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LETTER TO THE EDITOR

The Evolving Landscape of Digital Health Terminology

Fatima Baji*

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Digital health terminology finds its origins in the early days of telemedicine, a practice that gained traction in the mid-20th century as telecommunications offered new avenues for remote diagnosis and treatment. Digital health is the use of digital technologies in medicine and other health professions to manage illnesses and health risks and to

* ***Correspondence to****: Fatima Baji, Department of Medical Library & Information Science, School of Allied Medical Sciences, Ahvaz Jundishapur University of Medical Sciences, Postal Code: 61357-15794, Ahvaz, Iran. Fax: +98 61 33738330. email:* baji245@gmail.com

About the author:

Fatima Baji; PhD in Knowledge and Information Sciences, Associate Professor, Department of Medical Library & Information Science, School of Allied Medical Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

promote wellness. Beside this concept there is another related concept which originally conceived as medical care delivered without a direct, face-to-face physician-patient encounter, primarily through interactive audio-video systems, telemedicine definition has expanded. It now encompasses the comprehensive use of telecommunication technology to deliver healthcare services, share clinical information, and provide education over long distances. More than just a tool, it represents a complete system of care, integrating geographic distance, information technology, and specific clinical protocols to manage patient well-being.

Origin of the Term

The term "telemedicine," first appearing in 1972, initially described remote medical service provision (1). It has since evolved, becoming a subset of "telehealth," which encompasses broader health-related activities like education and administration, both involving electronic information transfer (2). Technological advancements spurred further terms: "eHealth" for electronic services, "mHealth" for services via mobile devices (3), and "virtual care" for patient-centric remote services. "Digital health" is now proposed as the most expansive term, integrating these with health IT, personalized medicine, and big data (2).

Telemedicine's history spans three eras: the Telecommunications Era (1970s), focused on medical care through broadcast, influenced by NASA and private sector telecom (2); the Dedicated Era (late 1980s-1990s), marked by digitalization despite high costs; and the Internet Era (1990s onwards), bringing complex applications and broader terms like telehealth. Early remote consultations traced back to the early 20th century via radio and telephone (4), expanding with video conferencing and the internet, driven by access needs and EHR integration (5).

Overall, the term "telemedicine" has seen a journey from its initial introduction in 1972 to a period of rapid growth, followed by fluctuations in usage. While it remains a key term in healthcare literature, the emergence and increasing prominence of related terms like "telehealth" and "e-health" indicate a broader and evolving understanding of remote healthcare practices. The trends suggest that as technology and healthcare needs continue to evolve, so too will the terminology used to describe these practices.

Terminology of digital health

The rapid evolution of digital health innovations, from remote consultations to AI diagnostics, is significantly hindered by a lack of standardized terminology. Terms like "telehealth," "telemedicine," "virtual care," "digital health," "mHealth," and "eHealth" often overlap or are inconsistently applied across contexts and disciplines (6). This "terminological sprawl" creates a fractured lexicon where definitions vary, undermining clarity and consensus among diverse stakeholders, including clinicians, policymakers, and patients (7).

This ambiguity presents a major barrier to effective communication, coherent policy, robust research, and seamless technological integration. The definition of telemedicine has evolved from direct patient care via audio-video to the broader "telehealth," encompassing health education and administration. Standardizing this specialized vocabulary, covering methods, specialties, and software, is crucial for clear communication among providers and enhancing system interoperability and effectiveness (5). A proposed taxonomy, including dimensions such as Application Purpose, Area, Setting, Communication

Infrastructure, and Delivery Options, aims to define these essential concepts and establish a critical foundation for future healthcare (1).

According to Fatehi's research (8) telemedicine, telehealth, and e-health are crucial, distinct, yet often interchangeably used terms describing technology-enabled healthcare. Telemedicine focuses on providing direct medical care remotely via telecommunications, such as consultations and diagnostics. It is the most widely referenced term, showing global interest across 126 countries, notably in the US and UK, with publications growing since 1994. Telehealth is a broader category, encompassing telemedicine, along with non-clinical services like health education and remote monitoring. E-health specifically refers to health services delivered or enhanced through internet technologies, including electronic health records and health apps.

Academic publications related to these terms have grown substantially. Although telemedicine currently leads in volume, e-health is projected to surpass both telemedicine and telehealth publications in the near future, indicating a significant shift towards digital health technologies in research and practice. Understanding these evolving terms is vital as they reflect the global transformation towards integrated, technology-driven healthcare solutions (8)

The Ramifications of Terminological Ambiguity

The lack of standardized definitions for digital health and telemedicine creates pervasive challenges across multiple domains. This terminological confusion detrimentally affects healthcare policy, regulation, and reimbursement, leading to fragmented regulatory landscapes and hindering unified policies and funding models (9). In clinical settings, it causes significant misunderstandings between providers and patients, impacting care quality, patient engagement, and trust, making it difficult to develop consistent protocols and achieve seamless adoption (3). For the research community, the absence of consistent terminology presents a formidable barrier to rigorous evidence building, impeding comparisons of findings, data aggregation, and the drawing of robust conclusions about intervention efficacy. Technologically, non-standardized terms complicate the design, development, and integration of digital health tools, resulting in siloed systems, data fragmentation, and limiting the potential for AI applications. Finally, this definitional ambiguity profoundly impacts education and professional training, hampering curriculum development and perpetuating inconsistent instruction among new practitioners (9).

Towards a Coherent Terminology Framework: A Call for Action

Overcoming the current terminological chaos in digital health and telemedicine requires a collaborative effort from professional organizations (e.g., AMA, ATA, WMA), regulatory bodies (e.g., FDA), research consortia, and international health organizations (e.g., WHO).

A hierarchical taxonomy is proposed to standardize definitions, establishing "Digital Health" as the broadest umbrella term. "Telehealth" serves as a primary subset for health services via telecommunication technologies. "Telemedicine" is a clinical component within Telehealth, referring to the remote practice of medicine. Further subsets include "mHealth" (mobile devices) and "Virtual Care," describing the patient-centric experience of remote service delivery (10).

Such a framework would provide much-needed clarity, differentiating between the overarching digital transformation of healthcare and specific modes of service delivery. The benefits of this standardization would be multifold:

- Enhanced Communication: Clear definitions would facilitate unambiguous discourse among all stakeholders, from policymakers to patients.
- Coherent Policy Development: Standardized terms would enable the creation of consistent, equitable regulatory and reimbursement policies across jurisdictions.
- Rigor in Research: Researchers could conduct more comparable studies, leading to a stronger evidence base and accelerated translation of findings into practice.
- Improved Interoperability: Technologists could develop more integrated and seamless digital health solutions, fostering innovation and data exchange.
- Effective Education and Training: Curricula could be standardized, ensuring a consistent understanding of digital health practices among current and future healthcare professionals (10).

Conclusion

Digital health and its subsets offer immense potential to improve healthcare, but this is severely limited by a pervasive lack of standardized terminology. Inconsistent definitions hinder effective communication, sound policy development, research integrity, and technological advancement. Addressing this terminological confusion is a foundational prerequisite for the continued ethical growth of digital healthcare. A collective, collaborative effort to construct a coherent, hierarchical terminology framework is paramount. Only through such standardization can digital healthcare's full potential be unlocked and seamlessly integrated into the future of medicine, ultimately benefiting patients worldwide.

Keywords: Telemedicine, Digital Health, Terminology

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