

Thirty years of vision and innovation: A nordic tribute to digital health

In a world marked by growing instability, advanced health and wellness technologies and strong multidisciplinary collaboration have become essential pillars of resilience, safety and preparedness. Digital health is entering a decisive new chapter, and the #eHealth2025cruising conference between Helsinki (Finland) and Stockholm (Sweden) offered a vivid snapshot of where the Nordic region is heading. Marking the 30th anniversary of the Finnish Society of Telemedicine and eHealth (FSTeH), the event brought together experts from Finland, Sweden, Norway, Denmark, and the Baltic countries to examine how interoperability, equality, and innovation can be strengthened in a rapidly evolving landscape.

At the heart of the discussions was a shared conviction: the future of healthcare depends on systems that communicate seamlessly, services that remain accessible to all, and technologies—especially artificial intelligence (AI)—that are deployed responsibly and securely. From the growing role of AI in clinical decision making to the pressing need for robust cybersecurity and preparedness for hybrid threats, the conference highlighted both the opportunities and the obligations that come with digital transformation. Scientific contributions further enriched the dialogue, offering insights into the effectiveness of digital services, user experience, data analytics, and the evolution of remote care.

The European Health Data Space (EHDS) featured prominently as a catalyst for cross border collaboration, research, and secondary use of data. As Finland and its Nordic and Baltic neighbours position themselves as frontrunners in this development, the conference underscored the value of common

standards, shared infrastructures, and a unified vision for digital health.

The conference [1] had the pleasure to host a panel on Nordic perspectives on ongoing digital transformation during EHDS deployment with a focus on digital inclusion. Panellists represented Denmark (Danish Health Data Authority), Finland (Ministry of Social Affairs and Health), Iceland, Norway (Norwegian Ministry of Health and Care Service/ Norwegian Directorate of Health) and Sweden (Swedish eHealth Agency). All the panellists were members of the Nordic Ministry Council eHealth group. The panellists presented the audience with current situation of e-health and interoperability issues in their countries. In discussion, further elaboration was conducted, and many distinguished insights were created. The audience was seemingly pleased with the national authority inputs regarding conference theme of strengthening interoperability and equality in digital health with Nordic innovations.

Interoperability is a dynamic concept, as its realization can shift across time and context. In many Nordic countries, the number of electronic health record (EHR) systems in use has been steadily decreasing in both primary healthcare and specialist hospital services. This consolidation has been particularly notable in Sweden, where the range of systems used in primary care and hospitals has narrowed significantly over the years.

Finland has experienced a similar trend. The variety of systems in primary healthcare has diminished since the early 2000s, and specialist hospitals have likewise reduced the number of systems they rely on, especially throughout the 2010s.

Interestingly international EHRs have also penetrated the Nordic countries. A well-known example is U.S. based Epic EHR data system that is used in locally and regionally Denmark, Finland and Norway. Another example is the Swedish CAMBIO that is used also in the Region of Åland since September 2025.

The journal has several interesting scientific articles presenting current many-sided research findings and development work. Detecting breast cancer in early stage is challenging. Using anatomically realistic breast phantoms representing all four clinically recognized breast density categories, the study by Särestöniemi et al. explores the feasibility of a wearable breast health monitoring vest utilizing microwave sensing as a complementary approach for early detection. The reference model without and with relatively small tumours is utilized to analyse the accuracy of tumour detection across different breast densities, the impact of breast density on microwave signal behaviour and detection performance, and practical implications for developing portable, patient-friendly solutions for telemedicine and self-screening.

The study by Salmijärvi et al. brings about new insight about pedagogical value and impact of the virtual patient simulators. The research is about how late-stage medical students practice clinical reasoning with different virtual patient cases in primary health care scenarios. The results highlight the effectiveness of virtual patient cases supporting deep learning and development of clinical reasoning. The article discusses the added value of using such learning method to integrate different competence areas. Additionally, virtual patient cases challenge the teacher-centric activity system.

Ihalapathirana et al. discuss how Finland's nationwide health registers offer rich longitudinal EHR data for AI research, but raw data are fragmented,

heterogeneous and inconsistently coded. This study examines data quality issues when forming a breast cancer cohort (2012–2022) in North Ostrobothnia. The initial 8074 patient dataset spanned diagnoses, labs, pathology, medications and procedures; after cohort restrictions and preprocessing, 1967 patients remained. Challenges fell into four groups: human errors, decentralization-related issues, system life cycle inconsistencies and data governance or coding problems. The qualitative analysis shows that substantial preprocessing and data loss are typical in real world EHR research and highlights the need for standardized documentation, harmonized data structures and closer collaboration across clinical, technical and data science teams. Raw Finnish EHR data require extensive preprocessing for reliable AI use. Standardization and early collaboration are essential to improve interoperability and research quality.

Digital health interventions often struggle to create lasting lifestyle changes, partly due to limitations in traditional behaviour change theories and weak theory integration. The systematic review by Saastamoinen & Virtanen examined strategies that enhance motivation and engagement in digital lifestyle interventions. The included mobile-, web- and multicomponent interventions targeted a wide range of behaviors, from diet and physical activity to substance use, sexual health and metabolic risk, with participant numbers varying widely. Many interventions were grounded in behavior change techniques and theoretical models, using diverse methods to support motivation and engagement. The review highlights that effective lifestyle change requires interventions designed to sustain motivation and long-term user involvement, and that modern digital solutions may improve usability and engagement.

The use of digital tools has expanded significantly in occupational health care, making digital competence an essential part of occupational health nursing. The study by Lahdenperä et al. examined nurses' current digital skills and the factors influencing them. Based on the findings nurses rated their digital competence as good, with ICT skills and ethical competence related to digital solutions emerging as the strongest areas. Age, work experience, workplace size, and completion of occupational health qualification training were associated with competence levels. Those in larger organizations viewed digital solutions as a more integral part of their work. Colleagues were seen as an important source of support, especially among nurses over 60 years. The weakest supporting factors were organizational practices and managerial support for competence development. Although overall competence was rated positively, systematic development requires stronger organizational support and further research. (Article in Finnish, only abstract in English)

In their opinion paper, Kouri et al. argue that National Telemedicine and eHealth societies occupy a crucial yet underutilized position in global digital health governance. The authors reviewed trends in ten countries and concluded that while these organizations contribute to evidence generation, regulatory discourse, workforce development, and the adaptation of digital solutions to local contexts, they lack the structures and resources needed for broader, coordinated global impact. They propose that the International Society for Telemedicine and eHealth (ISfTeH) could evolve from a networking platform into an orchestrator that consolidates knowledge, reduces duplication, and supports equitable digital transformation. Shared information infrastructures, comparative research, systematic capacity building, and harmonized training models would help bridge gaps between countries. The

authors' key message is that technological progress alone is not enough—effective governance and collaboration among telehealth associations are essential to achieving equitable and sustainable digital transformation.

Finland's long standing production of structured health and social welfare data provides a strong basis for interoperability, yet inconsistencies in data quality and guidance limit its effective use. The article by Härkönen et al. introduces the Finnish Strategy for Healthcare and Social Welfare Code Systems 2025–2030, which offers a coordinated framework to strengthen semantic interoperability by broadening the adoption of international code systems (such as SNOMED CT, the WHO family of classifications, such as ICD-11, and LOINC), improving the management of diagnostic and encounter data, and clarifying governance. It's phased, overseen by the Finnish Institute for Health and Welfare, with an interim evaluation in 2027. Implementation aims to enhance data quality, comparability, and reusability, supporting more coherent service provision and enabling stronger participation in European data ecosystems.

Digital care pathways have become an increasingly integral component of contemporary healthcare systems, offering structured, accessible, and patient-centered support outside traditional clinical settings. Rauhala et al. highlighted that by delivering timely, individualized guidance in patients' everyday environments, these pathways have demonstrated the potential to enhance treatment adherence and improve clinical outcomes across several domains, including weight management and chronic pain. The implementation, however, is shaped by patients' digital skills, professionals' technological competence, and organizational readiness. When these factors align, Omapolku digital pathways can enhance patient engagement,

streamline service delivery, and enable more meaningful clinician–patient interaction.

Vuohijoki through her *lectio praecursoria* (only in Finnish) presents research that examines smart clothing from the perspective of assistive technology by integrating battery-free RFID technology, traditional craft methods, and user-centered design. The study sought to address the problem that current smart garments are expensive, difficult to use, and often fail to meet users' aesthetic expectations. Forty professionals participated in ideation workshops, and the results highlighted three core needs: aesthetic appeal, easy activation, and customizability. Six methods for crafting handmade RFID tags were developed, and even the quickly produced versions were found to achieve reading distances sufficient for practical applications. The fabrication techniques enable visual customization of the tags and their integration into the garment's aesthetics. Two prototypes—a smart jacket that facilitates dressing and a command sleeve supporting communication—demonstrated how smart clothing can assist daily activities while reflecting the user's personal style and preferences. The research provides a new perspective on smart wearables: technology can be modified and crafted by the user, advancing the development of smart garments that are aesthetically pleasing, accessible, and personally meaningful.

This anniversary conference provided an excellent complement to the 30-year journey of the Finnish Society of Telemedicine and eHealth, founded in 1995, as the organizer of these events. From the

very beginning, the annual conferences have included an international, English-language section, and this year the event was organized as a cruise conference for the tenth time—nine times to Stockholm and once to Tallinn. In connection with the conference, the commemorative book “30 Years at the Forefront of Development – The Finnish Society of Telemedicine and eHealth 1995–2025” was also released [2] and distributed to participants, offering an opportunity to explore the Society's extensive educational and advocacy activities over the years. Once again, the conference served as a showcase for Finnish digital health for our closest neighbouring countries and facilitated exchange of ideas with representatives of the International Society for Telemedicine and eHealth (ISfTeH), a representative of the WHO, as well as a delegate from the Japanese Telemedicine and Telecare Association.

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Pirkko Kouri, PhD, PHN, RN

Outi Ahonen PhD, RN

Vesa Jormanainen, MD, MSc, Specialist in Public Health Medicine

Kiki Metsäranta, PhD, RN

Jussi Okkonen, PhD, M.Soc.Sc. (econ.)

Kaija Saranto, PhD, FACMI, FAAN, IFIAHSI

Jarmo Reponen, MD, PhD

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[2] Suomen telelääketieteen ja eHealth seura. 30 vuotta kehityksen kärjessä – Suomen telelääketieteen ja e-Health seura 1995–2025 [in Finnish]. STeHS; 2025. ISBN: 978-952-65791-1-5.