical or educational nursing contexts: attitudes, perceptions, AI literacy, readiness, or behavioural intentions
Population: Undergraduate or graduate nursing students; practising nurses (staff nurses, nurse leaders, educators)
Context: Clinical practice or formal nursing education settings
Language: English
Time frame: from inception to 30 May 2025
Exclusion criteria
Publication type: Reviews, meta-analyses, commentaries, editorials, protocols, conference abstracts, dissertations, gray literature
Focus: Studies solely describing technical performance of AI algorithms without reporting nursing stakeholders’ attitudes, literacy, readiness, or intentions
Population: Non-nursing health professionals or students; mixed-profession samples without disaggregated nursing data
Language: Publications in languages other than English

評讀結果：○是○否●不清楚

NotebookL

步驟 2：系統性文獻回顧的品質如何?(FAITH)

• 【F】研究是否找到 (Find) 所有的相關證據？

良好的文獻搜尋至少應包括二個主要的資料庫(如：Medline, Cochrane 考科藍實證醫學資料庫, EMBASE 等)，並且加上文獻引用檢索(參考文獻中相關研究、Web of Science, Scopus或 Google Scholar)、試驗登錄資料等。文獻搜尋應不只限於英文，並且應同時使用 MeSH字串及一般檢索詞彙(text words)。

We defined our eligibility criteria using the Sample, Phenomenon of Interest, Design, Evaluation, Research type tool (SPIDER) (26). Unlike Population, Intervention, Comparison, Outcome (PICO), SPIDER accommodates the conceptual breadth of studies exploring attitudes, literacy, readiness, and behavioural intentions toward AI, ensuring we capture both numerical measures (e.g., survey scores) and rich, contextual insights (e.g., interview themes). Applying SPIDER allowed us to include a wide spectrum of primary empiric work from large cross-sectional surveys to in- depth qualitative inquiries conducted from inception to May 2025. This framework ensured systematic identification of studies that directly address how nursing students and practising nurses perceive, understand, and intend to use AI in clinical and educational settings, while also key determinants, barriers, and facilitators of adoption (see Table 1).

評讀結果：○是○否●不清楚

TABLE 1 SPIDER framework for study eligibility.

Component	Definition
S (Sample)	Undergraduate and postgraduate nursing students; practising nurses (staff nurses, nurse leaders, nurse educators)
PI (Phenomenon of Interest)	Attitudes, perceptions, AI literacy, readiness, and behavioural intentions regarding the adoption of artificial intelligence in clinical practice and nursing education
D (Design)	Analytical cross-sectional surveys; quasi-experimental trials; qualitative studies (individual interviews, focus groups); mixed-methods research.
E (Evaluation)	Quantitative measures (validated scales such as GAAIS, AILS, MAIRS-MS, AIAS, UTAUT/UTAUT2 subscales); thematic findings on determinants, barriers, and facilitators of AI adoption
R (Research type)	Primary empirical studies published in peer-reviewed journals from inception to May 2025, and in English

Appraisal FAITH-步驟 2：系統性文獻回顧的品質如何

【A】文獻是否經過嚴格評讀(Appraisal)?

在文章的方法(Methods)章節，可以找到詳細搜尋策略的說明，包括使用的名詞，結果(Results) 章節中可以找到本篇系統性文獻回顧評估的摘要及全文文獻數目、文獻納入與排除的數量及原因。資料可能會以圖表或 PRISMA 的流程圖呈現。

All records were uploaded into Rayyan for de-duplication (27). Two reviewers independently screened titles and abstracts (RAE and AHA), then full texts, against SPIDER-based eligibility criteria; inter-rater agreement was excellent (Cohen's κ > 0.80). Conficts were resolved through consensus or, if needed, adjudication by a third reviewer (SSA or SHA). The detailed study-selection process is illustrated in Figure 1.

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- 所有記錄皆上傳至 Rayyan 平台進行查重（剔除重複文獻）。
- **兩位評審員**（RAE 與 AHA）根據以 SPIDER 架構為基礎的納入標準，獨立進行了標題與摘要的篩選，隨後進行了全文篩選；評分者間信度表現優異（Cohen’s κ > 0.80）。
- 篩選過程中的分歧透過協商解決，**必要時由第三位評審員**（SSA 或 SHA）進行裁決。

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PRISMA 的流程圖

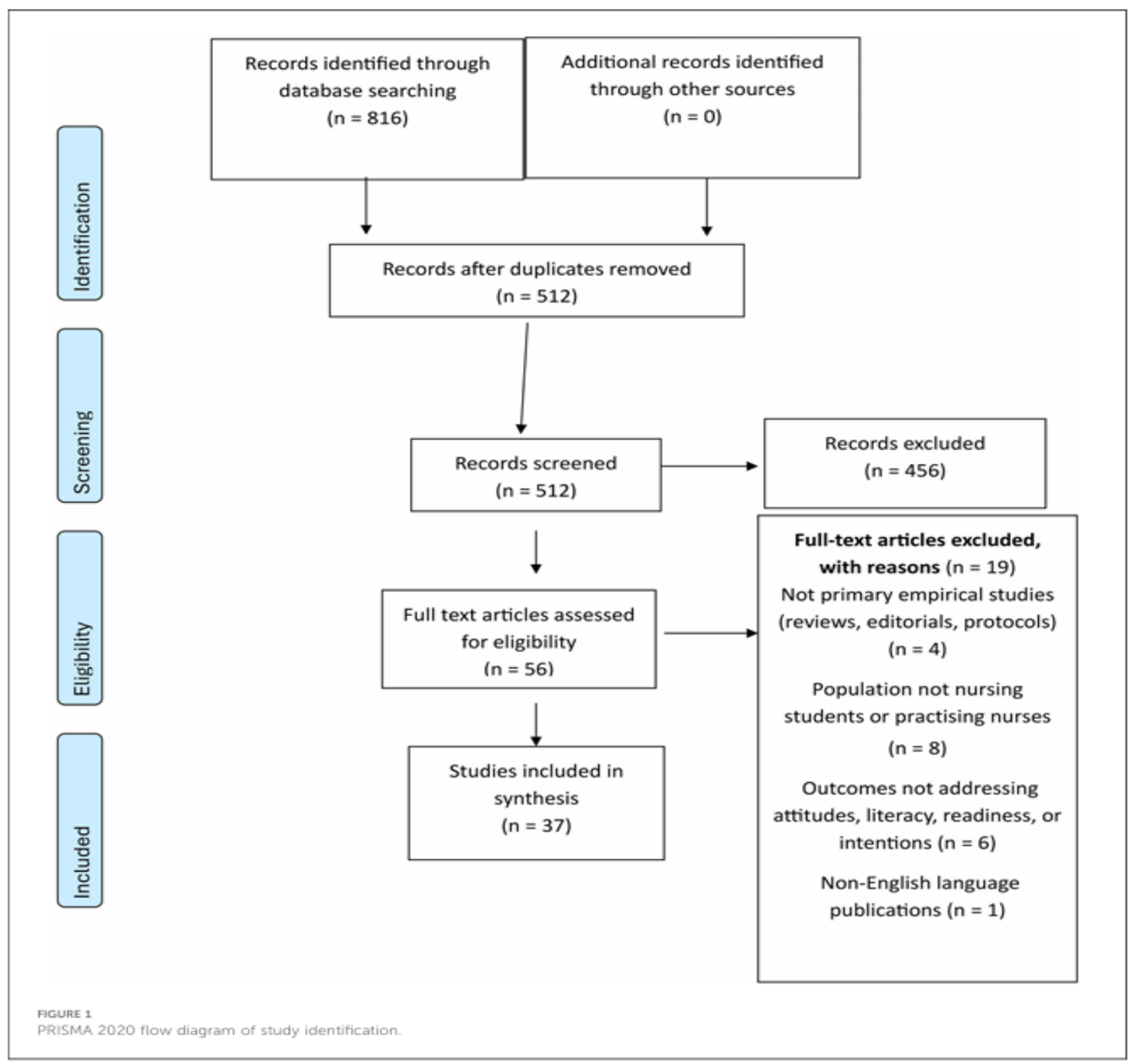

FIGURE 1
PRISMA 2020 flow diagram of study identification.

Supplementary Material 1. Database Search Strategy

Database	Search Strategy	Filters
PubMed/MEDLINE	**Concepts:** "Artificial Intelligence" OR "Machine Learning" OR "Deep Learning" OR "Neural Network*" OR "Natural Language Processing" OR ChatGPT OR "large language model*" AND **Nursing terms:** nurs* OR "nursing student*" OR "registered nurse*" OR "nurse leader*" OR "nurse educator*" AND **Acceptance terms:** attitude* OR perception* OR literacy OR readiness OR "behavioral intention" OR acceptance OR UTAUT OR UTAUT2 OR TAM	English; Humans
Embase	**Concepts:** 'artificial intelligence'/exp OR 'machine learning'/exp OR 'deep learning'/exp OR 'neural network'/exp OR 'natural language processing'/exp OR title/abstract AI terms AND **Nursing terms:** 'nurse'/exp OR 'nursing student'/exp OR title/abstract nurse terms AND **Acceptance terms:** 'attitude'/exp OR 'perception'/exp OR title/abstract acceptance terms	English; Humans
CINAHL	**Concepts:** MH "Artificial Intelligence+" OR TI/AB AI terms AND **Nursing terms:** MH "Nurses+" OR MH "Nursing Students+" OR TI/AB nurse terms AND **Acceptance terms:** MH "Attitude" OR TI/AB acceptance terms	English; Academic journals
Scopus	TITLE-ABS-KEY(AI terms) AND TITLE-ABS-KEY(nurse terms) AND TITLE-ABS-KEY(acceptance terms)	English
Web of Science	TS=(AI terms) AND TS=(nurse terms) AND TS=(acceptance terms)	English; Articles
IEEE Xplore	Full-text search: AI terms AND nurse terms AND acceptance terms	Journals; English

評讀結果：●是○否○不清楚

NotebookL

Supplementary Material 2. Characteristics of Included Studies

Study (Author, Year, Country)	Design & Setting	Population (N)	Measures / Instruments	Analysis & Main Findings
Lukić et al., 2023; Croatia (Lukić et al., 2023)	Cross-sectional, multicenter study at four Croatian undergraduate nursing programmes	336 first-year nursing students)	Modified 20-item General Attitudes towards Artificial Intelligence Scale (GAAIS), five-point Likert, contextualized for nursing	Exploratory factor analysis (four factors) Descriptive statistics, one-sample t-tests vs neutral, one-way ANOVA, Pearson correlation. Found slightly positive overall attitude (64.5 ± 11.7 vs neutral 60, $p<0.001$), favourable "benefits", "willingness" and "dangers" subscales, but unfavourable "practical advantages" subscale.
Yalcinkaya T et al., 2024; Turkey (Yalcinkaya et al., 2024)	Descriptive cross-sectional study at the Faculty of Nursing, state university, west Turkey	291 undergraduate nursing students (48 1st-year; 89 2nd-year; 83 3rd-year; 71 4th-year)	Individual Information Form: General Attitudes towards AI Scale (GAAIS, Turkish version; 20 items, 2 subscales) Medical AI Readiness Scale for Medical Students (MAIRS-MS; 22 items, 4 subscales)	Descriptive statistics and reliability (Cronbach's $\alpha > 0.90$); normality via skewness/kurtosis; inferential: one-sample t-tests against neutral, independent t-tests, one-way ANOVA with Bonferroni post-hoc, Pearson/Spearman correlations. Found moderately positive attitudes and readiness; 4th-year students had significantly higher readiness than 2nd-years ($F = 3.75$; $p = 0.011$); positive attitude–readiness correlation ($r = 0.330$; $p < 0.01$).
Kwak, Seo, et al., 2022; Republic of Korea (Kwak, Seo, et al., 2022)	Cross-sectional survey with path analysis at two nursing schools in Gyeonggi and Jeonnam Provinces, Republic of Korea	210 nursing students 183 (87.1 %) were female and 27 (12.9 %) were male	Four-item scales for performance expectancy, effort expectancy, social influence, facilitating conditions (UTAUT) Self-efficacy (4 items) and anxiety (4 items; Social Cognitive Theory) Behavioral intention (3 items; UTAUT) General Attitudes towards Artificial Intelligence Scale (20 items: 12 positives, 8 negative)	Descriptive statistics; tests of normality (skewness/kurtosis) and multicollinearity (VIF, tolerance); Pearson's correlation Path analysis via SPSS 26.0 and AMOS 26.0; model fit (GFI=0.956, SRMR=0.057, CFI=0.918, PNFI=0.152, ECVI=0.609) Positive attitude ($\beta=0.485$, $p=0.009$) and facilitating conditions ($\beta=0.117$, $p=0.045$) directly predicted intent to use; performance expectancy, self-efficacy, and effort expectancy predicted positive attitude; performance expectancy and self-efficacy negatively predicted negative attitude while anxiety positively predicted it; social influence non-significant
Labrague LJ et al., 2023; Philippines (Labrague et al., 2023)	Cross-sectional study at two government-owned nursing schools in Eastern Visayas, Philippines	200 undergraduate student nurses (157 female [78.5%], 43 males [21.5%])	Attitudes towards AI Technology Scale (12 items; 5-point Likert) AI Utilization in Nursing Practice Scale (modified; 5-point Likert) Intentions to Use AI Technology Scale (3 items; 5-point Likert)	Descriptive statistics; Pearson's correlation; independent t-tests; one-way ANOVA Mediation analysis via Hayes' PROCESS macro (Model 4) Perceived AI utilization directly predicted attitudes ($\beta = 0.450$, $p < 0.001$) and intention to adopt AI ($\beta = 0.458$, $p < 0.001$); attitudes partially mediated this relationship (indirect $\beta = 0.255$; 95% CI 0.173–0.343)
Demir-Kaymak et al., 2024; Turkey	Relational survey at midwifery and nursing	480 students (240 nursing, 240	Personal information form: Medical Artificial Intelligence	Descriptive statistics; inferential (independent t-tests, one-way ANOVA, Pearson correlations); path analysis via SPSS

(Demir-Kaymak et al., 2024)	departments, Sakarya University, Sakarya, Türkiye	midwifery; 25 male [5.2 %], 455 female [94.8 %]; aged 18–42)	Readiness Scale (22 items, four factors; Cronbach's α = 0.934) • Artificial Intelligence Anxiety Scale (21 items, four factors; Cronbach's α = 0.93)	26.0 and AMOS 26.0. Model 1 showed readiness did not significantly predict anxiety (β=0.093, p=0.080). Model 2 (χ^2/df=2.994; CFI=0.947; RMSEA=0.065) found that AI knowledge (β=–0.163, p<0.001) and daily AI use (β=–0.117, p=0.015) predicted readiness; AI trust (β=0.161, p=0.002), perceived occupational threat (β=–0.183, p<0.001), and daily AI use (β=0.135, p=0.009) predicted AI anxiety .
Summers et al., 2024; Australia (Summers et al., 2024)	Qualitative descriptive study with semi-structured interviews at the School of Health, Discipline of Nursing, University of the Sunshine Coast, Australia	13 nursing students (7 female [53.8%], 6 males [46.2%]; 10 domestic, 3 international; 5 first-year, 8 second-year)	Semi-structured interviews, digitally recorded and verbatim transcribed	Thematic analysis using Braun & Clarke's six-phase process; independent coding and team consensus. Six themes emerged, revealing more unfavourable than favourable views of generative AI, recognition of benefits in non-patient-facing tasks, concerns over patient-interaction and academic integrity, generational attitude differences, and recommendations for ethical integration and further research
El-Sayed et al., 2025; Egypt (El-Sayed et al., 2025)	Descriptive, cross-sectional study with moderation analysis at the College of Nursing, Alexandria University, Egypt	596 undergraduate nursing students (after removal of 4 extreme responses) 39.4 % were male (n ≈ 235) and 60.6 % were female (n ≈ 361)	• Innovative Thinking Competencies Scale (17 items; observing, questioning, idea networking, experimenting; α = 0.90) • Scale for the Assessment of Nonexperts' AI Literacy (31 items; technical understanding, critical appraisal, practical application; α = 0.93) • Career and Talent Development Self-Efficacy Scale (18 items; talent development, work habits & values, career exploration; α = 0.92)	Descriptive statistics showed moderate scores on all scales. Pearson correlations indicated CTSE was positively associated with both innovation mindset (r = 0.546, p < 0.01) and AI literacy (r = 0.568, p < 0.01). Moderated linear regression (PROCESS macro v4.2) revealed significant positive effects of innovation mindset (B = 0.154, p = 0.003) and AI literacy (B = 0.221, p < 0.001) on CTSE, with a significant interaction (B = 0.074, p = 0.004), indicating that higher AI literacy strengthens the innovation mindset–CTSE relationship.
Akca Sumengen et al., 2025; Turkey (Akca Sumengen et al., 2025)	Descriptive, correlational, cross-sectional online survey at the Faculty of Nursing, Yeditepe University, Istanbul	205 undergraduate nursing students (180 female [87.8 %], 25 males [12.2 %])	Participant Introduction Form Artificial Intelligence Literacy Scale (AILS; 12 items, four sub-dimensions: awareness, usage, evaluation, ethics; 7-point Likert) General Attitudes Towards Artificial Intelligence Scale (GAAIS; 20 items, positive and negative subscales; 5-point Likert)	Descriptive statistics for sociodemographic, scale scores; Kolmogorov–Smirnov confirmed normality Student's t-tests and one-way ANOVA (with Bonferroni post-hoc) to compare groups Pearson correlations between AILS and GAAIS scores Findings: male students and those with prior AI education or regular AI use had significantly higher AILS and positive GAAIS scores (p<0.001); students perceiving higher income had greater AI literacy (p<0.05); third- and fourth-year students scored higher on AILS usage and attitudes (p<0.05);

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				positive correlations between literacy and positive attitudes (r=0.318–0.519, p<0.001) and negative correlations with negative attitudes (r=–0.138 to –0.215, p<0.05)
Sarman & Tuncay, 2025; Turkey (Sarman & Tuncay, 2025)	Cross-sectional descriptive study at a single university's Faculty of Health Sciences in eastern Turkey; in-person survey conducted in common areas (library, cafeteria) outside classrooms	314 undergraduate nursing students (210 female [66.9%], 104 males [33.1%])	Socio-demographic form Artificial Intelligence Literacy Scale (AILS; 12 items, 4 dimensions; Cronbach's α=0.766) General Attitudes Towards Artificial Intelligence Scale (GAAIS; 20 items; α=0.792) Artificial Intelligence Anxiety Scale (AIAS; 16 items; α=0.942)	Descriptive statistics; normality tests (skewness/kurtosis); inferential: t-tests, ANOVA, Mann-Whitney U, Kruskal-Wallis H, Pearson/Spearman correlations; mediation analysis via Hayes' PROCESS macro in R 88.5% reported knowing AI; 63.7% aware of ChatGPT; 73.6% used AI AI literacy correlated positively with attitudes (r=0.433, p<0.01) and with anxiety (r=0.322, p<0.01) Mediation analysis showed AI anxiety partially mediated the effect of AI literacy on general attitudes (indirect effect's 95% CI excluded zero)
Hamad et al., 2025; Egypt (Hamad et al., 2025)	Descriptive cross-sectional survey at the Faculty of Nursing, Alexandria University, Egypt	600 undergraduate nursing students included (after attrition), 419 (69.8 %) were female and 181 (30.2 %) were male	General Attitudes Towards Artificial Intelligence Scale (20 items; positive/negative subscales) Technology Acceptance Model questionnaire (12 items; perceived usefulness & ease of use) Demographic and AI-experience form	Descriptive statistics; independent t-tests; one-way ANOVA; Pearson correlations (GA–PU r = 0.423, p < 0.001); Linear regression identifying predictors of GA (female B = 2.950, p < 0.001; prior AI training B = 3.012, p < 0.001; "friends" as info source B = –1.979, p = 0.005; academic level B = 0.602, p = 0.024) and of PU (academic level B = 0.528, p < 0.001; AI training B = 1.630, p < 0.001; female B = 1.191, p < 0.001; "internet" as info source B = –1.265, p = 0.021)
Rony, Kayesh, et al.,2024; Bangladesh (Rony, Kayesh, et al., 2024)	Descriptive qualitative study at three tertiary-level private hospitals in Dhaka city, Bangladesh	23 nursing professionals (purposively sampled senior staff nurses, charge nurses, nurse managers, lecturers; 10 domestic, 3 international)	Semi-structured interviews (audio-recorded, verbatim transcribed)	Thematic analysis (Braun & Clarke's six-phase process) with line-by-line coding, constant comparative method, independent coding and team consensus; identified ten key themes showing a balance of optimism and caution, highlighting needs for training, ethical safeguards, and a symbiotic AI–nurse partnership to enhance patient-centred care
Ramadan et al., 2024; Saudi Arabia (Ramadan et al., 2024)	Descriptive qualitative study using focus groups at four major healthcare facilities in Al-Kharj (general, defence, maternal–	48 registered nurses (37 female [77.1 %], 11 males [22.9 %]; mean age 36.7 ± 8.4 y,	Semi-structured focus-group interview guide (domains: AI understanding; facilitators; barriers; attitudes) Demographic questionnaire Field-notes template	Thematic analysis (Braun & Clarke six-phase): identified 4 themes and 12 subthemes (understanding, facilitators, barriers, attitudes). Participants held mainly positive yet cautious views of AI, emphasising the need for leadership commitment, user-centred design, robust training, ethical safeguards, and infrastructure upgrades. Proposed an

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	child, and university hospitals)	mean experience 11.3 ± 7.2 y)		extended TAM-AIN framework incorporating ethical alignment, organisational readiness, professional identity preservation, and technical capacity .
Alruwaili et al., 2024; Saudi Arabia (M. M. Alruwaili et al., 2024)	Descriptive cross-sectional design at three governmental hospitals (King Abdulaziz, Prince Mut'eb, Domat Al-Jandal) in Jouf region, northern Saudi Arabia	220 registered nurses	Demographic questionnaire Nurses' AI knowledge questionnaire (7 items, yes/no; Swed et al.) General Attitudes Towards AI Scale (GAAIS; 20 items; 5-point Likert; Schepman & Rodway)	Descriptive statistics (frequencies, percentages; means ± SD); χ^2 tests for associations: – Moderate awareness (58.2–70.9%) and moderate attitudes (item means 2.87–3.66) – Female nurses exhibited more negative attitudes (χ^2=4.67, p=0.03) – Younger nurses more positive (χ^2=9.31, p=0.02) – No significant effects of marital status or years' experience
Almagharbeh et al., 2025; Jordan (Almagharbeh et al., 2025)	Exploratory descriptive qualitative study using semi-structured interviews (n=25) and three focus-group discussions (7–8 participants each) with registered nurses in public and private healthcare facilities across Amman, Jordan	25 nurses (individual interviews) and 3 focus groups of 7–8 nurses each (total FG participants 21–24)	Semi-structured interview guide Focus-group discussion guide	Thematic analysis via Braun & Clarke's six-phase method using NVivo 14; independent coding with team consensus. Three overarching themes emerged: (1) AI as an enabler of efficiency; (2) ethical and practical challenges; (3) need for structured training and education to support safe, effective AI integration
Abou Hashish & Alnajjar, 2024; Saudi Arabia (Abou Hashish & Alnajjar, 2024)	Descriptive correlational, cross-sectional survey at College of Nursing-Jeddah, King Saud bin Abdulaziz University for Health Sciences, Jeddah (female-only)	266 third- and fourth-year undergraduate nursing students (all female	Structured six-section questionnaire: Personal information form Knowledge of Digital Transformation (19 items) Attitudes toward Digital Transformation (11 items) Digital Skills (6 items) Digital Health Literacy (8 items) Attitudes toward AI (5 items) All on 5-point Likert scales	Descriptive statistics; Student's t-test and one-way ANOVA for academic-level comparisons; Pearson correlation: – High digital transformation knowledge, skills, and DHL; moderate positive ATD and AAI – Knowledge significantly correlated with ATD, DS, DHL, AAI ($p < 0.001$) – 4th-year students scored higher than 3rd-years on knowledge, DS, and DHL ($p < 0.05$) but not on ATD or AAI – Key facilitators: reliable internet, tool availability, public awareness; barriers: user knowledge gaps, resource constraints
Hussein Mohamed et al., 2023; Egypt	Quasi-experimental pre–post intervention study in medical and surgical departments at Mansoura University Hospitals	203 staff nurses (180 female [88.7 %], 23 male [11.3 %])	Self-administered AI Knowledge Questionnaire (12 domains; true/false; scored 0–2 per item) General Attitudes towards AI Scale (24 items; 5-point Likert;	Descriptive statistics; chi-square for knowledge items; one-way ANOVA for attitude items Knowledge "satisfactory" rose from 16.3 % pre-intervention to 82.8 % immediate post (all $\chi^2 > 125$, $p < 0.001$) and declined to 68.0 % at 3-month follow-up Positive attitude increased from 26.1 % pre to 81.8 % post (F

(Hussein Mohamed et al., 2023)			adapted from Schepman & Rodway)	= 65.2, p < 0.001) and fell to 63.5 % at follow-up Educational program had highly significant positive effects on both knowledge and attitudes across all domains.
Ahmed et al., 2024; Egypt (Ahmed et al., 2024)	Exploratory research design at Minia University Hospital, a pediatric–obstetric university hospital, and a kidney disease & urology hospita	455 staff nurses in 254 (55.8 %) were female and 201 (44.2 %) were male	Perception toward AI questionnaire (adapted from Abdullah & Fakieh 2020): 4 dimensions—perception (4 items), benefits (5 items), implementation challenges (5 items), perceived barriers (7 items); 5-point Likert General Attitudes toward AI questionnaire (adapted from Schepman & Rodway 2020): 20 items; 5-point Likert	Descriptive statistics; independent t-tests and one-way ANOVA to compare groups; Spearman correlation between perception and attitude. Found moderately positive perception and attitude toward AI; highest perception for "AI reduces medical errors" (4.04 ± 0.96); no significant differences by hospital, age, gender, or residence, while education level and <15 years' experience showed higher scores (P = 0.018); strong positive correlation between perception and attitude (r = 0.715, P < 0.001)
Rony, Numan, Johra, et al., 2024; Bangladesh (Rony, Numan, Johra, et al., 2024)	Descriptive, phenomenological qualitative study using in-depth interviews at five tertiary-level health care institutions in Dhaka, Bangladesh	37 nurse practitioners	Semi-structured interview guide; face-to-face or video-conference interviews (50–60 min), audio-recorded and verbatim-transcribed	Thematic analysis via Braun & Clarke's six-phase process, with member checking and peer debriefing; uncovered a balanced mix of optimism and caution, highlighting AI's potential to enhance patient care, the imperative for ethical safeguards, structured training, and collaborative frameworks for responsible integration
Salama et al., 2025; Palestine (Salama et al., 2025)	Cross-sectional survey at eight private and governmental universities in the West Bank, Palestine, using an online self-administered questionnaire via Google Forms	304 nursing students (215 female [70.7 %], 89 male [29.3 %])	Multi-section KAP questionnaire: Demographics AI knowledge (definitions, machine learning, applications) Attitudes toward AI and ChatGPT (benefits, concerns, integration) Practices of AI and ChatGPT use	Descriptive statistics (frequencies, percentages, mean ± SD), chi-square tests, independent t-tests and one-way ANOVA (p<0.05); revealed high AI awareness (84.5 %) but limited formal education (41.8 %), strong support for curricular inclusion (79 %) yet concerns about errors (62.2 %), moderate AI use (58.6 %) and low ChatGPT adoption (33.9 %), with significant differences by gender, age and academic year
Kahraman et al., 2025; Türkiye (Kahraman et al., 2025)	Descriptive cross-sectional online survey of perioperative nurses across surgical units in Türkiye, using snowball sampling via mobile, email, and social media	505 perioperative nurses (399 female [79.0 %], 106 male [21.0 %]	• Nurse Information Form (demographics; AI training, awareness, use; perceived workload impact; IT proficiency) • AI Literacy Scale (12 items; four subdimensions—Awareness, Use, Evaluation, Ethics; 7-point Likert; Cronbach's α = 0.821)	Descriptive statistics (means, SDs, frequencies); normality via skewness/kurtosis Inferential: independent t-tests, dependent t-tests, one-way ANOVA, Pearson correlations (p<0.05) Male nurses scored significantly higher on Awareness, Use, Evaluation, and total literacy (p<0.05) Nurses who had heard of or used AI, who believed AI reduces workload, and with higher IT proficiency had higher literacy (p<0.05)

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				Age inversely correlated with literacy (r=–0.179 to –0.061; p<0.05)
Rony, Numan, Akter, et al., 2024 Bangladesh (Rony, Numan, Akter, et al., 2024)	Hermeneutic phenomenology qualitative study at four tertiary hospitals in Dhaka; purposive sampling of registered nurses with ≥ master's degree and semi-structured interviews	20 registered nurses (12 female [60 %], 8 male [40 %]; age 28–52 y, mean 37.2 y)	Semi-structured interview guide (validated via pilot and expert review); 50–60 min audio-recorded, verbatim-transcribed individual interviews in Bangla	Thematic analysis using Braun & Clarke's six-phase process within a hermeneutic phenomenological framework, with member checking and an audit trail; revealed nurses' emphasis on robust ethical safeguards, data privacy, human-centred AI adoption, and the need for structured training and organizational support
Al Omari et al., 2024; Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Saudi Arabia, UAE (Al Omari et al., 2024)	Descriptive cross-sectional online survey via convenience sampling across 10 Arab countries	1 713 nursing students (mean age 22.45 ± 3.56 y; 1 183 female [69.1 %], 530 male [30.9 %])	Demographic form Intention to use AI scale (3 items, 5-point Likert; α = 0.873) Knowledge of AI scale (8 items, 3-point Likert; α = 0.811) Perception of AI scale (10 items, 5-point Likert; α = 0.885) Attitude towards AI scale (3 items, 5-point Likert; α = 0.890)	Descriptive statistics; bivariate (t-tests, ANOVA); Pearson correlations; multiple linear regression (final model $F = 126.283$, $p < 0.001$, $R^2 = 0.342$): perception (β = 0.295), attitude (β = 0.211), knowledge (β = 0.061), age (β = 0.074), AI understanding (β = 0.092), self-rated tech-savviness (β = 0.108), clinical performance (β = 0.060) all independently predicted intention to use AI
Cho & Seo, 2024; South Korea (Cho & Seo, 2024)	Descriptive, cross-sectional study at two nursing schools in Gyeonggi Province and Gwangju Metropolitan City	180 nursing students, 26 (14.4 %) were male and 154 (85.6 %) were female .	Shinners Artificial Intelligence Perception tool (10 items; preparedness & professional impact subscales; 5-point Likert) Anxiety about AI scale (4 items; 5-point Likert; adapted from TAM) Acceptance attitude toward AI scale (4 items; 5-point Likert; TAM) Intention to use AI scale (3 items; 5-point Likert; TAM)	Descriptive statistics: means, SDs; independent t-tests, one-way ANOVA; Pearson correlations Mediation analysis via PROCESS Macro model 6 (10 000 bootstrap samples): perception negatively predicted anxiety (b = –0.420, $p < 0.001$) and positively predicted acceptance attitude (b = 0.541, $p < 0.001$); acceptance attitude (b = 0.246, $p < 0.001$) and perception (b = 0.280, p = 0.002) directly predicted intention to use AI; total indirect effect 0.198 (95 % CI 0.095–0.322) with significant dual mediation (b = 0.026; 95 % CI 0.004–0.066)
Atalla et al., 2024; Egypt (Atalla et al., 2024)	Cross-sectional descriptive correlational study at Alexandria Main University Hospital, Egypt	415 registered nurses (347 female [83.6 %], 68 male [16.4 %])	Socio-demographic form Perception of AI use scale (14 items; 5-point Likert) General Attitudes Towards AI Scale (GAAIS; 20 items; 5-point Likert) Ethical Awareness of AI scale (12	Descriptive statistics; independent t-tests and one-way ANOVA; Pearson correlations Linear regression with interaction terms (SPSS v23): attitude positively predicted innovation (B = 1.796, p = 0.001) and ethical awareness did likewise (B = 2.567, p = 0.013); ethical awareness moderated the attitude–innovation link (interaction

			items; 5-point Likert) Employee Innovative Behavior Scale (23 items; 5-point Likert)	B = 0.038, p = 0.002) but not the perception–innovation link (interaction B = 0.005, p = 0.767)
Kotp et al., 2025; Egypt (Kotp et al., 2025)	Descriptive cross-sectional study among nurse leaders (supervisors, CNOs, managers, educators, quality specialists) across nine private hospitals in Cairo, selected via multistage random and convenience sampling	187 nurse leaders	Nurse Leaders' Readiness for AI Integration Survey (20 items; 4-point Likert; three factors: Leadership Initiatives, Staff Engagement, Technical Readiness) Perceived Benefits of AI-Driven Predictive Analytics Survey (10 items; 5-point Likert; two factors: Patient Care & Outcomes, Decision-Making Support)	EFA: three-factor readiness model (loadings 0.760–0.842) and two-factor benefits model (loadings 0.756–0.836) CFA: readiness (χ^2/df=2.945; CFI=0.950; GFI=0.920; AGFI=0.892; RMSEA=0.069; RMR=0.054); benefits (χ^2/df=2.732; CFI=0.953; GFI=0.928; AGFI=0.887; RMSEA=0.067; RMR=0.050) Reliability: Cronbach's α readiness=0.90 (test–retest r=0.854); benefits=0.89 (test–retest r=0.834) Findings: 29.2% low, 34.0% moderate, 36.8% high readiness (mean low 65.05 ± 11.08); overall benefits mean 39.66 ± 4.32; readiness positively correlated with perceived benefits; age, education, and role significantly predicted readiness (R^2=0.375) and benefits (R^2=0.400)
Alruwaili et al., 2025; Saudi Arabia (A. N. Alruwaili et al., 2025)	Interpretive phenomenological qualitative study across four high-risk Neonatal Intensive Care Units in the Eastern Region of Saudi Arabi	33 neonatal nurses (29 female [87.9 %], 4 male [12.1 %]; roles: 20 staff nurses, 8 charge nurses, 5 unit coordinators)	Semi-structured individual interview guide Focus-group discussion guide Demographic questionnaire Field-notes template	Thematic analysis (Braun & Clarke six-phase) using NVivo, with inductive–deductive coding, investigator triangulation, member-checking, reflexive journaling, and peer debriefing. Five overarching themes emerged: (1) AI as a complementary "second opinion" preserving autonomy, (2) enhanced critical thinking and proactive risk assessment, (3) shifting nurse roles toward consultative strategists, (4) dependence on robust infrastructure, training, and clear protocols, (5) cultural and systemic factors shaping adoption, alongside pragmatic workarounds and recommendations for context-aware, EHR-integrated, user-friendly AI tools
Tuncer & Tuncer, 2024; Turkey (Tuncer & Tuncer, 2024)	Descriptive cross-sectional online survey of professional nurses who follow a nursing-focused Instagram account, using convenience sampling via Google Forms	288 registered nurses (260 female [90.3 %], 28 male [9.7 %])	Information Identification Questionnaire for ChatGPT and AI Programs (8 items on awareness, professional development, integration in care plans) General Attitudes to Artificial Intelligence Scale (GAAIS; 20-item Turkish version; Positive/Negative subscales)	Descriptive statistics (frequencies, percentages, means ± SD); Pearson correlations; independent samples t-tests; one-way ANOVA with Bonferroni post-hoc; Kruskal–Wallis for non-parametric comparisons. Found that higher education level, AI knowledge and use were significantly associated with more positive AI attitudes; demographic and experience variables showed significant group differences in GAAIS scores
Sabra et al., 2023; Egypt	Descriptive correlational cross-sectional study at Qena	200 registered nurses (128	Personal data sheet (6 items: age, gender, social status, qualifications, years of	Descriptive statistics (frequencies, percentages; means ± SD); chi-square tests showed perception varied by gender and social status (p<0.01), and attitude varied by age (p=0.047),

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(Sabra et al., 2023)	University Hospitals (medical, surgical, ICUs, and operation units)	female [64.0 %], 72 male [36.0 %])	experience, unit) Perception of AI scale (14 items; 3 subscales: knowledge [4 items], advantages [5], problems [5]; 5-point Likert) by Abdullah (2020) Attitude towards AI scale (14 items; 5-point Likert; negative vs positive scoring) by Sindermann et al. (2021)	qualifications ($p=0.005$), years of experience ($p=0.010$), and social status ($p<0.01$)
Alenazi & Alhalal, 2025; Saudi Arabia (Alenazi & Alhalal, 2025)	Cross-sectional, multicentre survey at three public and private universities in Riyadh, Saudi Arabia	500 undergraduate nursing students (376 female [75.2 %], 124 male [24.8 %])	Arabic-adapted UTAUT2 questionnaire (30 items; subscales: performance expectancy 4; effort expectancy 4; social influence 3; facilitating conditions 4; hedonic motivation 3; price value 3; habit 3; behavioral intention 3; use behavior 3; all 5-point Likert)	Structural equation modeling with CFA and SEM: performance expectancy ($\beta = 0.235$, $p = 0.004$), facilitating conditions ($\beta = 0.233$, $p = 0.026$), hedonic motivation ($\beta = 0.371$, $p < 0.001$) and habit ($\beta = 0.458$, $p < 0.001$) predicted behavioral intention; behavioral intention ($\beta = 0.702$, $p < 0.001$), facilitating conditions ($\beta = 0.271$, $p = 0.006$) and habit ($\beta = 0.316$, $p < 0.001$) predicted actual use; intention mediated effects of performance expectancy, hedonic motivation and habit on use; gender moderated the effects of intention on use ($\Delta\beta = 0.613$, $p = 0.005$) and of facilitating conditions on use ($\Delta\beta = -0.440$, $p = 0.023$)
Şimşek et al., 2025; Turkey (Şimşek et al., 2025)	Descriptive–correlational study at Koç University (Istanbul) and Bilecik Şeyh Edebali University (Bilecik), Turkey	441 undergraduate nursing students (314 female [71.2 %], 127 male [28.8 %])	Nursing Students Competency Scale (CINS; 43 items, 6 subscales; 7-point Likert) General Attitudes to Artificial Intelligence Scale (GAAIS; 20 items; 5-point Likert) Generative Artificial Intelligence Acceptance Scale (GAIAS; 20 items; 5-point Likert)	Descriptive statistics and linear regression showed that facilitating conditions, social influence, and negative attitudes toward AI significantly predicted clinical competence; positive attitudes and acceptance accounted for 8.6 % of variance in competence ($R^2=0.086$, $p<0.01$)
Mariano et al., 2025; Saudi Arabia (Mariano et al., 2025)	Cross-sectional descriptive correlational online survey via Google Forms, distributed by convenience and snowball sampling among staff nurses, nursing faculty, and students across four	349 staff nurses sparticipants (315 female [90.3 %], 34 male [9.7 %])	Sociodemographic form AI knowledge test (10 MCQs; scored 0–1) Attitudes toward AI scale (12 items; 5-point Likert) Practice/experience in AI scale (12 items; 5-point Likert	Descriptive statistics (frequencies, means, SDs); Spearman's correlations showing significant positive associations between knowledge and attitudes ($r = 0.451$, $p < 0.01$), knowledge and practice ($r = 0.404$, $p < 0.01$), and attitudes and practice ($r = 0.439$, $p < 0.01$)

	government universities, two private medical colleges, and six public hospitals/clinics in Saudi Arabia			
Oweidat et al., 2025; Jordan (Oweidat et al., 2025)	Descriptive correlational cross-sectional survey at four governmental hospitals in Jordan (Princess Basma Teaching Hospital; Princess Raya Governmental Hospital; Ramtha Governmental Hospital; Yarmouk Governmental Hospital)	116 registered nurses (39 female [33.6 %], 77 male [66.4 %])	Sociodemographic form AI engagement questionnaire: 40 items across four subscales (knowledge, attitudes, practices, barriers; 5-point Likert) Intent to Stay scale: 10 items (5-point Likert)	Descriptive statistics (means, SDs, frequencies, percentages); Pearson correlations; multivariate linear regression ($R = 0.75$, $R^2 = 0.56$) identified attitudes ($\beta = 0.34$, $P < 0.001$), practices ($\beta = 0.29$, $P < 0.001$), and knowledge ($\beta = 0.22$, $P < 0.01$) as positive predictors of intent to stay, while barriers negatively predicted intent to stay ($\beta = –0.14$, $P < 0.05$)
Ünal & Avcı, 2024; Turkey (Ünal & Avcı, 2024)	Cross-sectional descriptive survey via Google Forms of neonatal intensive care nurses in Ankara, Turkey	107 neonatal nurses (33 female [30.8 %], 74 male [69.2 %])	Sociodemographic form Artificial Intelligence Anxiety Scale (AIAS; 16 items, four subscales: learning, job change, sociotechnical blindness, AI configuration; 5-point Likert; α=0.986) Medical Artificial Intelligence Readiness Scale (MAIRS; 22 items, four sub-dimensions: cognitive, skill, foresight, ethical; 5-point Likert; α=0.984)	Descriptive statistics; scale reliabilities via Cronbach's α; Spearman's correlation between AIAS and MAIRS ($r = –0.549$, $p < 0.01$); Mann–Whitney U tests showing AIAS and MAIRS score differences by demographics and AI familiarity (all $p < 0.05$). Concluded that higher AI anxiety is linked to lower readiness, while higher education and AI knowledge predict greater readiness and reduced anxiety
Kwak, Ahn et al., 2022; Republic of Korea (Kwak, Ahn, et al., 2022)	Cross-sectional survey at a nursing college in Gyeonggi-do, South Korea	189 nursing students (162 female [85.7 %], 27 male [14.3 %])	Test for Artificial Intelligence Ethics Awareness (TAIEA; 24 items; 5-point Likert) General Attitudes Towards AI Scale (GAAIS; 20 items; 5-point Likert) TAM-based scales: anxiety (4 items), self-efficacy (4 items), behavioral intention (3 items); all 5-point Likert	Descriptive statistics; t-tests; Pearson correlations; hierarchical multiple regression ($R^2 = 0.44$) showed positive attitude ($\beta = 0.49$, $p < 0.001$) and self-efficacy ($\beta = 0.22$, $p = 0.002$) significantly predict behavioral intention

Tsiara et al., 2025; Greece (Tsiara et al., 2025)	Cross-sectional survey of undergraduate nursing students at the Department of Nursing, Faculty of Health Sciences, University of Thessaly, Larissa, Greece	159 nursing students (46 male [28.9 %], 112 female [70.4 %], 1 other [0.6 %])	General Attitudes Toward AI Scale (GAAIS; 20 items, two subscales: positive/negative attitudes; 5-point Likert) Ten-Item Personality Inventory (TIPI; Big Five traits; 7-point Likert)	Descriptive statistics and reliability (Cronbach's α: GAAIS 0.790; negative subscale 0.670; TIPI subscales α 0.016–0.571) Confirmatory factor analysis of GAAIS: χ^2/df 1.777; CFI 0.800; GFI 0.984; SRMR 0.083; RMSEA 0.070, supporting two-factor model Pearson correlations: positive vs negative attitudes r = –0.233 (p = 0.006); Extraversion vs negative attitudes r = –0.181 (p = 0.030); Openness vs positive attitudes r = 0.166 (p = 0.043); maternal education inversely associated with negative attitudes (F = 4.771; p = 0.010)
Jalal et al., 2025; Saudi Arabia (Jalal et al., 2025)	Cross-sectional survey at three major healthcare facilities in Al-Ahsa among registered nurses in ICUs, medical, surgical, emergency and outpatient units	246 registered nurses (188 female [76.4 %], 58 male [23.6 %])	guided by SPSS-based inferential framework Structured questionnaire (validated by expert panel; pilot tested; Cronbach's α = 0.916) consisting of: – Demographics (age, gender, education, role, experience, nationality, AI-IPC training) – Knowledge of AI in IPC (20 MCQs; scored 0–20; categorized poor/average/good) – Perceptions & attitudes (5 Likert items; 1–5; categorized negative/neutral/positive) – Perceived barriers (closed-ended checklist: training, technical, ethical, resource, support)	Descriptive statistics (means, SDs, frequencies) Chi-square tests for associations between knowledge level and demographics (age, education, role, AI training significant; no gender or nationality effect) SPSS v21 used; p < 0.05 threshold Findings highlight moderate overall knowledge but notable gaps in subdomains (surface disinfection, hand hygiene), generally positive yet cautious attitudes, and multilevel barriers emphasizing need for structured training, resource allocation, and ethical safeguards to optimize AI-driven IPC integration.
Chen et al., 2025 (China) (Chen et al., 2025)	Descriptive qualitative study; semi-structured interviews conducted at three medical universities and three affiliated hospitals in Shanghai, Suzhou, and Chengdu	12 nursing professionals (educators and clinical practitioners)	Semi-structured interview guide	Qualitative content analysis yielded three overarching themes with 11 sub-themes: 1. Potential of AI-driven nursing: decision-support tools; documentation assistance; robots for high-risk or physically demanding tasks; embodied intelligence for care activities. 2. Multi-dimensional response: prioritizing education/research; exploring application scenarios; fostering deep interdisciplinary collaboration. 3. Obstacles: human–technology–machine interaction

NotebookL

Appraisal FAITH-步驟 2：系統性文獻回顧的品質如何

【I】是否只納入 (Included) 具良好效度的文章？

僅進行文獻判讀是不足夠，系統性文獻回顧只納入至少要有一項研究結果是極小偏誤的試驗。在文章的方法章節，可以找到文章評估的方式，及由誰完成評估的，在結果章節則會提供審查者意見一致性的程度。

In order to ensure a rigorous and transparent evaluation of study quality, we employed the Joanna Briggs Institute (JBI) Critical Appraisal tools tailored to each study design, as described in the JBI Manual for Evidence Synthesis (29–33). For the analytical cross-sectional surveys, we applied the eight-item JBI Analytical Cross-Sectional Checklist, scoring each item dichotomously ("Yes"/"No") to yield a total from 0 to 8. The single quasi-experimental trial was appraised using the nine- item JBI Quasi-Experimental Studies Checklist, which adds criteria for causal linkage, control group presence, multiple measurement points, consistency of outcome measurement, and instrument reliability. For the qualitative inquiries, we used the ten-item JBI Critical Appraisal Checklist for qualitative research. Two reviewers (RAE, YSA) independently conducted all appraisals, discrepancies were resolved by consensus or, if needed, adjudication by a third reviewer (AA or SH). To characterize internal validity, we assessed risk of bias separately from methodological quality. For cross-sectional and quasi- experimental designs, we applied the JBI bias domains for observational studies and the ROBINS-I tool for non- randomized interventions (34). Qualitative studies were judged against five JBI bias domains; selection, investigator, data- collection, analysis, and reporting bias with overall risk of bias synthesized accordingly. Extracted item-level responses, domain judgments, and overall risk ratings were recorded in a pre- piloted data collection form, and summary statistics were generated to convey the distribution of quality and bias ratings across the body of evidence. This structured, multi-tool approach provides a robust foundation for interpreting the strength and trustworthiness of our subsequent syntheses

- 為了確保對研究品質進行嚴謹且透明的評估，我們採用了針對各種研究設計量身定制的Joanna Briggs Institute, JBI批判性評估工具，如《JBI 證據合成手冊)。
- 對於橫斷面調查，應用了包含 8 個項目的 JBI 分析性橫斷面清單，對每個項目進行二分法評分（「是」/「否」），得出 0 到 8 分的總分。
- 唯一的一項準實驗研究則使用包含 9 個項目的 JBI 準實驗研究清單進行評估，該清單增加了關於因果聯繫、對照組設置、多個測量點、結果測量一致性以及工具信度等準則。
- 對於質性探討，使用了包含 10 個項目的 JBI 質性研究批判性評估清單。
- 兩位評審員（RAE 與 YSA）獨立進行了所有評估，分歧透過協商解決，必要時由第三位評審員（AA 或 SH）裁決。
- 為了界定內部效度，將偏倚風險（risk of bias）與方法學品質分開評估。對於橫斷面和準實驗設計，我們應用了 JBI 觀察性研究偏倚領域以及針對非隨機干預研究的 ROBINS-I 工具 。質性研究則根據五個 JBI 偏倚領域（選擇、研究者、資料收集、分析及報告偏倚）進行判定，並據此綜合評估整體偏倚風險。
- 提取的各項目評分、領域判定及整體風險評級皆記錄在預試過的資料收集表單中，並生成匯總統計數據，以呈現整份證據體在品質與偏倚評級上的分布情況。這種結構化、多工具的方法為詮釋後續綜合分析的強度與可信度提供了穩健的基礎。

評讀結果：●是○否○不清楚

NotebookL

Appraisal FAITH-步驟 2：系統性文獻回顧的品質如何

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Supplementary Material 4. Table 1. Risk-of-Bias Assessment (cross-sectional)

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Confounding	Overall RoB
lukić et al. 2023	Moderate	Low	Low	Low	Low	Moderate	Moderate
Yalcınkaya et al. 2024	Low	Low	Low	Low	Low	Moderate	Moderate
Kwak, Seo et al. 2022	Low	Low	Low	Low	Low	Low	Low
Labrague et al. 2023	Moderate	Low	Low	Low	Low	Moderate	Moderate
Demir-Kaymak Z et al. 2024	Moderate	Low	Low	Low	Low	Low	Moderate
El-Sayed et al. (2025)	Low	Low	Low	Low	Low	Low	Low
Akca Sumengen et al. (2025)	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
Sarman & Tuncay (2025)	Low	Low	Low	Low	Low	Moderate	Moderate
Hamad et al. (2025)	Moderate	Low	Low	Low	Low	Low	Moderate
Alruwaili et al. (2024)	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
Abou Hashish & Alnajjar (2024)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Ahmed et al. (2024)	Moderate (convenience sample)	Low	Low	Low	Low	Moderate	Moderate
Salama et al. (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Kahraman H. et al. (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Al Omari et al. (2024)	Moderate	Low	Low	Low	Low	Low	Moderate
Cho & Seo (2024)	Moderate (convenience sampling)	Low	Low	Low	Low	Moderate	Moderate
Atalla et al. (2024)	Moderate	Low	Low	Low	Low	Low	Moderate
Kotp et al. (2025)	Moderate	Low	Low	Low	Low	Low	Moderate
Tuncer & Tuncer (2024)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Sabra et al. (2023)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Alenazi & Alhalal (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Şimşek et al. (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Mariano et al. (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Oweidat et al. (2025)	Moderate	Low	Low	Moderate	Low	Low	Moderate
Ünal & Avcı (2024)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Kwak, Ahn et al. (2022)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Tsiara et al. (2025)	Moderate	Low	Low	Low	Low	Moderate	Moderate
Jalal et al. (2025)	Low	Low	Low	Low	Low	Moderate	Moderate

NotebookL

Appraisal FAITH-步驟 2：系統性文獻回顧的品質如何

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僅進行文獻判讀是不足夠，系統性文獻回顧只納入至少要有一項研究結果是極小偏誤的試驗。在文章的方法章節，可以找到文章評估的方式，及由誰完成評估的，在結果章節則會提供審查者意見一致性的程度。

Supplementary Material 4.Table 2. Risk-of-Bias Assessment (qualitative studies)

Study (Author, Year)	Selection Bias	Investigator Bias	Data-Collection Bias	Analysis Bias	Reporting Bias	Overall RoB
Summers et al. 2024	Moderate (self-selection)	Moderate (no reflexivity)	Low (standard protocol)	Low (team consensus)	Low (full reporting)	Moderate
Rony, Kayesh, et al., 2024	Moderate (purposive)	Moderate (no reflexivity)	Low (uniform protocol)	Low (systematic coding)	Low (full transparency)	Moderate
Ramadan et al. (2024)	Moderate – purposive sampling across four sites	Low – reflexive journaling & peer debriefing	Low – standardized focus-group guide, validated and back-translated	Low – independent coding by two researchers with consensus checks	Low – full, transparent reporting of themes and exemplar quotes	Moderate
Almagharbeh et al. (2025)	Moderate (purposive)	Moderate (no reflexivity)	Low (standard guides)	Low (team consensus)	Low (full transparency)	Moderate
Rony, Numan, Johra, et al., 2024	Moderate (purposive)	Moderate (no reflexivity)	Low (uniform protocol)	Low (team consensus)	Low (transparent)	Moderate
Rony, Numan, Akter, et al., 2024	Moderate	Low	Low	Low	Low	Moderate
Alruwaili et al. (2025)	Moderate	Low	Low	Low	Low	Moderate
Chen et al. (2025)	Moderate	Low	Low	Low	Low	Moderate

Supplementary Material 4. Table 3. Risk-of-Bias Assessment (ROBINS-I)

Study (Author, Year)	RoB Tool	Confounding	Selection of participants	Classification of intervention	Deviations from intended	Missing data	Measurement of outcomes	Selection of reported results	Overall RoB
Mohamed et al.2023	ROBINS-I	Moderate	Low	Low	Low	Low	Low	Low	Moderate

NotebookL

Appraisal

FAITH步驟 2：系統性文獻回顧的品質如何 (T-H)

【T】作者是否以表格和圖表「總結」(Total up) 試驗結果？

- 以「森林圖」(forest plot) 呈現研究結果，最好再加上異質性分析。

評讀結果：○是●否 ○不清楚

NotebookL

Appraisal

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FAITH步驟 2：系統性文獻回顧的品質如何 (T-H)

【H】試驗的結果是否相近 - 異質性 (Heterogeneity) ?

Geographic distribution was heavily weighted towards Turkey, Egypt, and Saudi Arabia, with additional contributions from Republic of Korea, Jordan, Bangladesh, Palestine, Croatia, Philippines, Australia, Greece, China, Bahrain, Iraq, Kuwait, Lebanon, Oman and United Arab Emirates. Notably, there are no studies from the Americas (North, Central or South America), western Europe, and none from sub-Saharan Africa, all other regions are unrepresented. This geographic skew indicates that cultural, infrastructural, and educational contexts in under-represented regions particularly the Americas and sub-Saharan Africa may produce differing attitudes, literacy levels, and readiness for AI among nurses; therefore, our findings primarily reflect Middle Eastern and North African perspectives and should not be generalized to the global nursing workforce. Instruments spanned over 30 scales, including the GAAIS, the Artificial Intelligence Literacy Scale (AILS), the Medical Artificial Intelligence Readiness Scale–Medical Students (MAIRS-MS), the Artificial Intelligence Attitude Scale (AIAS), UTAUT, and its extension, UTAUT 2, with Cronbach's α ranging from 0.766 to 0.986. Notably, however, one Ten-Item Personality Inventory (TIPI) subscale in Tsiara et al. exhibited an α of 0.016 far below the acceptable threshold indicating essentially no internal consistency

- **地理分布：**主要偏向土耳其、埃及和沙烏地阿拉伯，另有來自韓國、約旦、孟加拉、巴勒斯坦、克羅埃西亞、菲律賓、澳洲、希臘、中國、巴林、伊拉克、科威特、黎巴嫩、阿曼及阿拉伯聯合大公國的貢獻。這種地理偏差顯示，特別是美洲和撒哈拉以南非洲等代表性不足地區的文化、基礎設施與教育環境，可能導致護理人員對人工智慧的態度、識字率及準備度有所不同。
- **工具不同：**涵蓋超過30個量表，包括GAAIS、人工智慧素養量表（AILS）、醫學人工智慧準備量表-醫學生量表（MAIRS-MS）、人工智慧態度量表（AIAS）、UTAUT，以及其延伸版UTAUT 2，Cronbach的α介於0.766至0.986之間。值得注意的是，Tsiara 等人有一個十項人格量表（TIPI）次量表。顯示α為0.016，遠低於可接受的門檻，顯示內部幾乎沒有一致性。

評讀結果：●是 ○否○不清楚

評讀總表

系統性文獻回顧品質	評讀結果
研究是否找到(Find) 所有的相關證據？	不清楚
文獻是否經過嚴格評讀(Appraisal)？	是
是否只納入(Included)具良好效度的文章？	是
作者是否以表格和圖表「總結」(Total up)試驗結果？	否
試驗的結果是否相近-異質性(Heterogeneity)？	是

NotebookL

Appraisal sheets(FAITH)

- **Appraisal Tool**
  - [統合分析 Meta-analysis]
    - 步驟1：研究探討的問題為何 (PICO)
    - 步驟2：研究的品質如何 (內在效度)
    - **步驟3：研究結果之意義為何 (效益)**

NotebookL

結論

◎護理人員與學生對 AI 態度整體正向，但仍存焦慮

大多數研究顯示受試者認為 AI 有助於護理工作效率與病人安全。但同時存在對工作取代、隱私及護理核心價值的維護感到擔憂。過度依賴人工智慧可能會影響批判性思考與同理心照護的擔憂，同時強調領導力、培訓與倫理保障的推動作用。

◎AI 素養與準備度普遍不足

多數護理學生與臨床護理師缺乏正式教育或培訓，教育與經驗會顯著影響準備度與採用意圖。同時，接受的態度會因人口結構和經驗而異：年輕且較懂科技的人往往較為接受，而部分女性和年長護理師，則持較多懷疑態度。

◎採用意圖受態度、素養與組織支持影響

接受過 AI 訓練或接觸的人展現出顯著較高的識字率與自信心。整合 AI 的行為準備度，反映在使用意圖上，源自認知（如感知的有用性）、情感（信任與焦慮）與情境（支持與資源）因素的複雜交互作用。

NotebookL

限制

●研究設計層級偏低

多為橫斷研究或質性研究，僅有1篇準實驗研究，無 RCT。因此無法推論因果關係。

●高異質性

對象(學生 vs 臨床護理師）、文化背景、量表與 AI 定義差異大。故無法進行統合分析（meta-analysis），僅為敘述性結果，並未使用圖表進行呈現。

●證據來源與測量限制

多來自問卷，可能產生社會期望偏差與回憶偏差。AI 概念與量表未統一，研究結果解讀需多參考。

NotebookL

討論時間

舉牌時間

是否同意於護理部導入人工智慧教學於新進人員課程？