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MANAGING ACCESSIBILITY IN THE HEALTHCARE SERVICE LIFE CYCLE – SYSTEMATIC LITERATURE REVIEW

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Theoretical background: Contemporary healthcare systems are defined in management sciences as complex adaptive systems (CAS), in which service availability is a critical determinant of public safety and clinical outcomes (National Academy of Engineering [NAE], 2008). Traditional service management frameworks, in particular the evolution from the process-centric ITIL v3 model to the value-oriented ITIL 4, provide the theoretical foundation for optimising these services (2019). However, the healthcare sector faces unique challenges, such as organisational silos, resource shortages and new legal imperatives arising from the European Accessibility Act (EAA).
Purpose: The main objective of this study is to analyse and evaluate the integration of availability management (AM) practices into the medical service lifecycle. The study focuses on how management decisions at the design and planning stages affect operational efficiency, reduce patient waiting times, and eliminate functional barriers for people with special needs (Sever, 2024).
Methodology: The study used a Systematic Literature Review (SLR) following PRISMA guidelines. The analysis covered peer-reviewed publications from 2014-2025 from the Scopus, Web of Science and PubMed databases, as well as our own bibliographic data, focusing on the intersections of ITIL theory and operational management in medicine (Toleman et al., 2023).
Findings: A review of the literature reveals a significant implementation gap (know-do gap) between theoretical management standards and their practical application in healthcare organisations (Morris et al., 2011). Organisational silos and a lack of management commitment (67% of managers are unaware of the implications of EAA) are the main barriers to proactive planning. The results suggest that a shift towards a "patient life cycle" orientation and co-creation enables a better match between resources and demand and improves the accessibility of these services to patients at many levels.
Practical and social implications: Above all, the authors emphasise a holistic approach to ensuring accessibility throughout the life cycle of a healthcare service. Moving away from isolated measures and incorporating the service life cycle into the analysis improves not only accessibility but also the effectiveness of healthcare services. A broader view of the processes of creating health services enables systemic optimisation in ensuring patient health, rather than merely improving medical procedures (suboptimisation).

Originality/value: The issue of accessibility should be viewed systematically. In terms of services, especially medical services, this identifies significant potential for re-engineering to improve effectiveness, costs, and, of course, accessibility. The article's originality manifests in two aspects: on the one hand, it links the accessibility of medical services to the service and patient life cycles; on the other hand, it recognises their role in co-creation. The literature on the subject fails to connect these two aspects. In particular, accessibility issues should be considered holistically rather than in a point- or segmental manner, as healthcare services are often delivered over time and are correlated with other aspects of patients' lives.
Keywords: accessibility management; medical service life cycle; healthcare; operational efficiency; organisational barriers; European Accessibility Act.
Category of the paper: Research paper.
JEL: I11; I18; M11; L84.

1. Introduction

This article is a systematic literature review on availability management (AM) in the medical service life cycle. The work integrates the classic service management framework (ITIL v3/ITIL 4) with modern co-creation methodologies and the legal requirements of the European Accessibility Act (EAA).

The main objective of the article is to identify and assess the impact of an integrated service lifecycle management model on the operational efficiency of healthcare entities and the availability of the services they provide, with particular emphasis on organisational barriers and the needs of people with functional limitations.

The study focuses on how management decisions made at the planning and design stages of processes translate into greater accessibility of these services for patients and greater comfort during service provision.

Justification for choosing the health services sector

The decision to limit the analysis to healthcare services rather than general services is dictated by their unique operational and social characteristics, as well as their great importance to society and to each individual. Four key factors are worth noting here:

A. Criticality and ethical imperative: In medicine, the "unavailability" of a service (e.g., no free beds, patient data system failure) directly threatens life and health, which distinguishes it from the commercial sector (World Health Organisation, 2024). Availability management is based on the principles of *beneficence* and distributive justice (O'Sullivan et al., 2022).
B. Systemic complexity (Complex Adaptive Systems): Healthcare is defined as a "system of systems" in which independent agents (doctors, patients) respond to changes in a non-linear manner, often using informal workarounds, which makes process management much more difficult than in linear services (National Academy of Engineering [NAE], 2008).

C. Population specificity and inclusiveness requirements: This sector serves the most excluded groups. In Poland, people with special needs account for 35-50% of the population, and in the 85+ age group, as many as 70-75% of people declare functional limitations. (Central Statistical Office, 2024). Global reviews show that people with disabilities and other structurally marginalised groups experience systemic barriers at all levels – from the cost and organisation of services, through logistics, to stigmatisation and lack of accessible information (Gréaux et al., 2023; Hemihemi et al., 2020; Scheffler et al., 2015; Chiarenza et al., 2019). Even when systems formally ensure accessibility (infrastructure, services), the way services are organised and the prevailing logic of efficiency can lead to a mismatch between services and the real needs of people in difficult situations, as shown, for example, in oncology and primary health care (Horrill et al., 2025; Scheffler et al., 2015; Mazibuko et al., 2024).

D. Legal framework of the European Accessibility Act (EAA): Directive 2019/882 imposes mandatory accessibility requirements on healthcare providers, with non-compliance resulting in penalties of up to 5% of annual turnover and the risk of losing public contracts (European Commission, 2025; Act on the Accessibility of Products and Services, 2025). Legal analyses emphasise that the effectiveness of the EAA will depend on whether Member States adopt an approach that truly harmonises standards and covers both technical requirements (e.g. compliance with WCAG 2.1) and enforcement mechanisms (Drabarz, 2020; Michtner, Pinzolits, 2025; Jankowska, 2021). Studies of current accessibility of digital services (e.g., VOD platforms) point to significant gaps in keyboard navigation, contrast, compatibility with screen readers, and media alternatives, underscoring the scale of implementation challenges for healthcare entities (Michtner, Pinzolits, 2025).

In this context, accessibility management in the healthcare service lifecycle must combine an operational perspective (ITIL/AM) with regulatory requirements (EAA) and "design for all" and universal digital design approaches (Drabarz, 2020; Michtner, Pinzolits, 2025; Jankowska, 2021).

Research gap

Given the importance of healthcare service management, it is also worth noting gaps in the scientific literature in this area. Despite numerous studies on the medical and organisational aspects of treatment, there is a clear gap in the management literature in three areas:

- Implementation (Know-do gap): There are no specific guidelines for medical facility managers on how to adapt the service management framework step by step in everyday clinical practice.
- Lack of a holistic approach to processes: Most studies focus on the management of a selected element (e.g., only drug logistics or only doctors' working time), ignoring accessibility as a coherent process that spans from the moment the Patient enters the system until the end of care.

- The human factor in management**:** The impact of medical staff resistance to new process management methods on the final availability of services has not been sufficiently researched.

There is therefore considerable potential for improving medical service delivery processes in terms of both organisation and cost.

To prepare empirical research that could fill the gaps identified above, it is worth reviewing, inventorying, and systematising the existing scientific achievements in this area, especially in the fields of management and quality sciences.

Research questions

As part of a systematic review of the literature, answers were sought to the following research questions.

RB1: How has the approach to service management evolved? RB2: What role does accessibility play in service anagement?

RB3: To what extent can the concept of service life be used to ensure availability?

Research hypothesis

To maintain methodological correctness, a research hypothesis was also formulated.

H1: Implementing a holistic model of medical service lifecycle management increases patient accessibility, especially for those with special needs.

The article does not propose a quantitative measure of the impact's strength, but only presents arguments supporting the hypothesis.

2. Search strategy and PRISMA model

The research process, based on a systematic review of the literature, was systematised and developed using our own bibliography and search results from scientific bibliographic databases (WoS, Scopus, PubMed), supported by AI tools such as Consensus, Notebook LM, Perplexity, Scopus AI, Gemini, and ChatGPT. The following summary includes the search strategy, the PRISMA selection criteria, and the assignment of identified literature to help answer the research questions and support the verification of the research hypothesis.

The search strategy was based on a multi-stage approach combining classic service management nomenclature (ITIL) with modern concepts (Health 4.0, Co-creation) and legal requirements (EAA). Databases was Web of Science, Scopus, PubMed. Time frame 2014-2026 (updated with the latest records from 2026 available in the Scopus database). Detailed keywords in the area of:

- Management and processes: Availability Management, Service Lifecycle, ITIL 4, Service-Dominant Logic, Operational efficiency.
- Sectors and technologies: Healthcare 4.0, Digital health platforms, Welfare technology, Medical Things (IoMT).
- Accessibility and inclusivity: Accessibility barriers, European Accessibility Act (EAA), Patient wait time, Gender-affirming care access, Inclusive Design.
- Methodologies: Co-creation, Service Design, Value co-creation, Design Thinking.

PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

The flow of information through the various phases of a systematic literature review is presented below.

Stage 1: Identification

At this stage, all records found in the databases using the defined keywords (availability management, service lifecycle, healthcare operations, co-creation) were counted.

Total number of records identified in the databases: 3,596 (Scopus database 3,034, Web of Science (WoS) 559, PubMed: 3, records identified from other sources 15). Manually added items from the so-called grey literature, EU reports on the EAA, government websites, e.g. European Accessibility Act, and WHO reports cited in the bibliography. Total: 3611 records.

Stage 2: Screening

At this stage, the number of articles was reduced the most. Duplicates were removed: 650 items. The WoS and Scopus databases largely index the same journals. It is estimated that approximately 20-30% of the results overlap. Number of records after removing duplicates: 2961.

Review of titles and abstracts (Screening) excluded 2811. The reason for the mass exclusion was that keywords such as "lifecycle" or "availability" in medicine yield many results unrelated to management, e.g.:

- The biological life cycle of parasites/viruses (instead of the life cycle of a service).
- Availability (bioavailability) instead of organisational availability.
- Technical availability of servers without a medical context.
- Articles on agriculture or freight transport (e.g. records on "freight rates" or "agribusiness").

Number of records that qualified for full-text evaluation: 150.

Stage 3: Eligibility

At this stage, the content of 150 selected articles was analysed in detail with respect to research questions and inclusion criteria. Full-text articles evaluated: 150, Articles excluded at this stage: 44. The reasons for exclusion were an overly general approach, lack of reference to organisational barriers, articles older than the assumed scope (unless they were key theories such as ITIL/SDL), and lack of access to the full text.

Stage 4: Inclusion

Final number of articles included in the synthesis (and bibliography) was 120. This is a collection of articles that were directly used to write the text, to verify the hypothesis, and to answer the research questions PB1, PB2, and PB3.

The selected literature has been assigned to specific research questions, combining the theoretical basis with the latest scientific research results from 2025–2026, supplemented with older analyses.

PB1: How has the approach to service management evolved?

The answer to this question is that there has been an evolution from processes (ITIL v3) to value ecosystems (ITIL 4, SDL) and network platforms. In particular: ITIL transformation and service logic:

- Barcikowski (2016) and Harjanto (2024): The foundation for the transition from lifecycle (v3) to value chain (v4).
- Schmidt, R., Zimmermann A. (2026). The latest study (using Alexa as an example) shows how *Service-Dominant Logic* (SDL) works in networked assistant platforms. This is key to understanding how health services can benefit from external ecosystems.

Health 4.0 and Innovation Ecosystems:

- Al-Jaroodi et al. (2020). Defines Health 4.0 as the integration of IoT and management processes.
- Hoveskog et al. (2026). A case study (Polestar) showing how a peripheral supplier can become a key player in a mature innovation ecosystem – an analogy for medical entities entering digital health networks.
- Dal Mas et al. (2023). Challenges of digital transformation in healthcare.

PB2: What role does accessibility play in service management?

The answer may be that accessibility is a critical operational (time and resources) and legal ethical (equality and EAA) parameter.

Operational and measurable availability:

- Cavalcanti et al. (2022). Analysis of factors influencing wait time – a key indicator of availability.
- Nucamendi-Guillén et al. (2026). A mathematical logistics model (Location Routing Problem) that minimises customer waiting time by optimising routes and locations – hard evidence of the role of management in availability.
- Levesque et al. (2013). Conceptualisation of the 5 dimensions of availability (including Approachability and Affordability).

Barriers and specific groups (Inclusiveness):

- Puckett et al. (2018). Identification of systemic barriers to healthcare access for transgender people – evidence of the need for inclusivity management.
- Frishammar et al. (2023). Barriers to seniors adopting digital platforms.

- Drabarz (2020) & Michtner (2025): The role of the European Accessibility Act (EAA) and gaps in digital accessibility.
- Gréaux et al. (2023). Global overview of barriers for persons with disabilities.

PB3: To what extent can the concept of service lifecycle be used to ensure accessibility?

The answer is that, with the help of co-creation in the early stages of the life cycle and staff training, accessibility can be ensured by using service lifecycle concepts: Co-creation and Design:

- Teig, G.-S., Gjerstad (2026). A key study shows that technologists (suppliers) and health managers must *co-create* solutions for welfare technology to be useful in primary health care.
- Jiang et al. (2026) indicate that reputation and trust are key to value co-creation behaviours on platforms, which applies to e-patients. The article provides the latest evidence on what factors (e.g., *prosocial motivation*, *relational embeddedness*) motivate users to share knowledge and co-create value on digital platforms.
- Voorheis et al. (2025). Applying *Service Blueprinting* to Integrated Care Design. The article directly discusses the application of Service Blueprinting (service process mapping) and Journey Mapping (patient pathway mapping). These are fundamental tools in service lifecycle management, allowing "pain points" and accessibility barriers to be identified before a service is implemented.
- Östberg et al. (2026). The role of engagement and motivation in co-creation ecosystems in rural areas is important for accessibility outside metropolitan areas.

Competencies in the life cycle:

- Hsu & Sung (2026). Using *service-learning* to build cultural competence and empathy in medical students – preparing staff to serve diverse patient groups is part of service lifecycle management (human resources).

Verification of Hypothesis (H1)

Hypothesis H1: *The implementation of a holistic model of medical service life cycle management increases its accessibility for patients, especially those with special needs.*

Based on the compiled literature, the hypothesis has been validated (qualitatively confirmed):

1. Technological Argument: Articles from 2026 (Teig, Gjerstad-Sørensen, Gjerstad, 2026; Schmidt, Alt, Zimmermann, 2026) prove that the isolated implementation of technology (without holistic *co-creation*) leads to failure. Only the cooperation of technologists with medical staff at the *design* stage (the beginning of the life cycle) guarantees usability and final accessibility.

2. Operational Argument: Nucamendi-Guillén and Cavalcanti demonstrate that optimising logistics and location processes (elements of cycle management) directly reduces waiting times, thereby increasing temporal accessibility.
3. Social Argument: Research on barriers faced by marginalised groups (Puckett et al., 2018; Horrill) indicates that "inaccessibility" results from systemic mismatches. A holistic approach (including *cultural competence* according to Hsu and *Service Design* according to Voorheis) enables these barriers to be systematically eliminated rather than only on an ad hoc basis.

3. Accessibility management in services: experience to date

Significant progress has been made in the provision of individual services, such as transport. Means of transport, especially public transport, are primarily equipped with facilities ensuring accessibility for people with physical disabilities – low-floor buses and trams, lifts and platforms at vehicle doors, spaces for people in wheelchairs or with prams or large luggage, seats for older adults, pregnant women or people with small children, etc.

There are more and more parking zones designated for people with disabilities, and parking spaces reserved for families with children (e.g., near shops). Voice announcements about the route are becoming standard in public transport and trains. Markings for blind or visually impaired people are installed on transport routes, pavements and crossings to indicate stairs, thresholds, platform ends, etc. Appropriate Braille inscriptions appear on handrails, lift and stair control buttons, vending machines, ATMs, ticket machines, etc. Traffic lights at pedestrian crossings are also equipped with audible signals and other features. Installation of information screens with the option to enlarge images or fonts via touchscreen, or to activate audio description mode.

Significant progress is being made in the field of accessibility, wherever it can be ensured through quick, one-off investments – the installation of equipment and the arrangement of space described above ensure accessibility in various aspects. However, there are several services for which ensuring accessibility requires actions that continue throughout the service's entire duration, which can be many years or even the service's entire life cycle. The management of such services, especially in terms of accessibility, is very often carried out in a fragmented manner. Examples of such services include:

1) Financial services (bank account management, loans, credits, leasing, etc.).
2) Telecommunications services (telephones, internet access, cloud access to virtual drives, applications, etc.).

3) Medical services (diagnostics, treatment, rehabilitation).
4) IT services (implementation, maintenance and development of IT systems in organisations).

In financial services such as bank account management, loans, or credit, the focus on accessibility is most often concentrated on the stages of contract conclusion, informing customers about changes to terms of service and contract annexes, etc. Measures to ensure accessibility most often take the form of simplifying the language used in these documents and providing translations, e.g. into sign language, audio description or Braille.

The situation is similar in telecommunications services, where customers can receive similar support to that available in financial services.

A common feature of these services is the lack of customer involvement in their creation or configuration. The customer obviously has a choice between service providers, but at this stage, the customer's active role usually ends. The services offered are limited.

4. The evolution of availability management paradigm in ITIL v3 vs ITIL 4

The transition from ITIL v3 to ITIL 4 in 2019 represented a fundamental change in service delivery philosophy, evolving from a process-based structure to flexible, value-oriented practices (Harjanto, 2024).

4.1. ITIL v3: Service Lifecycle

The ITIL v3 model was based on a linear approach divided into five stages: Strategy, Design, Transition, Operation and Continuous Improvement (Barcikowski, 2016). Availability Management (AM) was defined here as **a process** within the *Service Design* phase responsible for ensuring that the infrastructure and support resources are at a level that guarantees fulfilment of the availability targets agreed in the Service Level Agreements (SLAs). For example, the work of Wang et al. on availability management and SLAs emphasises that service availability is defined in SLAs, and ITIL processes (including AM) are used to achieve these availability levels (Wang et al., 2018).

Key characteristics of AM in ITIL v3:

- Process approach: **roles, sequence of activities -** In works implementing ITIL v3, AM is treated as a formalised process with defined activities, procedures, and responsibilities, documented in the form of an "availability management plan" together with policies, standards, and service recovery procedures (Zeng, 2008). This supports the aforementioned thesis about the validity of the "process approach" and assigned operational roles.

- Reactive measures: Monitoring and analysis of incidents and problems causing unavailability (Zeng, 2008).
- Proactive activities: Planning and designing redundancy mechanisms to eliminate single points of failure (SPoF). Zeng's case study demonstrates the use of availability engineering and block modelling to design high-availability solutions, including the identification of critical elements and the selection of an architecture that minimises downtime risk (Zeng, 2008).

4.2. ITIL 4: Service Value System

ITIL 4 has transformed the rigid lifecycle into a flexible Service Value System (SVS) that promotes a holistic approach to ITIL 4 management. It is a flexible, integrated system focused on value creation. Availability management is no longer a process confined to the design phase but has become **a practice** that permeates the entire service delivery value chain (Harjanto, Aji, 2024; Ayuh, Chernovita, 2021).

The main changes introduced in ITIL 4:

1. From Processes to Practices: A practice is a set of organisational resources (people, technology, processes, partners) designed to perform work (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022).
2. *Value Co-creation*: Value is no longer "delivered" to the Patient but is co-created through interaction between medical staff and the Patient (Batalden et al., 2015). In healthcare, co-creation and coproduction of services mean patient-professional partnerships, mobilisation of patient resources, and participation in the design of care pathways. Systematic reviews show that co-approaches (coproduction, co-design, co-creation) promote better-tailored interventions, a sense of ownership and a greater chance of implementation, although evidence of hard health outcomes is still limited (Grindell et al., 2022; Palumbo, 2016; Palumbo, Manna, 2018; Ciasullo et al., 2022; Palumbo, 2021).
3. Four Dimensions Model: AM must consider (1) Organisations and people, (2) Information and technology, (3) Partners and suppliers, and (4) Value streams and processes (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022).
4. Guiding Principles: Introduction of 7 principles, such as (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022; Richter, Lantow, 2021):
    a. Focus on Value: All activities should be linked to creating value for customers and stakeholders.
    b. Start where you are: Do not start from scratch; leverage what already exists by assessing current processes, services, and tools.
    c. Progress iteratively with feedback: Break the work down into smaller, more manageable pieces, continuously gathering feedback to adapt and improve quickly.

d. Collaborate and promote visibility (Collaborate and promote visibility): Collaboration between teams and knowledge sharing (visibility) are key to better results.
e. Think and work holistically: Look at the system as a whole – at all its parts and their interrelationships, not just at individual elements.
f. Keep it simple and practical: Avoid unnecessary complexity; focus on simple, practical solutions that deliver value.
g. Optimise and automate: Use technology to automate repetitive tasks and optimise processes to increase efficiency.

Many concepts, methods and tools developed to improve IT project management are being implemented in other fields of knowledge. This was the case with the concept of Agile developed by programmers Ken Schwaber, Jeff Sutherland and 15 other signatories of the Agile Manifesto (Manifesto for Agile Software Development…). This concept revolutionised the way multiple projects are managed. Today, a similar situation applies to the ITIL standard for IT service management with the transition from version v3 to v4.

5. Availability Management (AM) in healthcare

In a medical context, this evolution represents a shift from technical equipment maintenance (v3) to strategic patient pathway management (v4). In the medical context, this evolution means a shift in emphasis from technical maintenance of equipment to strategic patient pathway management based on integrated, patient-centred care pathways (an integrated, process-based system for managing the Patient's journey through the system, rather than solely technical maintenance of resources) (Gartner et al., 2022; Sanseverino et al., 2024). It is crucial to identify critical business functions – such as ensuring accessible booking appointments for people with disabilities or immediate access to Electronic Medical Records (EHR) in emergencies – because these are what determine an organisation's readiness to provide equal/accessible and safe care (Mudrick et al., 2020; Rotoli et al., 2023; Halkides et al., 2022).

An important aspect of accessibility management is co-creation in healthcare. Unlike manufactured products, services are always co-created by the professionals providing them and the users of those services (Batalden et al., 2015). Coproduction (co-creation) in healthcare is a practice of collaboration between clinicians, researchers, policymakers, health system managers, and other professionals, working in genuine partnership with patients and the public to improve health outcomes (Dingelstad et al., 2025). The adoption of co-creation processes is critical at all stages of healthcare planning and policy, care and treatment, education, research, publication, and funding processes (Fusco et al., 2020; Fusco et al., 2023; Smith et al., 2022). Research shows that effective co-creation requires a process with a well-

defined goal (Masterson, 2024; Litchfield, 2025). The implementation of co-delivery with peer support enables service users' engagement to be placed at a higher level of the "co-creation ladder" (Fusco et al., 2020; Åkerblom, Ness, 2022). Co-creation builds on the principles of person-centred care and communication, where the knowledge and experience of care users are valued and respected on an equal footing with professionals' knowledge (Grindell et al., 2022; Litchfield, 2025; Knowles et al., 2021; Farr et al., 2021). This requires a collaborative environment with clear goals and genuine, early involvement of all stakeholders. In balancing multiple perspectives, co-creation is often an iterative process, requiring a culture of openness and honesty, as well as humility and understanding for all involved.

An analysis of the medical sector's preparedness for upcoming legal changes reveals a significant gap in terms of competence and infrastructure. Consultations conducted in 2024 by the All-Poland Alliance of Trade Unions (OPZZ) in cooperation with Healthcare Employers revealed critical barriers in non-public medical facilities (Fundacja Widzialni, 2024; All-Poland Alliance of Trade Unions & Healthcare Employers, 2024). These results correlate with data presented by the Widzialni Foundation, according to which as many as 67% of managers surveyed entities lack basic knowledge of the obligations arising from the European Accessibility Act (EAA).

Particularly worrying is that 82% of management staff have not participated in any accessibility training in the last 2 years. The lack of a systematic approach is manifested, among other things, by the absence of dedicated budgets for digital audits (WCAG compliance) and by a reactive model of removing barriers, initiated only in response to direct patient complaints. The implementation of the EAA, which expires in June 2025, therefore requires immediate intensification of educational and auditing activities in the private sector. Analysing the above description, a detailed analysis of the key barriers hindering the process of adapting medical facilities to accessibility standards can be made:

1. Knowledge and awareness gap – Low level of knowledge about accessibility/health literacy in organisations and the resulting need for basic education and staff engagement (Fundacja Widzialni, 2024; Ogólnopolskie Porozumienie Związków Zawodowych & Pracodawcy Ochrony Zdrowia, 2024; Pelizzari et al., 2025).
2. Deficit of technical and organisational resources - Institutions often lack the technical resources (IT infrastructure, accessibility audit tools, WCAG-compliant content management systems) and organisational resources (dedicated accessibility personnel, change implementation procedures, adaptation budgets) necessary to implement accessibility requirements effectively (Nascimento et al., 2023, Kooij et al., 2018, Granberg, 2025). This problem is particularly acute in small and medium-sized institutions, which constitute the majority of non-public healthcare entities in Poland.

3. Lack of systematic analysis of barriers. Most facilities do not conduct systematic analysis of accessibility barriers or formally identify the needs of patients with special needs. This means that decisions regarding infrastructure or process adaptations are made on an ad hoc basis, often in response to specific complaints or incidents, rather than as part of strategic, data-driven planning (Jonsson et al., 2023; Roy, Shoshi, 2025).
4. Lack of user participation. Facilities rarely involve patients, including those with special needs, and community organisations in the process of designing accessibility solutions (Henni et al., 2022). Meanwhile, international best practices clearly indicate that effective accessibility implementation requires co-creation of solutions with end users, in accordance with the principle of "Nothing About Us Without Us" (Albert et al., 2023).
5. Lack of applied research. There is also a lack of national applied research that would comprehensively identify factors facilitating and hindering the adaptation of health services to EU standards and indicate possible implementation scenarios for the non-public sector. A review of Polish literature and databases (BazEkon, CEJSH, Google Scholar) did not reveal any publications on the implementation of the EAA in Polish healthcare facilities published after 2023. Existing studies are primarily legal (analysis of the provisions of the directive) or technical (WCAG guidelines) in nature, but do not provide knowledge about organisational processes, stakeholder cooperation models or change management methods in the context of accessibility implementation. This research gap has serious practical consequences. Institutions do not have access to reliable, evidence-based guidance on how to effectively implement EAA requirements in a manner adapted to the realities of the Polish healthcare system, budgetary constraints, and the organisational specifics of the non-public sector (Jonsson et al., 2023; Roy, Shoshi, 2025).

In addition to the barriers described above, the literature on the subject also points to the gaps already mentioned in the introduction:

- The implementation gap (*Know-do gap*). A significant discrepancy between theoretical management standards and their practical adaptation by medical managers (Morris et al., 2011; World Health Organisation, 2006; Westerlund et al., 2019). Scoping and systematic reviews in the field of e-health and accessibility for people with disabilities highlight the discrepancy between the growing number of pilot interventions and their permanent integration into systems (Kaboré et al., 2022). Interventions are often not mapped to identified barriers, have unclear funding, and rarely include groups with complex, intersectional situations (Gréaux et al., 2023; Doherty et al., 2020; Marcus-Quinn, 2022; Zhou, Parmanto, 2018).
- Lack of process holism. Most studies focus on optimising isolated fragments (e.g. medicine logistics), overlooking accessibility management as a coherent *end-to-end* process (Eastwood, 2025). Most research on accessibility focuses on individual segments of the chain (e.g., telemedicine, rehabilitation, access to a general

practitioner), while relatively few studies treat accessibility as a managed, cross-cutting process covering successive points of contact between the Patient and the system (Anawade et al., 2024; Scheffler et al., 2015; Mazibuko et al., 2024).

- Human factors and cultural resistance. The impact of specific resistance among medical staff to formalised management methods on the final level of service availability (Wears, Sutcliffe, 2020). Research on the implementation of digital solutions and equity-oriented healthcare indicates that staff concerns, lack of resources, organisational stress and dominant discourses of efficiency ("doing more with less") hinder the adoption of solutions that enhance accessibility, despite formal institutional commitments (Horrill et al., 2025; Gréaux et al., 2023; Marcus-Quinn, 2022; Chiarenza et al., 2019).

A review of the literature also shows that the tendency to create organisational silos in hospitals (divisions into medical, administrative, and technical departments) hinders cooperation and leads to bottlenecks, drastically reducing the actual accessibility of services (Eastwood, 2025; Trachsel, Fallegger, 2017).

Qualitative research on access to oncology services shows an apparent mismatch (Al-Jaroodi et al., 2020, Khelassi et al., 2019, Kotzias et al., 2022)[1] (between the way services are designed (priority of operational efficiency, segmentation, standardisation) and the complex needs of marginalised people; this results in barriers to booking appointments, interrupted care pathways and experiences of stigmatisation (Horrill et al., 2025).

Similarly, reviews of global barriers for people with disabilities point to staff unpreparedness, poor coordination, and the failure to adapt appointments and procedures to functional limitations as key determinants of inequality in access, alongside financial and transport barriers (Gréaux et al., 2023; Hashemi et al., 2020; Mazibuko et al., 2024).

6. A new approach to the concept/ model of healthcare management: Health 4.0

The idea of the Health 4.0 model stems from the Industry 4.0 concept (Schwab, 2016; Wang, Wang, 2016; Lampropoulos, 2019), which describes integrated production systems that use cyber-physical systems, the Internet of Things (IoT), artificial intelligence (AI), and data analytics. The transfer of these ideas into healthcare began in 2010-2015 and gained importance amid the digitisation of medical services and the personalisation of therapy.

[1] mismatch - a lack of alignment/discrepancy between expectations and reality, between a person and their environment, or between behaviour and values and remote patient monitoring.

The main areas of development for Health 4.0 are related to:

1. Integration of digital health ecosystems: interoperable information systems, electronic medical records (EMR/EHR), Hospital Information System (HIS) solutions, medical device systems with built-in intelligence (Al-Jaroodi et al., 2020; Khelassi et al., 2019; Kotzias et al., 2022; Osama et al., 2023).
2. Digitisation of care: telemedicine, m-health, wearable devices, big data analytics, AI in diagnostics and therapy (Aceto et al., 2020; Jayaraman et al., 2019; Osama et al., 2023).
3. Modularity and adaptability: flexibility of care management processes, digital collaboration between facilities, and data standardisation (Kotzias et al., 2022; Li, Carayon, 2021; Al-Jaroodi et al., 2020).

This enables the integration of prevention, diagnosis, treatment, and rehabilitation processes, i.e., the entire cycle of medical service provision, as well as the service's life cycle, combined with the Patient's life cycle.

The integration of advanced technologies (AI, Machine Learning - ML, Internet of Things - IoT, robotics, data analytics, cloud computing) with medical service management processes enables:

a) data exchange between systems through interoperability and open data standards (e.g. HL7 FHIR, DICOM)[2,3] (Kotzias et al., 2022),
b) integration of healthcare ecosystems – hospitals, outpatient facilities, laboratories, research institutes – and placing the Patient at the centre of the network (Li, Carayon, 2021),
c) real-time data analysis – AI/ML for assisted diagnostics, demand forecasting, patient flow management, resource optimisation (staff, rooms, equipment) (Al-Jaroodi et al., 2020),
d) remoteness and telecare – real-time monitoring, teleconsultations, home care using wearables and medical IoT (Al-Jaroodi et al., 2020),
e) personalisation of care – adaptive treatment plans based on genomic data, phenotypic data and patient preferences (Li, Carayon, 2021),
f) security and compliance – cybersecurity, data privacy, regulatory compliance (e.g., GDPR) (Sisodia, Jindal, 2021),
g) improvement of management processes: predictive resource management, cost optimisation, and quality and efficiency indicators (e.g., KPIs) (Al-Jaroodi et al., 2020).

[2] **DICOM** manages medical *images* (X-rays, MRIs) and their metadata, while **HL7 FHIR** (Fast Healthcare Interoperability Resources) handles broader clinical/administrative data (patient records, labs). **DICOM** manages medical *images* (X-rays, MRIs) and their metadata, while **HL7 FHIR** (Fast Healthcare Interoperability Resources) handles broader clinical/administrative data (patient records, labs).

The potential benefits of Health 4.0 include increased availability and quality of medical services, reduced waiting times, better resource utilisation, increased patient engagement, and personalised treatment. All this can be achieved in an adaptive, personalised and patient-oriented manner.

Health 4.0 management models have shown that the actual involvement of patients in the service management process – not just in individual clinical decisions – increases the efficiency of resource use and better aligns services with user expectations (Laurisz et al., 2023; Tang et al., 2025).

Levesque and colleagues have developed a comprehensive conceptualisation of healthcare access that describes the broad dimensions and determinants integrating demand- and supply-side factors (Levesque et al., 2013). In this model, access is defined as the ability to identify health needs, seek healthcare services, reach them, obtain or use them, and actually meet service needs. The model conceptualises five dimensions of accessibility: - Approachability – the ability of people to identify that services exist that can meet their health needs – Acceptability – social and cultural factors that determine people's ability and willingness to seek, reach and accept services - Availability and accommodation – the ability of services to reach patients and adapt service delivery to Patient needs - Affordability – the ability of patients to bear the costs of services and the time spent obtaining them - Appropriateness – the suitability of services to patient needs and the quality of services provided In this model, five population-related capabilities interact with the dimensions of availability to generate access: ability to perceive, ability to seek, ability to reach, ability to pay, and ability to engage (Levesque et al., 2013).

7. Conclusion

Based on a review of the literature, this article presents the premises for interest in healthcare service management, adopting a broader perspective that considers the service life cycle. It presents the origins and assumptions of the concepts, models, methodologies and tools used in service management, particularly in ensuring their availability. This answers the first research question.

In the context of the second research question, the growing role of accessibility as a cardinal factor in medical service management has also been demonstrated. On the one hand, this is enforced by national and European Union legislation, such as the Act on the Accessibility of Products and Services, 2025, and the European Accessibility Act (EAA) Directive 2019/882. On the other hand, service management concepts such as Health 4.0, participatory design, integration of patient service processes throughout their life cycle, and a holistic approach to

the provision of medical services are being developed. They place the Patient (recipient/customer/human being) at the centre of attention.

The examples presented show that integrating medical service management processes improves efficiency and accessibility. This is evidenced by the implementation of elements of the Health 4.0 model, which integrates medical processes (prevention, diagnosis, treatment and rehabilitation with the service life cycle and patient life cycle.

The issue of accessibility manifests throughout the entire duration of the medical service, where this service should be considered an integrated patient care process in the area of prevention through diagnosis, therapy and rehabilitation. This is the answer to the third research question.

Taking into account the entirety of the argument and the arguments presented, it can be concluded that the research hypothesis has been substantiated. The term "confirmed" has been deliberately avoided here, as it is challenging to formulate deterministic judgements in the social sciences. At the same time, fundamental hypothetical-deductive falsificationism (Popper, 1977) cannot be used, as according to this concept, a single observation of an anomaly would thoroughly falsify any hypothesis, and, as we know, scientific laws in the social sciences assume an internal margin of error[3].

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[3] The rationale for this judgement can be found in Jokiel G. (2006).

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