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Review Article

Facilitators and Barriers to the Use of Artificial Intelligence in Rehabilitation: A Narrative Review

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ABSTRACT

Background: Artificial intelligence is increasingly being applied to movement assessment, clinical decision support, remote monitoring, robotic rehabilitation, virtual assistance, and administrative functions. Its routine integration into rehabilitation nevertheless depends on professional, technological, ethical, organisational, and patient-related factors. Objective: To synthesise current evidence concerning AI applications, clinician perceptions, and barriers and facilitators influencing its adoption in rehabilitation and related healthcare settings. Methods: A narrative review with a structured literature search was conducted using PubMed, CINAHL, Scopus, Google Scholar, and ScienceDirect for English-language publications from January 2010 to April 2026. Eligible qualitative, quantitative, mixed-method, and review studies addressing AI adoption or implementation were synthesised thematically. Results: Nineteen publications were included. Recurrent barriers involved limited AI literacy and specialised training, uncertain clinical validity, lack of trust, privacy and ethical concerns, financial and infrastructural constraints, poor workflow integration, limited organisational readiness, and insufficient patient involvement. Facilitators included structured education, representative clinical validation, transparent governance, user-friendly design, technical and leadership support, local adaptation, clinician and patient co-design, and continued human oversight. Conclusion: AI may improve rehabilitation assessment, personalisation, monitoring, access, and service efficiency, but evidence for sustainable routine implementation remains limited. Adoption requires clinically validated, ethical, secure, contextually appropriate, and patient-centred systems that complement professional judgement. Keywords: Artificial Intelligence; Machine Learning; Rehabilitation; Physical Therapy; Technology Adoption; Implementation Barriers; Clinical Decision Support.

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INTRODUCTION

Artificial intelligence (AI) refers broadly to computational systems capable of performing tasks that ordinarily require human cognitive functions, including learning, pattern recognition, prediction, decision support, and problem-solving (2–4). Over the past decade, healthcare applications of AI have expanded from screen-based decision-support algorithms to more integrated technologies, including predictive models, computer-vision systems, virtual assistants, wearable sensors, and physically embodied robotic platforms (1). These technologies are increasingly being used to support diagnosis, clinical decision-making, outcome prediction, documentation, scheduling, and other administrative and clinical functions. Their rapid adoption across professional settings reflects growing interest in the capacity of AI to improve efficiency and support data-informed decisions, although its integration into routine healthcare remains uneven (5).

Rehabilitation comprises interventions intended to optimise functioning and reduce disability among people with health conditions in interaction with their environments (7). Within rehabilitation, advances in machine learning, computer vision, motion analysis, wearable technologies, and sensor-based monitoring have created opportunities to assess movement, identify functional patterns, predict recovery, personalise treatment programmes, and provide feedback during therapeutic exercise. AI-supported systems may also help bridge conventional face-to-face rehabilitation and technology-enabled remote care by allowing patients to receive supervised or semi-supervised interventions outside traditional clinical environments (8). Potential applications include gait and movement analysis, robotic rehabilitation, home-exercise monitoring, virtual physiotherapy assistance, clinical decision support, progress tracking, documentation, appointment coordination, and adaptive modification of treatment plans (8–10).

The potential value of AI in rehabilitation extends beyond technical performance. AI-enabled tools may assist clinicians in retrieving and synthesising relevant evidence, identifying patterns within complex clinical information, monitoring adherence, and delivering timely feedback to patients and professionals (9). Virtual rehabilitation platforms and AI-driven assistants may improve geographical access and continuity of care, particularly for people who experience transportation, mobility, or workforce-related barriers to conventional rehabilitation services (8). Nevertheless, improvements demonstrated under experimental or controlled conditions do not necessarily translate into routine clinical adoption. Technologies must also be clinically valid, usable, affordable, compatible with existing workflows, acceptable to patients and clinicians, and supported by appropriate organisational and regulatory systems.

Experience from other areas of healthcare has demonstrated the capacity of AI to support image interpretation, diagnostic classification, risk prediction, and error reduction. However, these developments have also raised concerns regarding algorithmic bias, fairness, privacy, data security, accountability, transparency, and the limited interpretability of complex "black-box" models (11–13). In rehabilitation, these concerns may be particularly important because clinical decision-making often depends on repeated observation of movement, individualised progression, therapeutic interaction, patient motivation, functional context, and professional judgement. Excessive reliance on automated recommendations may therefore affect not only technical decisions but also the therapeutic relationship and the human-centred nature of rehabilitation care (19).

The adoption of AI is also shaped by factors that extend beyond algorithmic accuracy. Healthcare professionals may be reluctant to use new technologies when they lack relevant knowledge, practical training, confidence, technical support, or evidence of clinical usefulness (14). Implementation may be further restricted by financial cost, inadequate infrastructure, poor interoperability, disruption of established workflows, unclear professional responsibility, limited organisational readiness, and concerns that technology could diminish care quality or threaten professional roles (15–20). Conversely, adoption may be facilitated by user-friendly interfaces, locally validated systems, clinician involvement in technology development, organisational leadership, accessible training, transparent governance, reliable technical support, and evidence that AI complements rather than replaces clinical expertise.

Although the literature on AI in healthcare is expanding rapidly, much of the available evidence consists of reviews, perception studies, and opinion-based discussions rather than evaluations conducted during sustained implementation in real-world rehabilitation settings (14,15). Rehabilitation-specific evidence also remains dispersed across studies of physiotherapy, home rehabilitation, robotics, virtual assistants, clinical decision-support systems, and broader healthcare implementation. Consequently, the relative importance of technological, professional, ethical, organisational, and patient-related determinants has not been sufficiently integrated. Evidence from low- and middle-income settings is especially limited, despite the likelihood that infrastructure, affordability, digital literacy, language, workforce capacity, and local data availability substantially influence implementation.

This narrative review therefore aimed to synthesise current evidence concerning the applications of AI, clinicians' perceptions, and the principal barriers and facilitators influencing its adoption in rehabilitation and related healthcare settings. Particular attention was given to rehabilitation practice and physiotherapy, while evidence from broader healthcare contexts was considered when it provided relevant insight into implementation determinants applicable to rehabilitation.

MATERIALS AND METHODS

This study was conducted as a narrative review with a structured literature-search approach. Its conceptual scope encompassed the adoption and implementation of artificial intelligence in rehabilitation and related healthcare settings, with particular emphasis on physiotherapy and rehabilitation practice. The review was designed to synthesise evidence concerning AI applications, healthcare-professional perceptions, implementation barriers, and factors that may facilitate the integration of AI-supported technologies into clinical rehabilitation. Broader healthcare evidence was considered when it addressed implementation determinants with clear relevance to rehabilitation, including trust, clinical validation, usability, workflow integration, training, organisational readiness, cost, privacy, and ethical governance.

A structured search of the published literature was undertaken using PubMed, CINAHL, and Scopus as bibliographic databases. Google Scholar and ScienceDirect were used as supplementary search platforms to identify additional potentially relevant publications and to support citation tracking. The principal search period extended from January 2010 to April 2026, thereby covering both the recent expansion of healthcare AI and contemporary developments in technology-assisted rehabilitation. Seminal publications outside the principal search period were eligible for inclusion when they provided essential conceptual definitions or foundational context directly relevant to the review.

The search strategy was organised around three concept groups. The first represented AI technologies and included terms such as “artificial intelligence,” “machine learning,” “deep learning,” “AI-driven virtual assistants,” “robotics,” and “clinical decision support systems.” The second represented the clinical context and included “rehabilitation,” “physical therapy,” “physiotherapy,” “home rehabilitation,” “clinical practice,” and “healthcare.” The third represented adoption and implementation determinants and included “barriers,” “facilitators,” “acceptance,” “adoption,” “implementation,” “perception,” “attitude,” “trust,” “training,” and “usability.” Terms within each concept group were combined using the Boolean operator OR, and the three concept groups were combined using AND. A representative search construction was: (“artificial intelligence” OR “machine learning”) AND (“rehabilitation” OR “physical therapy” OR “physiotherapy” OR “healthcare”) AND (“barriers” OR “facilitators” OR “adoption” OR “acceptance” OR “implementation”). Search terminology was adapted to the indexing structure and search functions of each information source.

Eligible publications were required to be written in English and to examine the application, acceptance, adoption, implementation, barriers, or facilitators of AI in rehabilitation or a directly relevant healthcare context. Studies involving physiotherapists, rehabilitation professionals, other healthcare professionals, patients, clinical implementers, or healthcare organisations were considered eligible when their findings contributed to understanding AI implementation. Eligible designs included cross-sectional studies, qualitative studies, mixed-method investigations, clinical and observational studies, narrative reviews, scoping reviews, and systematic reviews. Studies of technologies such as machine-learning applications, AI-supported rehabilitation platforms, virtual assistants, robotic systems, computer-vision tools, and AI-based clinical decision-support systems were included when they addressed clinical use or implementation determinants.

Conference abstracts without accessible full text, non-peer-reviewed reports used as primary evidence, publications unrelated to healthcare or rehabilitation practice, and articles that did not clearly address the use or implementation of AI were excluded. Studies concerned exclusively with technical algorithm development or computational performance were also excluded when they did not discuss clinical applicability, professional acceptance, workflow integration, patient considerations, or other implementation factors. Publications from general healthcare settings were retained only when their findings were considered conceptually transferable to rehabilitation.

Records were initially assessed by title and abstract for relevance to the review objective. Potentially eligible publications were subsequently examined in full text against the predefined eligibility criteria. Reference lists of relevant articles were manually searched, and forward or backward citation tracking was used to identify additional publications that might not have been captured through the principal searches.

Where multiple reviews addressed overlapping areas, their findings were interpreted cautiously to reduce the risk of treating repeated discussion of the same primary evidence as independent confirmation.

Information from the included publications was organised in a structured evidence matrix. Extracted characteristics included author and publication year, country or study context, research design, participant or professional group, rehabilitation or healthcare setting, type of AI application, and the principal barriers and facilitators reported. Barriers and facilitators were interpreted according to their relevance to technological performance, clinical validity, professional knowledge and training, trust and explainability, usability and workflow integration, cost and infrastructure, ethical and privacy concerns, patient engagement, organisational readiness, and wider health-system support.

Because the included literature encompassed heterogeneous populations, AI technologies, settings, research designs, and outcome concepts, statistical pooling was neither planned nor considered methodologically appropriate. The findings were therefore synthesised qualitatively using a thematic narrative approach. Evidence was grouped into recurring implementation domains rather than being interpreted solely as a sequence of individual study summaries. Particular attention was given to the consistency of themes across different study designs and settings, the distinction between rehabilitation-specific and general healthcare evidence, and the difference between perceived benefits, demonstrated clinical performance, professional acceptance, and successful routine implementation.

The review relied exclusively on information available in previously published sources and did not involve the recruitment of human participants, access to identifiable patient information, or collection of primary clinical data. Institutional ethical approval and informed consent were therefore not applicable. The review was conducted with attention to accurate attribution, preservation of the meaning of the included studies, and transparent distinction between the reported findings of individual publications and the interpretive synthesis developed in this manuscript.

RESULTS

Nineteen publications addressing the adoption, implementation, acceptance, or clinical application of artificial intelligence in rehabilitation and related healthcare settings were included in the narrative synthesis. The evidence base was methodologically heterogeneous and comprised systematic reviews, scoping reviews, narrative or practice-based reviews, cross-sectional studies, qualitative investigations, and mixed-method studies. Several publications focused directly on rehabilitation, physiotherapy, home rehabilitation, or rehabilitation robotics, whereas others examined implementation determinants in broader healthcare environments, including primary care, emergency departments, medical imaging, and multidisciplinary clinical practice. The latter were retained because they provided transferable evidence concerning trust, usability, professional acceptance, workflow integration, ethics, organisational readiness, and clinical validation.

Table 1. Characteristics of the Publications Included in the Narrative Synthesis

No.	Study	Context	Study design	Population or evidence focus	AI application or implementation focus
1	Lefebvre et al., 2025 (6)	Rehabilitation practice	Qualitative study	Rehabilitation professionals	Professional understanding, perceived role, education, and trust in AI
2	Olawade et al., 2025 (8)	Home rehabilitation	Narrative review	AI-supported home rehabilitation literature	Virtual physiotherapy assistants, remote treatment, sensor accuracy, accessibility, and engagement
3	Hassan et al., 2024 (9)	Healthcare	Scoping review	Healthcare AI-adoption literature	Trust, barriers, and facilitators influencing AI adoption
4	Syed et al., 2025 (10)	Rehabilitation	Cross-sectional study	Healthcare professionals involved in rehabilitation	Perceptions, expertise, cost, privacy, and training barriers
5	Alsobhi et al., 2022 (11)	Rehabilitation	Mixed-method study	Rehabilitation professionals	Knowledge, experience, cost, resources, work environment, and professional speciality
6	Scipion et al., 2025 (14)	Healthcare settings	Scoping review	Clinicians and clinical settings	Clinician acceptance, implementation context, and evidence gaps
7	Wenderott et al., 2025 (15)	Routine medical imaging	Systematic review with qualitative analysis	Medical-imaging implementation studies	Reporting of barriers and facilitators in routine AI use
8	Ahmed et al., 2023 (16)	Healthcare	Systematic review	Healthcare implementation literature	Moral, legal, technological, social, personnel, and clinical-safety barriers
9	Nambi et al., 2024 (19)	Physiotherapy	Practice-based review	Physiotherapy practice	Clinical usefulness, professional roles, and humanistic concerns

No.	Study	Context	Study design	Population or evidence focus	AI application or implementation focus
10	Sahoo et al., 2025 (20)	Healthcare	Systematic review	Healthcare professionals	Professional perspectives concerning healthcare AI
11	Sumner et al., 2023 (22)	Physical rehabilitation	Systematic review	AI applications in physical rehabilitation	Accessibility, effectiveness, personalisation, and evidence quality
12	Yin et al., 2021 (23)	Real-world clinical practice	Systematic review	Clinical AI applications	Evidence supporting routine clinical decision-making
13	Katonai et al., 2025 (24)	Primary care	Scoping review	Primary-care AI literature	Training, workflow integration, usability, clinical knowledge, and empathy
14	Fujimori et al., 2022 (25)	Emergency departments	Mixed quantitative and qualitative evaluation	Emergency clinicians and clinical implementation	Acceptance, overreliance, system failure, local adaptation, and interface design
15	N et al., 2024 (26)	Tertiary healthcare setting	Cross-sectional study	Healthcare professionals	Perceptions and adoption of AI in healthcare practice
16	Shawli et al., 2024 (27)	Physiotherapy and rehabilitation	Qualitative study	Physical therapists	Attitudes, utilisation, privacy, ethics, and educational requirements
17	Marco-Ruiz et al., 2024 (28)	Multinational clinical settings	Qualitative study	Clinical implementers	Clinical validity, explainability, stakeholder involvement, and AI literacy
18	Moy et al., 2024 (29)	Healthcare	Scoping review	Patients and patient-centred AI literature	Patient values, concerns, acceptance, and involvement
19	Mennella et al., 2023 (30)	Rehabilitation services	Systematic literature review	Future rehabilitation technologies	AI applications, local relevance, implementation, and future rehabilitation services

AI: artificial intelligence.

The included literature showed that AI adoption was influenced by interacting technological, professional, ethical, organisational, patient-related, and health-system factors. Although the terminology and emphasis varied among studies, six recurrent thematic domains were identified: professional knowledge and training; trust, clinical validity, and explainability; ethical, legal, privacy, and fairness concerns; cost, infrastructure, and organisational readiness; workflow integration and usability; and patient-centred and locally responsive implementation.

Professional Knowledge, Training, and AI Literacy

Insufficient knowledge and lack of specialised training were among the most consistently reported barriers. Rehabilitation professionals expressed interest in the potential clinical applications of AI but frequently reported limited familiarity with its capabilities, limitations, and appropriate use. The mixed-method rehabilitation study by Alsobhi et al. associated AI use with professional experience, work environment, and clinical speciality while identifying limited knowledge and resource availability as important barriers (11). Similar concerns were reported in rehabilitation-focused cross-sectional and qualitative studies, in which professionals indicated that AI had not been fully incorporated into routine practice and that structured education was required to improve confidence and appropriate utilisation (10,27).

Evidence from broader healthcare settings supported these findings. Reviews of clinician perspectives and AI implementation repeatedly identified insufficient training, limited technical literacy, and uncertainty regarding professional responsibilities as impediments to adoption (14,20,24). Education and practical exposure were therefore identified as central facilitators. Training was considered most useful when it addressed not only basic AI concepts but also clinical interpretation, limitations, privacy, bias, safe use, and circumstances in which professional judgement should override or contextualise automated recommendations.

Trust, Clinical Validity, and Explainability

Trust emerged as a central determinant of clinician acceptance. Healthcare professionals were more likely to consider AI useful when its recommendations were supported by credible clinical evidence, validated in relevant populations, and aligned with professional judgement and patient needs (9,14). Conversely, limited transparency, uncertain reliability, and concerns regarding “black-box” decision-making reduced confidence in AI-supported systems.

The importance of explainability was not uniform across all evidence. The multinational qualitative study of clinical implementers indicated that rigorous clinical-validity studies could be more influential for adoption than technical explainability alone (28). This suggested that clinicians may accept systems whose internal computational processes are complex when the technologies have demonstrated reliable performance, safety, and relevance in representative clinical populations. Nevertheless, explainability remained important when AI recommendations influenced high-stakes decisions, conflicted with clinical observations, or required communication to patients.

Overreliance and system failure represented additional trust-related concerns. In emergency-department implementation, clinicians identified both excessive dependence on AI recommendations and the consequences of technical malfunction as potential barriers (25). Rehabilitation-specific adoption therefore required AI to function as an adjunct to professional decision-making rather than as an autonomous substitute for clinical expertise.

Ethical, Legal, Privacy, and Fairness Concerns

Ethical and governance issues were prominent across rehabilitation and general healthcare evidence. A systematic review of healthcare AI implementation classified barriers within moral, legal, technological, social, personnel, and clinical-safety domains (16). Data privacy, confidentiality, algorithmic bias, fairness, accountability, and responsibility for erroneous recommendations were recurring concerns.

Physical therapists specifically expressed concern regarding the protection of patient information and the ethical implications of incorporating AI into rehabilitation care (27). Similar findings were reported among healthcare providers involved in rehabilitation, who identified data privacy as an important obstacle to adoption (10). These concerns were particularly relevant to rehabilitation technologies that continuously collect video, movement, sensor, behavioural, or home-based monitoring data.

Implementation was facilitated when organisations established clear governance procedures, transparent consent processes, secure data-management systems, defined professional accountability, and mechanisms for evaluating bias and safety. The findings also indicated that ethical acceptability depended on preserving human oversight and ensuring that AI supported rather than displaced empathic, individualised clinical care.

Cost, Infrastructure, and Organisational Readiness

Financial and infrastructural limitations were repeatedly identified as barriers, particularly in rehabilitation settings where implementation may require sensors, cameras, robotic devices, specialised software, secure digital systems, maintenance, and technical support. Rehabilitation professionals reported cost and limited resources as major constraints (10,11). These barriers may be amplified in resource-constrained settings where internet reliability, device availability, interoperability, technical expertise, and institutional funding are limited.

Organisational readiness influenced whether potentially useful technologies could be incorporated into routine care. Successful adoption required leadership support, staff preparation, compatible digital infrastructure, technical assistance, and alignment between the technology and institutional priorities. A lack of organisational support was associated with uncertainty, inconsistent use, and difficulty sustaining implementation.

Evidence concerning embodied AI and healthcare robotics further demonstrated that promising clinical performance alone was insufficient. Studies of surgical and rehabilitation robots were limited by small samples, restricted external validity, and inadequate cost-effectiveness evidence (1). These limitations reduced the ability of healthcare organisations to determine whether resource-intensive systems offered sufficient clinical and economic value for routine implementation.

Workflow Integration and Usability

Compatibility with clinical workflow was a major practical determinant of adoption. AI systems that increased documentation burden, interrupted established processes, generated poorly timed recommendations, or required extensive additional data entry were less likely to be accepted. Reviews in primary care and medical imaging identified workflow integration and usability as persistent challenges (15,24).

User-friendly and interactive interfaces were reported as facilitators. In emergency-department implementation, locally adapted systems and interactive user interfaces supported acceptance, whereas system failure and concern about inappropriate reliance reduced confidence (25). Rehabilitation technologies similarly required interfaces that could be used efficiently by clinicians and patients with differing levels of technical literacy.

AI-powered virtual physiotherapy assistants demonstrated potential to support home rehabilitation, but sensor accuracy, patient engagement, accessibility, and usability affected their practical implementation (8). Thus, successful adoption depended on reliable performance in real-world environments rather than laboratory conditions alone. Technologies also needed to accommodate variation in disability, movement ability, language, cognition, digital literacy, and access to devices.

Patient-Centredness, Human Interaction, and Local Relevance

Although much of the included literature focused on clinicians, patient values and concerns were also important. The patient-perspective scoping review found that patient priorities were not consistently incorporated into the design and implementation of healthcare AI (29). This represented a significant gap because acceptance may be influenced by privacy concerns, perceived loss of human contact, trust in automated recommendations, accessibility, and the extent to which technology reflects individual goals.

Human interaction was particularly important in rehabilitation, where motivation, therapeutic alliance, shared decision-making, and repeated clinician–patient contact contribute to treatment engagement. Clinicians expressed concern that poorly designed AI systems could diminish empathy or reduce the humanistic quality of care (19,24). In contrast, adoption was more acceptable when AI was positioned as a supportive tool that reduced administrative burden, enhanced monitoring, and enabled clinicians to devote greater attention to complex clinical and interpersonal tasks.

Local relevance was another recurring facilitator. AI systems trained or validated in populations that differed from the intended users could produce less reliable or less acceptable recommendations. Locally adapted systems, representative data, contextual validation, and clinician involvement during development were therefore important for implementation (25,28,30). These considerations were especially relevant to low- and middle-income settings, where language, infrastructure, service organisation, workforce capacity, and disease profiles may differ substantially from the environments in which many AI technologies were initially developed.

Table 2. Thematic Synthesis of Barriers and Facilitators Affecting AI Adoption

Implementation domain	Principal barriers	Principal facilitators	Main supporting references
Professional knowledge and training	Limited AI literacy; insufficient specialised education; uncertainty regarding limitations and professional responsibility	Structured education; practical training; continuing professional development; exposure to clinically relevant applications	(6,10,11,14,20,24,27,28)
Trust and clinical validation	Black-box concerns; uncertain reliability; overreliance; system failure; weak real-world evidence	Representative clinical validation; transparent performance information; human oversight; evidence of safety and usefulness	(9,14,23,25,28)
Ethics, law, privacy, and fairness	Data-security concerns; confidentiality risks; algorithmic bias; unclear accountability; threats to humanistic care	Ethical governance; secure data systems; informed consent; bias monitoring; defined accountability; clinician oversight	(10,12,13,16,19,27,29)
Cost and infrastructure	Acquisition and maintenance cost; inadequate digital infrastructure; limited technical support; poor interoperability	Institutional investment; technical support; compatible infrastructure; economic evaluation; scalable systems	(1,10,11,14,24)
Organisational readiness	Weak leadership support; resistance to change; limited implementation planning; lack of workflow alignment	Leadership commitment; implementation planning; staff involvement; institutional policies; sustained support	(9,14,15,20,24)
Workflow and usability	Disruption of routine practice; additional workload; poor interface design; inaccurate sensors; accessibility limitations	User-friendly interfaces; local workflow adaptation; reliable sensors; interoperability; co-design with clinicians	(8,15,24,25,28)
Patient engagement and human interaction	Reduced personal contact; inadequate consideration of patient values; digital exclusion; limited engagement	Patient-centred design; preservation of therapeutic relationships; accessible technology; shared decision-making	(8,19,24,29)
Local relevance and generalisability	Non-representative training data; limited external validity; insufficient evidence from resource-constrained settings	Local validation; representative datasets; culturally and linguistically responsive systems; context-specific implementation	(1,14,25,28,30)

AI: artificial intelligence.

Evidence Gaps

Despite broad agreement regarding the potential value of AI, the included literature demonstrated important limitations in the maturity of the evidence. Much of the evidence consisted of reviews, cross-sectional surveys, and qualitative investigations that evaluated expectations, attitudes, and perceived barriers rather than sustained implementation or patient outcomes. A systematic review of AI in physical rehabilitation reported potential improvements in accessibility, effectiveness, and individualisation but also highlighted the limited availability of high-quality studies (22). Similarly, the review of real-world clinical AI applications identified insufficient high-level evidence to support routine use in clinical decision-making (23).

The implementation literature also lacked consistent reporting. In routine medical imaging, barriers and facilitators were frequently omitted or incompletely described, restricting comparison and transfer of implementation knowledge across settings (15). Rehabilitation robotics and embodied AI studies were constrained by limited external validity, small study populations, and inadequate cost-effectiveness information (1). Evidence from low- and middle-income settings and from long-term routine rehabilitation practice remained particularly limited.

The findings therefore indicated that interest in AI adoption was greater than the available evidence demonstrating sustainable implementation. Future evaluation would require prospective clinical-validation studies, pragmatic and implementation trials, mixed-method investigations, usability testing, health-economic analyses, and longitudinal assessment of patient, clinician, organisational, and equity outcomes. Randomised controlled trials may be appropriate for evaluating the comparative effectiveness of specific AI-supported rehabilitation interventions, but qualitative, observational, economic, and implementation-science designs are also necessary to examine adoption, acceptability, workflow, sustainability, and contextual determinants.

RESULTS

The synthesis showed that AI was generally perceived as having potential to improve rehabilitation accessibility, personalisation, monitoring, decision support, and service efficiency. However, adoption was constrained by limited professional training, insufficient clinical validation, privacy and ethical concerns, financial and infrastructural requirements, poor workflow compatibility, and uncertainty regarding accountability. These barriers operated at multiple levels and could not be resolved solely through improvements in algorithmic performance.

Professional education and trust-building were the most consistently emphasised enabling conditions. Clinicians were more likely to accept AI when they understood its purpose and limitations, had opportunities for practical training, and could evaluate recommendations within their existing clinical reasoning processes. Trust was strengthened by evidence of clinical validity, reliable system performance, human oversight, and transparent communication regarding limitations.

Implementation was also facilitated by user-friendly design, local adaptation, organisational leadership, technical support, secure governance, and early involvement of clinicians and patients in technology development. The evidence suggested that AI systems were most acceptable when they complemented clinical expertise, integrated into established workflows, protected patient information, and preserved the therapeutic and human-centred components of rehabilitation.

Nevertheless, the strength of these conclusions was limited by the predominance of reviews and perception-based studies, heterogeneity of AI applications, and scarcity of longitudinal real-world evaluations. Accordingly, the available evidence supported the feasibility and perceived usefulness of AI-assisted rehabilitation more strongly than it supported definitive conclusions regarding routine effectiveness, cost-effectiveness, sustainability, or equitable implementation.

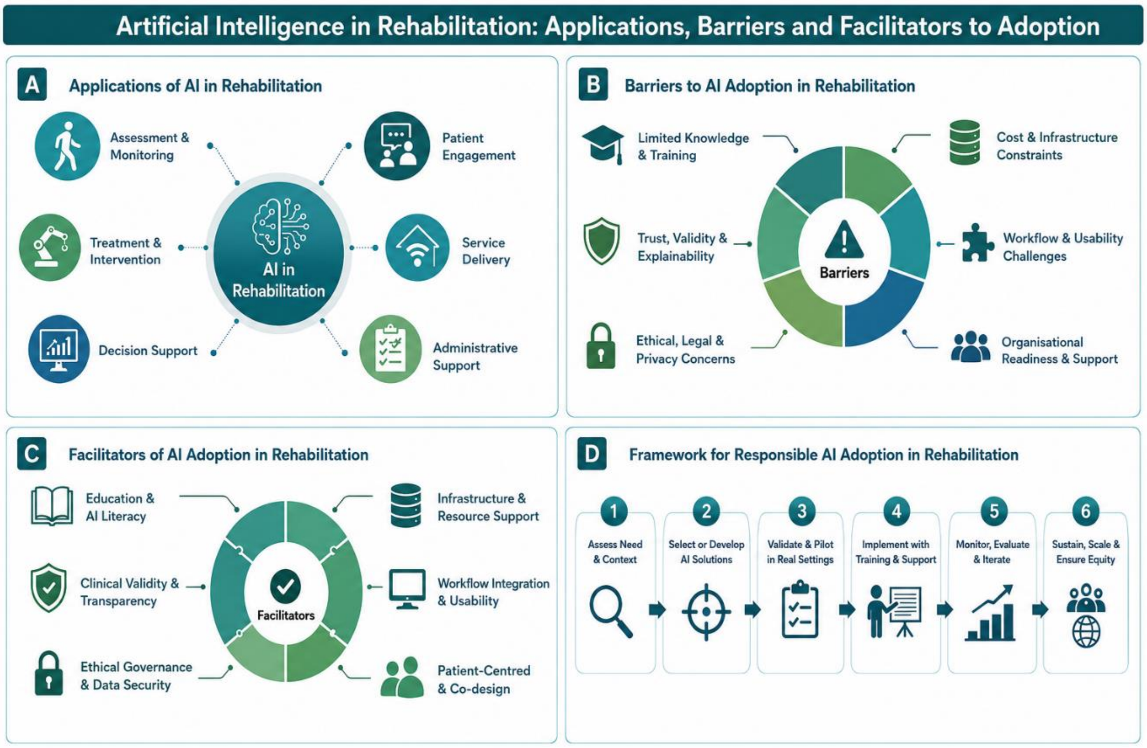

Figure 1 Artificial intelligence has broad applications in rehabilitation, including patient assessment and monitoring, treatment planning and intervention, clinical decision support, patient engagement, service delivery, and administrative support. Its adoption, however, may be limited by inadequate knowledge and training, concerns regarding trust, validity, and explainability, ethical, legal, and privacy risks, cost and infrastructure constraints, workflow and usability challenges, and insufficient organisational readiness. Key facilitators include education and AI literacy, clinical validation and transparency, ethical governance and data security, adequate infrastructure and resources, effective workflow integration, and patient-centred co-design. Responsible implementation should follow a structured process involving assessment of clinical needs and context, selection or development of appropriate AI solutions, validation and pilot testing in real-world settings, implementation with training and support, continuous monitoring and evaluation, and sustainable scaling while ensuring equitable access and outcomes.

DISCUSSION

This narrative review synthesised evidence from 19 publications and identified a consistent set of interacting factors that influenced the adoption of artificial intelligence in rehabilitation and related healthcare settings. AI was generally perceived as capable of supporting movement assessment, clinical decision-making, personalised treatment, remote monitoring, documentation, and service efficiency. However, routine adoption was limited by insufficient professional training, uncertainty regarding clinical validity, lack of trust, privacy and ethical concerns, cost and infrastructure requirements, poor workflow compatibility, inadequate organisational support, and limited patient involvement. Conversely, implementation was facilitated by structured AI education, representative clinical validation, transparent governance, user-centred design, workflow integration, technical support, local adaptation, and continued human oversight.

The findings indicated that professional knowledge and AI literacy were fundamental to adoption. Rehabilitation professionals commonly expressed interest in AI but lacked sufficient education regarding its clinical applications, limitations, ethical implications, and safe interpretation (9,10,14,19,20,23,26). This pattern suggested that exposure to AI alone was unlikely to produce meaningful implementation. Training needed to be clinically oriented and should enable professionals to determine when an AI-generated recommendation was relevant, when it required contextual interpretation, and when it should be questioned or rejected. Education should therefore extend beyond technical definitions and include algorithmic bias, data protection, clinical accountability, patient communication, and the preservation of professional judgement.

Trust was closely linked to the perceived validity, reliability, and clinical relevance of AI systems. Previous reviews similarly reported that clinicians were reluctant to adopt systems whose recommendations were insufficiently validated, difficult to interpret, or poorly aligned with routine clinical work (8,14,22,24,27). Although explainability was important, the findings suggested that clinicians might place greater value on credible evidence of safety and clinical validity than on a complete technical explanation of complex computational processes (27). This distinction was particularly relevant to rehabilitation, where treatment decisions depended on movement quality, functional context, patient goals, repeated assessment, and clinical reasoning that might not be fully represented in routinely collected data.

The risk of overreliance also required consideration. AI-supported decision systems could assist clinicians in identifying patterns and processing large amounts of information, but uncritical dependence could weaken independent clinical reasoning or propagate errors when systems failed or were applied outside their validated context (24). AI should therefore be implemented as an adjunct rather than an autonomous substitute for rehabilitation expertise. Human oversight was especially important when recommendations affected treatment progression, safety, discharge planning, or the management of patients with complex physical, cognitive, or psychosocial needs.

Ethical, legal, and privacy concerns represented another major group of barriers. Healthcare AI frequently relied on extensive clinical, behavioural, imaging, video, sensor, or movement data. In rehabilitation, continuous monitoring and home-based technologies could generate particularly sensitive information concerning a patient's functional capacity, living environment, adherence, and daily activities. Previous literature identified confidentiality, data security, algorithmic bias, fairness, accountability, and unclear responsibility for erroneous decisions as important obstacles to adoption (10–12,16,26,28). These concerns could not be resolved solely through technical improvement. Organisations required clear policies concerning informed consent, data ownership, access control, cybersecurity, bias monitoring, professional responsibility, and procedures for reporting or managing AI-related errors.

Algorithmic fairness was particularly relevant where AI systems were developed using data that did not adequately represent the population in which they were subsequently deployed. Performance could vary according to age, sex, disability, ethnicity, language, socioeconomic status, disease severity, device access, or other contextual characteristics. Systems trained in well-resourced settings might therefore be less accurate or less practical in low- and middle-income countries. Local validation, representative datasets, culturally and linguistically appropriate interfaces, and monitoring of differential performance were necessary to reduce the risk that AI could reinforce existing inequalities.

Financial cost, infrastructure, and organisational readiness also influenced implementation. Rehabilitation technologies could require specialised software, cameras, sensors, robotic devices, secure servers, technical maintenance, interoperability, and continuous user support. Cost and limited resources were repeatedly reported as barriers among rehabilitation professionals (9,10). Evidence concerning embodied AI and rehabilitation robotics further suggested that encouraging clinical findings were often accompanied by small samples, restricted external validity, and insufficient cost-effectiveness data (4). Healthcare organisations therefore needed evidence not only that a technology could function but also that it produced sufficient clinical or operational value to justify acquisition, maintenance, staff training, and workflow redesign.

Implementation was more likely to succeed when AI systems were compatible with existing clinical processes. Poorly integrated technologies could increase documentation, duplicate work, generate poorly timed alerts, or interrupt patient care. Similar workflow and usability difficulties were reported in primary care, emergency medicine, home rehabilitation, and medical imaging (7,15,23,24). In contrast, user-friendly interfaces, reliable performance, interoperability, local adaptation, and early involvement of intended users facilitated acceptance. Clinicians should therefore participate in defining the clinical problem, selecting outcome measures, testing prototypes, identifying safety risks, and evaluating whether a proposed system improves rather than complicates routine practice.

Patient-centredness remained comparatively underdeveloped in the literature. Much of the evidence focused on clinician acceptance, while patient values and experiences were less consistently incorporated into technology design and evaluation (28). This represented an important limitation because rehabilitation commonly depended on shared goals, motivation, adherence, repeated interaction, and the therapeutic alliance. Patients might value convenient remote monitoring and rapid feedback but remain concerned about privacy, digital exclusion, reduced personal contact, or excessive dependence on automated advice. Meaningful co-design with patients could improve accessibility, acceptability, consent processes, communication, and alignment with functional goals.

The findings also highlighted the need to distinguish technical performance from successful implementation. An algorithm could demonstrate accuracy under controlled conditions without being usable, affordable, acceptable, equitable, or sustainable in routine rehabilitation. Similarly, favourable clinician attitudes did not establish clinical effectiveness. Current evidence supported the perceived usefulness and feasibility of AI more strongly than it supported definitive conclusions regarding long-term patient outcomes, cost-effectiveness, or sustainable health-system integration. Reviews of physical rehabilitation and real-world clinical AI similarly identified limited high-quality evidence supporting routine implementation (21,22).

Future research should therefore use designs matched to the question being investigated. Randomised controlled trials may be appropriate for evaluating the comparative effectiveness of specific AI-supported interventions, but they are not sufficient for examining all implementation determinants. Pragmatic trials, prospective validation studies, mixed-method investigations, qualitative studies, usability evaluations, implementation-science designs, economic analyses, and longitudinal surveillance are also required. Studies should report the clinical setting, intended users, data sources, validation population, workflow implications, implementation resources, patient involvement, safety outcomes, and reasons for successful or unsuccessful adoption.

The principal strength of this review was its integration of rehabilitation-specific evidence with transferable findings from broader healthcare implementation research. It considered technological, professional, ethical, organisational, patient-related, and system-level determinants rather than limiting the synthesis to algorithmic performance. The inclusion of recent literature also enabled consideration of emerging applications such as virtual rehabilitation assistants, clinical decision-support systems, and embodied AI.

Several limitations should nevertheless be acknowledged. The narrative design and broad eligibility criteria increased the possibility of selection bias and limited reproducibility. The included evidence was heterogeneous in design, population, setting, AI application, and outcome concepts, preventing statistical pooling. Many included publications were reviews, cross-sectional surveys, or qualitative studies, and overlap among the primary evidence included in different reviews could not be excluded. A formal risk-of-bias assessment was not reported, and evidence from general healthcare settings might not have been fully transferable to rehabilitation. Restriction to English-language publications may also have excluded relevant findings. Moreover, AI technologies and regulatory expectations are developing rapidly, and some conclusions may require revision as stronger implementation and effectiveness evidence emerges.

Despite these limitations, the synthesis indicated that successful AI adoption in rehabilitation depended on more than technological sophistication. Sustainable implementation required clinically valid systems, an appropriately trained workforce, ethical governance, secure infrastructure, organisational commitment, patient participation, and continuous evaluation. AI was most likely to strengthen rehabilitation when it augmented professional expertise, supported patient-centred care, and was adapted to the clinical and socioeconomic context in which it was used.

CONCLUSION

Artificial intelligence has the potential to support assessment, treatment planning, monitoring, remote care, and service efficiency in rehabilitation; however, routine adoption remains constrained by limited professional training, uncertain clinical validity, lack of trust, privacy and ethical concerns, financial and infrastructural requirements, workflow disruption, and inadequate organisational support. Implementation is more likely to be successful when AI systems are clinically validated, user-friendly, securely governed, locally adapted, integrated into existing workflows, and developed with the active involvement of clinicians and patients. Current evidence supports the feasibility and perceived usefulness of AI-assisted rehabilitation more strongly than its long-term effectiveness, cost-effectiveness, and sustainability, underscoring the need for rigorous real-world evaluation while preserving professional oversight and patient-centred care.

REFERENCES

1. Copeland BJ. Artificial intelligence. Encyclopaedia Britannica. Available from: https://www.britannica.com/technology/artificial-intelligence
2. Stryker C, Kavlakoglu E. What is artificial intelligence? IBM. Available from: https://www.ibm.com/think/topics/artificial-intelligence
3. Aldhahi MI, Alorainy AI, Abuzaid MM, Gareeballah A, Alsubaie NF, Alshamary AS, et al. Adoption of artificial intelligence in rehabilitation: perceptions, knowledge, and challenges among healthcare providers. Healthcare. 2025;13(4):350.
4. Mir BA, Nishwa DE, Lee SW. Embodied artificial intelligence in healthcare: a systematic review of robotic perception, decision-making, and clinical impact. Healthcare. 2026;14(5):572.
5. Stanford Institute for Human-Centered Artificial Intelligence. The AI Index 2026 annual report. Stanford (CA): Stanford University; 2026.
6. World Health Organization. Rehabilitation. Available from: https://www.who.int/news-room/fact-sheets/detail/rehabilitation
7. Olawade DB, Adeleye KK, Egbon E, Nwabuoku US, David-Olawade AC, Boussios S, et al. Enhancing home rehabilitation through AI-driven virtual assistants: a narrative review. Ann Transl Med. 2025;13(5):61.
8. Hassan M, Kushniruk A, Borycki E. Barriers to and facilitators of artificial intelligence adoption in health care: a scoping review. JMIR Hum Factors. 2024;11:e48633.
9. Syed H, Abbas DS, Ranjan R, Maurya B, Warsi A, Khan S. Evaluating healthcare providers' perceptions, expertise, and barriers regarding the adoption of AI in rehabilitation. 2025;54:4423-39.
10. Alsobhi M, Sachdev HS, Chevidikunnan MF, Basuodan R, K U, DK, et al. Facilitators and barriers of artificial intelligence applications in rehabilitation: a mixed-method approach. Int J Environ Res Public Health. 2022;19(23):15919.
11. Ghosh M. Artificial intelligence and ethical concerns: a review and research agenda. Cogent Bus Manag. 2025;12(1):2551809.
12. Stahl BC. Ethical issues of AI. In: Artificial intelligence for a better future. 2021. p. 35-53.
13. Nambi G, Alghadier M, Mohamed SHP, Aldhafian OR, Alshahrani NA, Albarakati AJA. Clinical usefulness of artificial intelligence in physiotherapy: a practice-based review. SBV J Basic Clin Appl Health Sci. 2024;7(4):184-8.
14. Scipion CEA, Manchester MA, Federman A, Wang Y, Arias JJ. Barriers to and facilitators of clinician acceptance and use of artificial intelligence in healthcare settings: a scoping review. BMJ Open. 2025;15(4):e092624.
15. Wenderott K, Krups J, Weigl M, Wooldridge AR. Facilitators and barriers to implementing AI in routine medical imaging: systematic review and qualitative analysis. J Med Internet Res. 2025;27:e63649.

16. Ahmed MI, Spooner B, Isherwood J, Lane M, Orrock E, Dennison A. A systematic review of the barriers to the implementation of artificial intelligence in healthcare. Cureus. 2023;15(10):e46454.

17. Bianchini S, Müller M, Pelletier P. Drivers and barriers of AI adoption and use in scientific research. Technol Forecast Soc Change. 2025;220:124303.

18. Marocco S, Barbieri B, Talamo A. Exploring facilitators and barriers to managers' adoption of AI-based systems in decision-making: a systematic review. AI. 2024;5(4):2538-67.

19. Sahoo RK, Sahoo KC, Negi S, Baliarsingh SK, Panda B, Pati S. Health professionals' perspectives on the use of artificial intelligence in healthcare: a systematic review. Patient Educ Couns. 2025;134:108680.

20. Lefebvre K, Leuther K, Schmalzl K. Understanding the role of artificial intelligence in rehabilitative practice: a qualitative study. Top Geriatr Rehabil. 2025;41(3):144-53.

21. Sumner J, Lim HW, Chong LS, Bundele A, Mukhopadhyay A, Kayambu G. Artificial intelligence in physical rehabilitation: a systematic review. Artif Intell Med. 2023;146:102693.

22. Yin J, Ngiam KY, Teo HH. Role of artificial intelligence applications in real-life clinical practice: a systematic review. J Med Internet Res. 2021;23(4):e25759.

23. Katonai G, Arvai N, Mesko B. AI and primary care: a scoping review. J Med Internet Res. 2025;27:e65950.

24. Fujimori R, Liu K, Soeno S, Naraba H, Ogura K, Hara K, et al. Acceptance, barriers, and facilitators to implementing artificial intelligence-based decision-support systems in emergency departments: quantitative and qualitative evaluation. JMIR Form Res. 2022;6(6):e36501.

25. N A, Chowdhury RR, L P, Peter RM, Vv A. Perception of the adoption of artificial intelligence in healthcare practices among healthcare professionals in a tertiary-care hospital: a cross-sectional study. Cureus. 2024;16(9):e69910.

26. Shawli L, Alsobhi M, Chevidikunnan MF, Rosewilliam S, Basuodan R, Khan F. Physical therapists' perceptions and attitudes towards artificial intelligence in healthcare and rehabilitation: a qualitative study. Musculoskelet Sci Pract. 2024;73:103152.

27. Marco-Ruiz L, Hernández MAT, Ngo PD, Makhlysheva A, Svenning TO, Dyb K, et al. A multinational study on artificial intelligence adoption: clinical implementers' perspectives. Int J Med Inform. 2024;184:105377.

28. Moy S, Irannejad M, Manning SJ, Farahani M, Ahmed Y, Gao E, et al. Patient perspectives on the use of artificial intelligence in health care: a scoping review. J Patient Cent Res Rev. 2024;11(1):51-62.

29. Mennella C, Maniscalco U, Di Pietro G, Esposito M. The role of artificial intelligence in future rehabilitation services: a systematic literature review. IEEE Access. 2023;11:11024-43.