AI as a Disruptive Technology and its Future in Healthcare in the Digital Era – Original research article

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Artificial intelligence in Malaysian health practice: Perspectives from allied health professionals

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Abstract

Background: Artificial intelligence (AI) is transforming healthcare, but allied health professionals' (AHPs) perspectives on AI integration remain underexplored, especially in Malaysia. This study examined AHPs' perceptions and preparedness regarding AI in Malaysian Health Practice. Specifically, it addressed: (1) AHPs' current perceptions of AI technologies' integration in Malaysian practice, (2) Preparedness of AHPs to integrate AI technologies into their professional roles, and (3) demographic and professional factors influencing AHPs' perception and preparedness toward AI integration.

Methods: A cross-sectional survey was conducted using the *Shinners AI Perception* questionnaire (14), disseminated via Google Forms through LinkedIn, Facebook, WhatsApp, and professional association mailing lists. Participants included speech therapists, occupational therapists, nutritionists, clinical psychologists, dietitians, audiologists, physiotherapists and counselors practicing in Malaysia. A total of 211 AHPs (86% female, $M = 33.5$ years, $SD = 7.26$; M years of practice $= 9$, $SD = 7$) participated between November 2024 and March 2025. Data were analyzed using descriptive statistics, chi-square tests, and Spearman correlations.

Results: A majority (58.2%) of respondents believed AI could improve clinical decision-making, 61.5% agreed it could enhance patient care delivery, and 59.1% felt it could improve population health outcomes. Responses were mixed on AI's impact on professional roles and costs. However, 67.6% reported feeling inadequately trained to work with AI-specific tools in their practice, and only 34.3% were aware of existing ethical frameworks in their workplace.

Conclusions: AHPs in Malaysia recognize AI's potential benefits but report insufficient preparedness, ethical awareness and training opportunities. Addressing these gaps through education, institutional frameworks, and national policy initiatives is essential for effective AI integration in Malaysia's healthcare system.

Keywords

Artificial intelligence, Malaysia, allied health professionals, allied health, health

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Introduction

Artificial intelligence (AI) is rapidly transforming healthcare by enabling enhanced clinical decision-making, improving patient outcomes, and optimizing service delivery across diverse clinical settings. Successful integration of AI into healthcare systems is contingent upon healthcare professionals' readiness and acceptance of these emerging technologies. Despite extensive studies examining physicians' and nurses' perspectives, empirical data on allied health professionals' (AHPs) perception and preparedness toward AI remain scarce, particularly within middle-income countries such as Malaysia.[1–3] This study aims to address

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this knowledge gap by systematically exploring AHPs' perception and preparedness concerning AI implementation within Malaysian practice. By elucidating these critical factors, this research provides insights that may, in the future, inform the design of educational programs, policy frameworks, and ethical guidelines to support responsible AI integration within Malaysia's healthcare system.

AHPs constitute a broad and heterogeneous group of health-related disciplines that provide therapeutic, technical, and support services across patient care, health promotion, and research. There is no universally agreed definition of allied health, as its composition varies by country, context, and professional identity.[4,5] In Malaysia, the Malaysian Allied Health Professions Act (Act 774) identifies 23 regulated AHPs, including audiologists, dietitians, physiotherapists, clinical psychologists, occupational therapists, speech therapists, and others.[6–9] Across these professions, AHPs demonstrate substantial variation in professional skills, knowledge bases, work practices, and levels of patient contact. This diversity contrasts with the more standardized professional roles and training pathways commonly described in nursing and medical professions.[1] Such heterogeneity underscores the importance of examining AHPs' perceptions of AI both collectively and across different disciplines, as the impact and relevance of AI may differ meaningfully between professional roles.[1,10,11]

AI is a significant aspect of the fourth industrial revolution or Health 4.0, transforming the healthcare sector.[12] Health 4.0 represents the fusion of digital, biological, and physical innovations, reshaping healthcare delivery and patient outcomes. In this context, AI refers to a broad class of computational systems capable of performing tasks that typically require human intelligence, such as learning from data, pattern recognition, prediction, and decision support, through approaches including machine learning, deep learning, natural language processing, and computer vision.[1,13] More recently, generative AI systems, such as large language models, have further expanded healthcare applications by enabling text generation, summarization, and interactive decision support.[12,14,15] In this study, we use "AI" as an umbrella term for computational systems that can learn from data to support tasks such as pattern recognition, prediction, and decision support in healthcare.[13,15] This includes machine learning and deep learning models, as well as newer generative AI tools (e.g., large language models) used for documentation or decision support.[15,16] Importantly, most current and anticipated applications in Malaysian allied health practice are AI-assisted tools that support, rather than replace, clinician decision-making.[11] Distinguishing these from more autonomous AI-based systems is relevant for interpreting our findings on accountability, training needs, and perceived role change.

AI applications in healthcare may operate along a continuum from AI-assisted tools, which support clinical reasoning and workflow while retaining practitioner decision authority, to AI-based systems that generate outputs capable of directly influencing clinical decisions or service delivery.[17] In recent years, AI applications in healthcare have expanded significantly, encompassing areas such as diagnostic imaging, predictive analytics, personalized treatment planning, and administrative automation.[12,14,15,18] While the literature reflects substantial interest in the technical and clinical efficacy of AI tools, there remains a critical gap in understanding the perspectives and lived experience regarding AI in the healthcare workforce, particularly those of AHPs in low and middle-income countries, especially within the Malaysian context.[2,3]

As many healthcare professionals have had limited exposure to AI, they often grapple with the ethical implications of AI, data management, the impact on the patient-physician relationship, and the development of professional knowledge.[19,20] While healthcare professionals generally acknowledge AI's potential to enhance patient care, there are valid concerns regarding its unintended consequences and the adequacy of current workforce preparation for such technological transitions.[21,22] Qualitative studies suggest that while healthcare workers are generally open to engaging with AI, they are also aware of the risks associated with misalignment between innovation pace and workforce readiness, which may exacerbate systemic inefficiencies or lead to adverse outcomes.[16,23,24]

Given their integral roles in multidisciplinary care, AHPs, such as speech therapists, occupational therapists, physiotherapists, dietitians, nutritionists, and clinical psychologists, are well-positioned to contribute to and benefit from the integration of AI in clinical settings. However, their engagement with AI remains underexplored, particularly in low- and middle-income countries, such as Malaysia, where structural, educational, and infrastructural challenges may affect integration.[1–3] Understanding the current level of perceived impact, and preparedness among AHPs is crucial for designing interventions that support ethical, effective, and contextually relevant AI implementations.

AHPs, comprising more than 30% of Malaysia's healthcare workforce, play crucial roles in patient care delivery, rehabilitation, and health promotion, yet their perspectives on AI integration remain unexplored despite their potential as key stakeholders in digital health transformation (Ministry of Health Malaysia, 2023; Ministry of Health Malaysia, 2025). However, the readiness of the allied health workforce for this technological shift remains unexplored, creating a critical knowledge gap for policy implementation. This study seeks to address this gap by examining the perceptions, knowledge, and preparedness of AHPs in relation to AI integration within their Malaysian practice. This study specifically aimed to address three research questions: (1) What are AHPs' current perceptions of AI technologies' integration in Malaysian practice? (2) How prepared do AHPs feel to integrate AI technologies into

their professional roles in Malaysia? (3) What demographic and professional factors influence AHPs' perception and preparedness toward AI integration?

This research is especially pertinent in the Malaysian healthcare context, where digital health initiatives are gaining momentum but remain unevenly implemented across sectors. By exploring demographic and contextual variables, such as years of professional experience, discipline, and prior exposure to AI, this study aimed to identify both enablers and barriers to AI integration. The findings will inform professional development strategies, institutional policies, and national Health 4.0 agendas aimed at fostering digital competence and interdisciplinary collaboration among AHPs. By illuminating workforce perspectives, this study lays the foundation for targeted, evidence-informed strategies that align technological innovation with professional practices, ultimately enhancing patient outcomes and system sustainability in the Malaysian healthcare landscape.

Method

Study design

This study adopted a cross-sectional quantitative design to examine the perceptions and preparedness of AHPs in Malaysia regarding the integration of AI into clinical practice. This study included AHPs such as speech-language therapists, occupational therapists, physiotherapists, audiologists, dietitians, nutritionists, and clinical psychologists. The approximate population of 15,000 AHPs in Malaysia was estimated from Ministry of Health workforce statistics and membership counts from relevant professional associations (2022–2023), with extrapolation when recent data were unavailable and aggregation across professions. Using this estimate, a calculated target sample size of 375 was obtained (95% confidence level, 5% margin of error). In line with the exploratory design and resource constraints, we employed convenience sampling and set a pragmatic recruitment target of >200 participants. We approached AHPs through professional networks and online platforms and achieved a final sample of 211 participants, which met our pragmatic target (≥200) although it was below the calculated target sample size of 375.

Data collection procedure

Data were collected using an online survey administered via Google Forms. All participants provided implied consent by clicking a "Yes" button confirming that they had read the study information and agreed to participate voluntarily, which was displayed on the first page of the survey. The survey link was disabled after completion to prevent duplicate submissions. The research employs the Shinners AI Perception (SHAIP) questionnaire, a validated instrument designed to assess healthcare professionals' views on AI, including its perceived impact on professional roles and readiness for integration.,[14 Appendix A] Unlike other tools that focus solely on technical competencies or system usability, the SHAIP provides a comprehensive framework for evaluating the sociotechnical dimensions of AI integration across diverse health disciplines. The SHAIP questionnaire has 10 items, and they demonstrated acceptable internal consistency in the original validation study (Cronbach's $\alpha = 0.78$).[14] Internal consistency was also calculated in the current study, yielding a Cronbach's alpha of 0.81 ($n = 211$) and indicating good reliability.

The questionnaire was reviewed by a panel of five AHPs practicing in Malaysia for cultural and linguistic appropriateness before implementation, with no edits to the original SHAIP items. Feedback from the expert panel and pilot testing guided refinement of the survey's demographic section and additional exploratory questions, resulting in a total of 19 items. The demographic section included email address, age, gender, nationality, race/ethnicity, profession, years of practice, location of practice, and setting. The questionnaire was distributed on social media platforms, with an estimated time for completion of approximately 10–20 min. Each survey question was marked as mandatory to avoid incomplete submissions. The survey consisted of a demographic section (9 questions) and a section on personal beliefs about AI (10 questions on a Likert scale). The Likert scale ranged between 1 (Totally Disagree) to 5 (Totally Agree). All questions were mandatory, and there was no imposed time limit.

Convenience and snowball sampling were employed due to the absence of a comprehensive registry of Malaysian AHPs. To reduce duplicate entries from participants across different platforms (LinkedIn, Facebook, WhatsApp), the survey was restricted to one submission per email address, and completion timestamps were monitored for anomalies. An invitation message and study information were disseminated through LinkedIn, Facebook and WhatsApp groups relevant to the target population. Participants were also encouraged to share the invitation with eligible contacts, consistent with snowball sampling methods. In addition, recruitment was conducted through professional associations like the Malaysian Association of Speech-Language and Hearing (MASH). A call for participants was circulated through online posters in Malaysia, where the posters were advertised on these associations' social media and sent by email to association members, as well as to monthly newsletters. This study was conducted between November 2024 and March 2025. Ethical approval was obtained from the Universiti Kebangsaan Malaysia Research Ethics Committee (JEUKM) (JEP-2024-843).

Raw survey data were reviewed for consistency, invalid entries, and duplicate submissions prior to analysis. All responses were anonymized, assigned a serial number,

and stored securely with password. No missing data occurred due to mandatory survey responses.

Statistical analysis

Responses in the survey were analyzed as follows. For each question on a Likert scale, descriptive statistics show the overall frequency of responses. Next, inferential statistics were used to investigate the role of profession, setting, age, and years of practice in the distribution of responses. For continuous variables, that is, age and years of practice, Spearman's correlations were applied; for discrete variables, that is, profession and setting, chi-square tests were used. These variables will be referred to as "demographics" henceforth for brevity. Data analysis was run on Rstudio 4.3.1.

Results

A total of 211 healthcare professionals took part in the survey (see Figure 1 for profession distribution). The most represented category was speech-language therapists (37%). The first section of the survey collected participant demographics (Table 1). Most of the participants were female (86%) and Malaysian (99%). The participants worked equally in the government and private sectors. Figure 2 shows the distribution of professions by sector.

Statistical analyses are reported in Table 2. Bivariate analyses demonstrated that age and years of professional practice were not significantly associated with perceptions of AI benefits (clinical decision-making, patient care delivery, or population health), perceived impact on professional roles or costs, concerns regarding role replacement, perceived preparedness or training adequacy, awareness of ethical frameworks, or views on accountability for AI-related errors (all Spearman's ρ, $p > 0.05$). Profession was also not significantly associated with any of these items, including responsibility for AI error (all χ^2 tests, $p > 0.05$).

Figure 3 presents the distribution of responses across all 10 SHAIP questionnaire items. Over half of the participants shared the belief that the use of AI in their specialty could improve clinical decision-making, improve the delivery of patient care, and improve population health outcomes. These positive perceptions were consistent across demographic variables, with no statistically significant differences observed by age, years of practice, profession, or practice setting. Opinions were mixed regarding whether AI will change the participant's role as a healthcare professional in the future, and whether it will reduce financial cost associated with the participant's role. No statistically significant associations were identified between these items and any demographic variables.

Participants mostly showed certainty in their role, by disagreeing that AI may take over their role as healthcare professionals. A trend is reported for the demographic value of "setting," whereby people working in Government settings showed a tendency to be more in disagreement (chi-sq = 47.443, df = 36, $p = 0.09$).

Regarding preparedness and training, there are mixed responses on whether health professionals are prepared for the introduction of AI technology. Furthermore, most participants feel inadequately trained themselves to work with AI specific to their role. Both of these perceptions were not significantly influenced by age, years of practice, profession, or setting.

Regarding ethical considerations, the existence of an ethical framework in place for the use of AI technology in their workplace is mixed. Most participants disagree with the sentiment that the responsibility of AI error would fall on the healthcare professional. No statistically significant associations were found between these two items and any demographic variables, including profession, indicating broadly consistent views on accountability across allied health disciplines.

Discussion

This study investigated AHPs perceptions and preparedness regarding the use of AI in Malaysian practice. The results indicate predominantly positive perception toward AI's integration into practice and its potential benefits among AHPs in Malaysia, yet reveal significant deficiencies in training preparedness, ethical awareness, and implementation readiness. While consistent with international patterns of AI acceptance documented in high-income countries, our findings reveal substantial disparities in training adequacy and implementation readiness that reflect Malaysia's unique healthcare system characteristics and digital infrastructure constraints.[11,15,25]

Comparative analysis with Hoffman et al.'s[1] Australian AHP study reveals that AHPs in Malaysia exhibited comparable levels of AI acceptance, with 58.2% expressing positive perception toward AI benefits. However, the proportion of AHPs reporting inadequate AI training was substantially higher in Malaysia (67.6%) relative to findings from Western European healthcare contexts,[23,24] underscoring persistent digital capacity gaps between high-income and middle-income healthcare systems. This disparity potentially reflects the accelerated pace of digital health policy development in Malaysia relative to workforce preparation infrastructure.[2,3,16]

Perceived benefits of AI in healthcare

More than half of the participants agreed that AI could enhance clinical decision making, improve patient care delivery, and support population health outcomes. These findings are consistent with studies in other countries reporting that healthcare professionals view AI as a

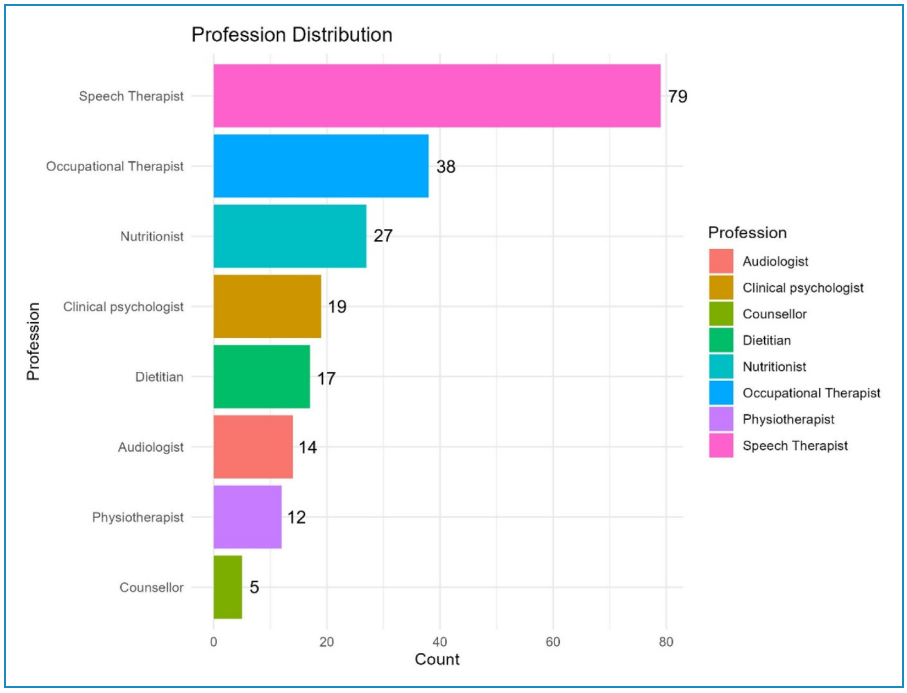

Figure 1. Distribution of participants by profession ($n = 211$).

supportive tool for improving efficiency and clinical accuracy.[14,25] The absence of demographic influences suggests that this optimism is widely shared across professions, years of experience, and settings, reflecting a general recognition of AI's potential of AI rather than being confined to specific subgroups. The analysis was intentionally limited to descriptive statistics and unadjusted bivariate tests, in keeping with the exploratory aims and available sample size. Future studies with larger and more representative samples could employ multivariable ordinal regression or other modeling approaches to more fully characterize adjusted associations between demographics and AI perceptions.

Table 1. Demographic information of participants ($n = 211$).

Variable		
Age (years)	Range	23–58
	Mean ± SD	33.5 ± 7.26
Gender	Female	183 (86.7%)
Nationality	Malaysian	209 (99.1%)
	Australian	1 (0.5%)
	Pakistani	1 (0.5%)
Years of professional practice	Range	0.5–30
	Mean ± SD	9.0 ± 7.0
Primary practice setting	Government	99 (46.9%)
	Private	112 (53.1%)

Impact of AI on professional roles

Opinions were mixed to determine whether AI could change professional roles or reduce financial costs. This ambivalence may stem from limited direct exposure to AI in allied Malaysian health settings, where the technology is not yet widely implemented. Prior studies have shown similar uncertainty, with professionals acknowledging potential efficiency gains but expressing doubts about how AI might alter responsibilities or reduce costs.[1,21,22] Interestingly, participants working in government settings were more likely to disagree that AI could replace their role. This may reflect contextual differences, as public-sector professionals often face systemic resource challenges that reinforce the perceived indispensability of human expertise.

Job security and role replacement

Most participants disagreed with the statement that AI might take over their roles. This suggests a strong sense of professional identity and confidence in the unique human aspects of allied health, such as empathy, therapeutic relationships, and individualized care. These elements cannot be easily replicated using AI. Similar findings have been

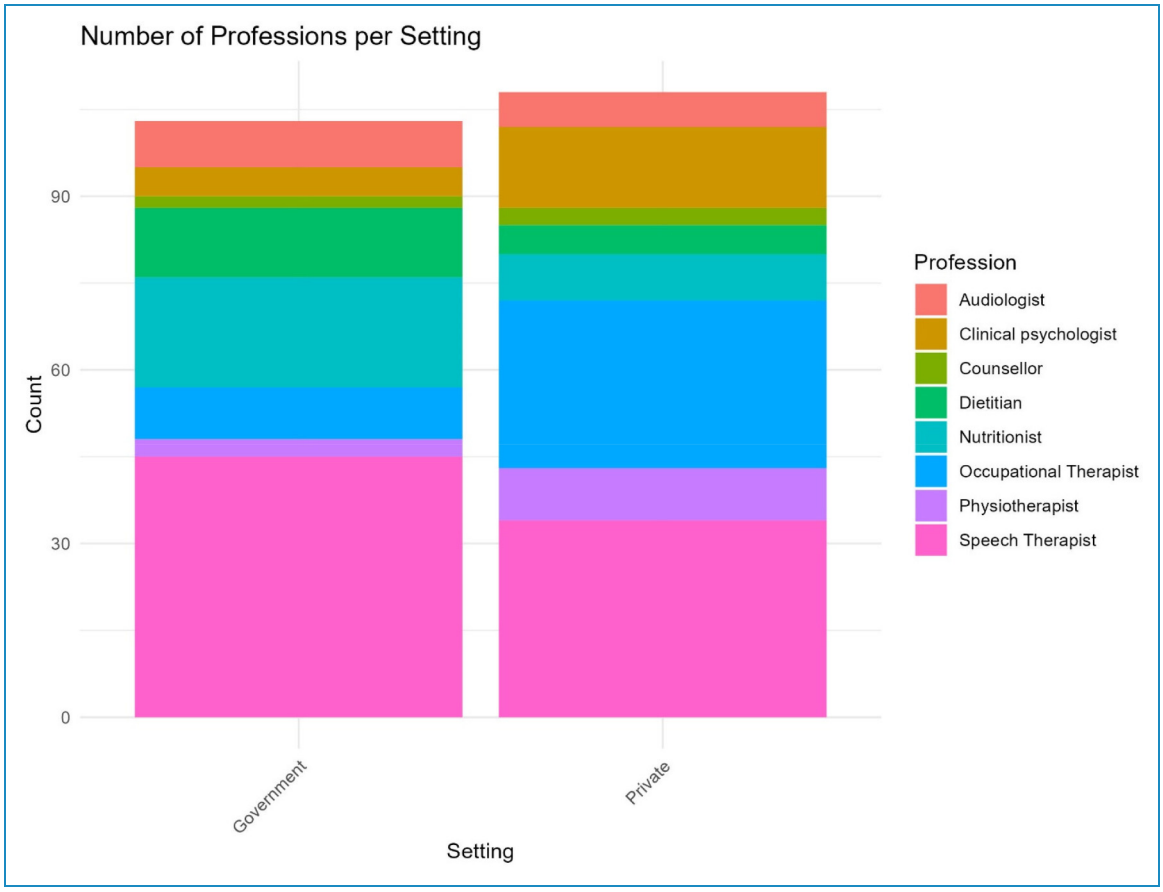

Figure 2. Profession by setting distribution ($n = 211$).

reported in previous studies, in which healthcare professionals acknowledged AI's utility but rejected the notion of replacement.[25,26] The trend by setting (greater disagreement in government work) suggests that the work context may shape professionals' confidence in the irreplaceability of their role.

Preparedness and training

When asked about preparedness for AI introduction, participants' responses were divided, and the majority felt inadequately trained to use AI tools in their practice. This finding reflects a common theme in the literature: While healthcare professionals may hold positive perceptions of AI, many lack the knowledge and skills to integrate it effectively.[1,24,26] The fact that this perception was not influenced by demographic factors suggests that training needs are widespread across all AHP groups, highlighting the importance of systemic and professional capacity-building initiatives.

The training inadequacies identified in this study align with broader educational deficits within Malaysia's healthcare system. Malaysian medical students demonstrate awareness of AI's importance but report feeling underprepared for practical AI implementation, with only 44.5% expressing confidence in their readiness to work with AI upon graduation.[27] This educational gap extends beyond medical students to practicing healthcare professionals, highlighting systemic weaknesses in both undergraduate curricula and continuing professional development programs.

Ethical frameworks and accountability

Responses regarding the existence of ethical frameworks for AI in participants' workplaces were mixed, indicating uncertainty regarding governance structures. Most participants disagreed that healthcare professionals should be responsible for errors caused by AI systems. No statistically significant differences by profession were observed for this item. However, descriptive patterns suggested that counselors more frequently endorsed the view that responsibility for AI-related errors lies with the clinician. This nonsignificant observation should be interpreted cautiously and is presented as an exploratory trend rather than a confirmed group difference. One possible explanation relates to the professional ethos in counseling, where responsibility for outcomes is often closely tied to practitioner decision-

Table 2. Associations of demographic info to survey items.

	AI Could Improve Delivery of Patient Care	AI Could Improve Clinical Decision Making	AI Could Improve Population Health Outcomes	AI Could Change My Role as HP	AI Will Reduce Costs Associated With My Role	AI Will Take Over Part of My Role as HP	HP are Overall Prepared for AI use	I am Adequately Trained for AI use	There is an Ethical Framework for use of AI	Responsibility of AI Error Lies With HP
Age	$\rho = 0.10$, $p = 0.17$, $n = 211$	$\rho = -0.05$, $p = 0.47$, $n = 211$	$\rho = 0.04$, $p = 0.60$, $n = 211$	$\rho = 0.05$, $p = 0.48$, $n = 211$	$\rho = 0.06$, $p = 0.39$, $n = 211$	$\rho = .10$, $p = 0.13$, $n = 211$	$\rho = 0.00$, $p = 0.96$, $n = 211$	$\rho = -0.08$, $p = 0.24$, $n = 211$	$\rho = -0.08$, $p = 0.24$, $n = 211$	$\rho = 0.11$, $p = 0.13$, $n = 211$
Years of practice	$\rho = 0.11$, $p = 0.13$, $n = 211$	$\rho = -0.03$, $p = 0.71$, $n = 211$	$\rho = 0.08$, $p = 0.28$, $n = 211$	$\rho = 0.05$, $p = 0.44$, $n = 211$	$\rho = 0.09$, $p = 0.22$, $n = 211$	$\rho = 0.10$, $p = 0.15$, $n = 211$	$\rho = 0.00$, $p = 0.98$, $n = 211$	$\rho = -0.08$, $p = 0.26$, $n = 211$	$\rho = -0.07$, $p = 0.33$, $n = 211$	$\rho = 0.08$, $p = 0.25$, $n = 211$
Profession	$\chi^2(28) = 22.27$, $p = 0.77$	$\chi^2(28) = 30.51$, $p = 0.34$	$\chi^2(28) = 26.95$, $p = 0.52$	$\chi^2(28) = 18.91$, $p = 0.90$	$\chi^2(28) = 21.46$, $p = 0.81$	$\chi^2(28) = 14.11$, $p = 0.99$	$\chi^2(28) = 15.55$, $p = 0.97$	$\chi^2(28) = 31.39$, $p = 0.30$	$\chi^2(28) = 26.94$, $p = 0.52$	$\chi^2(28) = 22.57$, $p = 0.75$
Setting	$\chi^2(36) = 21.36$, $p = 0.97$	$\chi^2(36) = 44.64$, $p = 0.15$	$\chi^2(36) = 17.73$, $p = 0.99$	$\chi^2(36) = 31.34$, $p = 0.69$	$\chi^2(36) = 20.64$, $p = 0.98$	$\chi^2(36) = 47.44$, $p = 0.10$	$\chi^2(36) = 37.66$, $p = 0.39$	$\chi^2(36) = 32.65$, $p = 0.63$	$\chi^2(36) = 43.99$, $p = 0.17$	$\chi^2(36) = 34.21$, $p = 0.55$

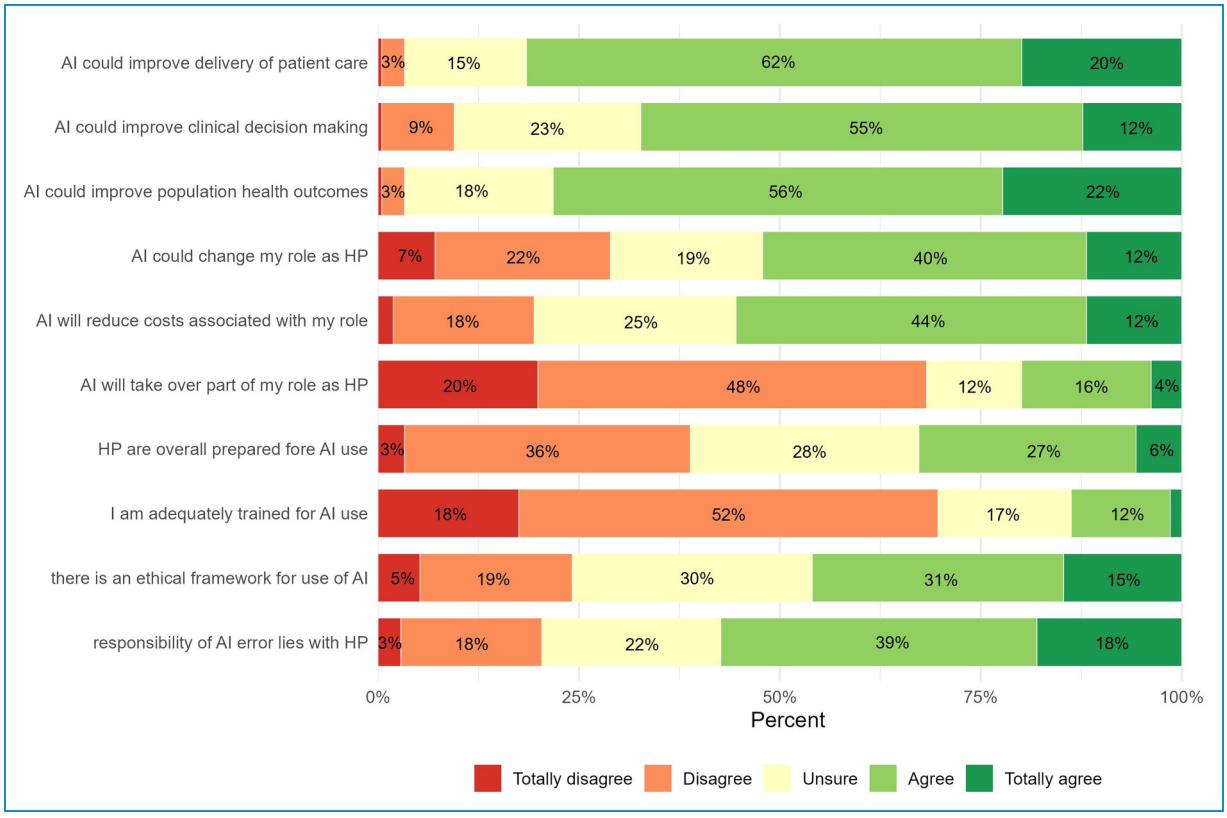

Figure 3. Answer distribution across the 10 items.

making. These results highlight the need for clearer policies and role-specific guidance on liability and accountability, consistent with calls in the literature for robust ethical frameworks in AI integration.[16,23,24,26]

The low awareness of workplace ethical frameworks and mixed views on accountability should be understood within Malaysia's evolving AI and digital health governance landscape. Although national instruments such as the National Digital Health Blueprint and data protection legislation outline broad principles for safe and ethical AI use, these are not yet consistently translated into clear local policies or training for allied health teams. This governance–practice gap likely contributes to AHPs' uncertainty about ethical responsibilities and accountability when using AI tools, underscoring the need for more explicit, profession-specific guidance and institutional implementation.

Limitations

This study provides new insights into the readiness of AHPs in Malaysia to integrate AI, an area where empirical research remains limited. Several limitations warrant consideration in interpreting these results. The achieved sample ($n = 211$) was smaller than the calculated target ($n = 375$) and was obtained through convenience and snowball sampling. This non-probability, underpowered design limits statistical power and generalizability, so the findings should be considered exploratory. In addition, speech-language pathologists were over-represented (37% of the sample), which may bias the results toward their views and practice contexts and under-represent other allied health professions. Geographic bias may also exist, as urban practitioners with better internet access were more likely to participate. The cross-sectional design captures perception and preparedness at a single timepoint, which may not reflect the dynamic nature of AI integration.

Implications and future directions

These findings inform Malaysia's National Digital Health Blueprint implementation, particularly regarding workforce readiness assessments and training program development prioritization. Primarily, healthcare authorities should establish comprehensive AI literacy curricula tailored to AHP disciplines, incorporating profession-specific competencies that address distinct clinical applications and ethical considerations.[20] Additionally, healthcare organizations require robust AI governance structures that clarify ethical boundaries, accountability mechanisms, and risk management protocols prior to technology implementation.[12] Furthermore, professional regulatory authorities must formulate AI competency frameworks and mandatory

continuing education standards to safeguard practice quality and patient safety.[24]

Conclusion

In summary, AHPs in Malaysia perceive AI as a valuable tool to support decision-making, patient care, and population health but express uncertainty about their impact on roles, costs, and workplace ethics. They also reported insufficient training and preparedness for AI integration. Addressing these gaps through targeted education, institutional frameworks, and national-level policies is essential for ensuring safe and effective AI integration within Malaysia's evolving healthcare system.

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Ethical approval

Ethics approval for the study was obtained from the *Universiti Kebangsaan Malaysia* Research Ethics Committee Board (JEP-2024-843).

Author contributions

TWYC, SYC, RU, and MG designed the study protocol. TWYC, SYC, JEW, SCC, and GS collected data. GS performed the data analysis. TWYC, SYC, JEW, SCC, GS and RU drafted and edited the manuscript. All authors have provided commentary and critical revisions to the draft and approved the final version of the manuscript for publication.

Author's Note

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Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon request.

Supplemental material

Supplemental material for this article is available online.

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