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Talent-Driven Gamechangers

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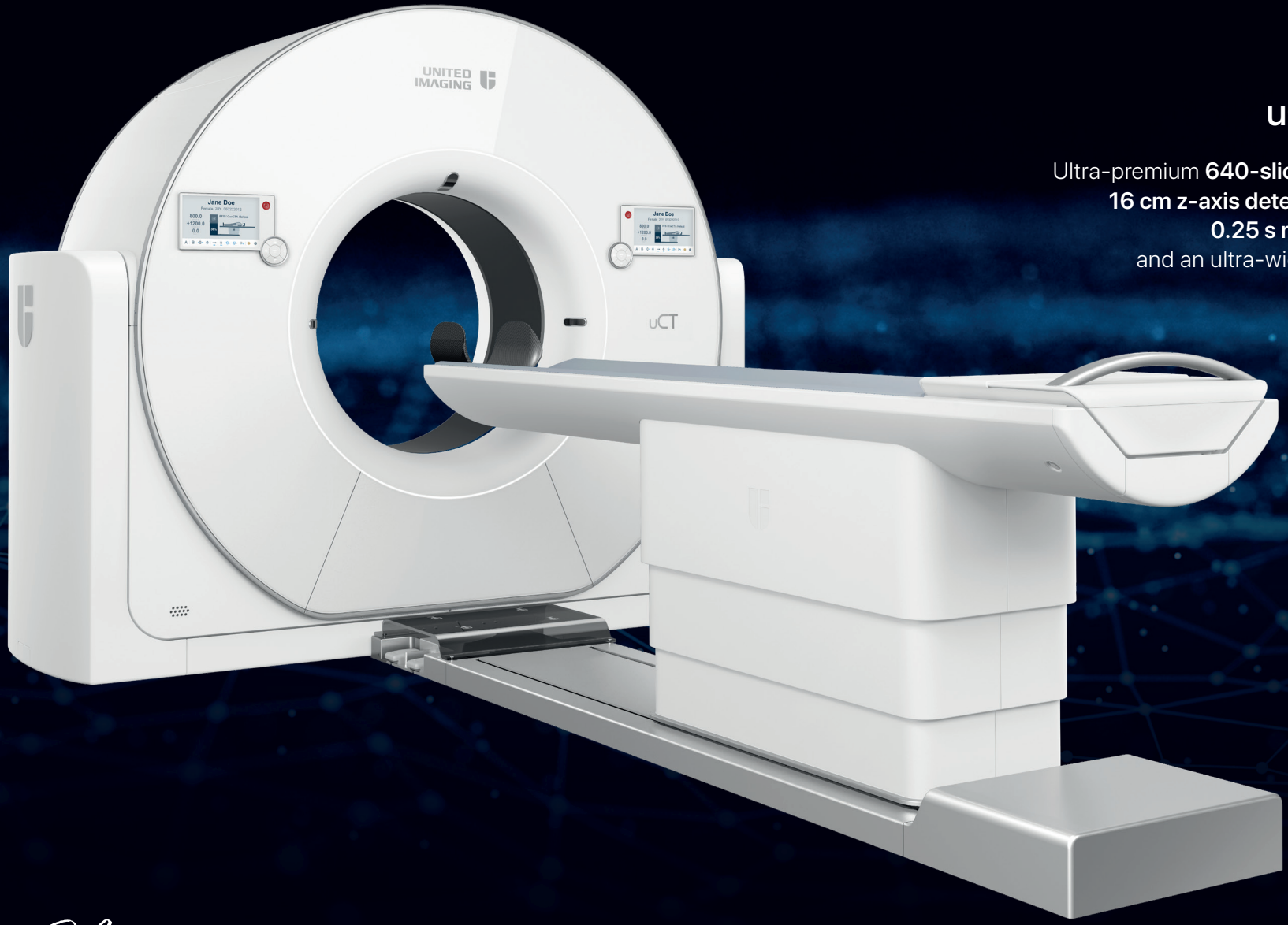

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Editorial

PROF. LLUIS DONOSO BACH

Director Clinical Advanced Technologies Initiative | Hospital Clínic Barcelona | University of Barcelona. LEITAT Technological Center | Spain | HealthManagement.org Editor-in-Chief Imaging

Talent-Driven Gamechangers

This issue focuses on the transformative power of talent in reshaping healthcare. In an industry driven by innovation and evolving patient needs, the role of visionary leaders and skilled professionals has never been more critical. Our contributors explore how talent-driven strategies can empower organisations to navigate complex challenges, embrace emerging technologies, and foster a culture of continuous improvement.

Through insightful case studies and expert perspectives, we highlight individuals and teams making a profound impact on healthcare delivery. From redefining patient care models to implementing ground-breaking operational practices, these game changers are setting new standards of excellence across the sector. In this issue, we'll showcase the leaders and change-makers shaping the future of healthcare with their expertise, creativity, and unwavering commitment to better outcomes.

Rita Veloso discusses how transformational and distributed leadership approaches emphasise flexibility, collaboration and shared vision to ensure a future-ready workforce and resilient organisations. Dave Goyal focuses on the transformative shift brought by AI technologies in healthcare and the steps leaders should take to upskill their workforce for emerging roles driven by AI technologies.

Márcio Silva outlines the digital health tools organisations should embrace to adapt to technological advancements and rapidly changing patient expectations. The Carer Matters 2 Project team dives into Singapore's efforts to address gaps in caregiving resources to build community connections, ensuring sustained caregiver support.

Mories Atoki offers her perspective on how frameworks like Six Sigma can be tailored to local contexts and leveraged with community engagement to achieve sustainable progress in service access and reduced mortality rates.

Precious Chisom Uroeghelu studies how effective leadership in healthcare directly impacts job satisfaction, performance and commitment and suggests recommendations to create a balanced, efficient workplace.

José A. Cano and Alan Zettelmann advise leaders to incorporate data analysts and AI specialists in multidisciplinary teams, transforming healthcare through enhanced collaboration, predictive analytics and proactive interventions.

Albérto Leitë reports on how Brazil's digital transformation advances despite challenges and drives growth, innovation, and inclusivity.

Simon Lewerenz and co-authors discuss the XpanDH project that has taken significant strides in activating and maturing the European Electronic Health Record Exchange Format (EEHRxF) ecosystem, laying the foundation for a more interoperable and collaborative digital health landscape across Europe.

Mariia Kovalova talks about patient safety and hospital management software and how improving staff coordination, safety guidelines, and automating management systems can help reduce unsafe care.

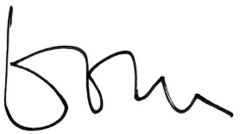
Aarthi Janakiraman and Debarati Sengupta show how emerging technologies like AI, ML, and wearables enhance precision care while digital therapeutics offer new solutions for women's health. Increased investment and regulatory focus are crucial to fostering future innovations.

Peter Kapitein and Robert S. Greene offer an update on how the influence of tobacco companies can and should be fought to prioritise public health.

Tru Performance Research explores how shared services support digital transformation. Integrating advanced technologies like AI and blockchain presents promising opportunities to enhance telehealth's effectiveness and security.

We hope you enjoy reading this issue and as usual any feedback is welcome.

Happy reading!



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Dr. Mories Atoki (HON) is CEO of the African Business Coalition for Health (ABCHealth), a not-for-profit organisation working to support African governments in improving the health sector. She facilitates the Health Policy Commission at the Nigerian Economic Summit Group and is an alumna of Harvard, London Business School and Yale. Holding multiple Master's degrees, her career spans the public and private sectors. Mories serves on several boards and is passionate about youth empowerment, sustainable development and leadership.

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Dimitri Belov, Germany

Dimitri Belov, Head of Health Marketing at Düsseldorf Convention since 2022, leverages over a decade of experience in health tourism and strategic marketing. Previously with Visit Düsseldorf, he led efforts to position the city as a global healthcare destination. Dimitri specialises in acquiring medical congresses and attracting medical travellers, fostering partnerships with top medical facilities, and developing ambassador programmes to enhance Düsseldorf's profile in health tourism and congress hosting.

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Dr. Alexander Berler, Greece

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José Antonio Cano holds a PhD in Telecommunications Engineering from the University of Valladolid and a Master's degree in international relations and foreign trade from INFOREM. He is the Director of Analysis and Consulting at IDC and has over 20 years of experience in strategic consulting and technology. He has advised large corporations, SMEs and startups on business transformation and innovation. He is also an executive advisor for the Spanish Aeronautical Society and a professor at institutions like CEU, DBS and EOI.

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Anderson Carmo, Portugal

Anderson Carmo has a PhD in genetics and molecular biology, with significant experience in the European Commission eHealth project management. He is very motivated and enthusiastic regarding the development of eHealth assets in a cross-border context.

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Everest Group, India

Everest Group is a leading global research firm helping business leaders make confident decisions. The firm provides actionable research into the world's cutting-edge Science & Technology innovations and delivers the tools to identify and understand upcoming innovations across R&D science and technology domains. Everest Group also investigates the enablers to effective innovation, including innovation processes and toolkits and critical mega forces for navigating a changing future.

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Sofia Franconi, France

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Dave Goyal is an AI, BI and data warehousing expert with 30 years of experience. Founder of Think AI, he has collaborated with leading firms like Microsoft and Starbucks, achieving a 95% project success rate. Author of "Real-Time Business Intelligence: CIO's Playbook," he shares frameworks for real-time decision-making. Dave developed READON.AI for dyslexia support and holds a neuroscience patent. Named a LinkedIn Top Voice, he shares insights through his newsletter and publications.

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Robert S. Greene, the Netherlands

Robert S. Greene, a British-Dutch citizen, is a passionate patient advocate and speaker, committed to promoting patient-centred healthcare. Inspired by his own experience with chemotherapy side effects in 2012-2013, he raises awareness of patient involvement and fosters collaboration among stakeholders. Robert founded the HungerNdThirst Foundation and serves on influential boards, including the ASCO Foundation Grants Selection Committee and the GSK Health Advisory Board.

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Dr. Hoi Shu Yin is the Chief Nurse at Tan Tock Seng Hospital (TTSH) in Singapore, known for her contributions to nursing and healthcare innovation. She received her DNP from Duke University. She is a proponent for improving healthcare services and nurse empowerment. She played a pivotal role during the COVID-19 pandemic and establishing the Nursing Shared Governance System at TTSH. Her work in digital transformation and her collaboration on innovations like the PreSAGE fall-monitoring system highlight her commitment to enhancing healthcare efficiency and safety.

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Aarthi Janakiraman has more than 15 years of experience in technology research and strategic consulting. She has broad experience identifying and assessing the impact of emerging trends and technologies in the healthcare, F&B and CPG industries. Her expertise lies in opportunity assessment, IP management, R&D landscaping and technology road mapping and innovation ecosystem analysis.

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Peter Kapitein, the Netherlands

Peter Kapitein founded Inspire2Live, a global patient advocacy organisation with professional volunteers. As a patient advocate, he connects patients, researchers, clinicians, industry and regulators to advance cancer research, treatments, and care. Peter lobbies public authorities, organises congresses, and gives talks to improve patient quality of life. He co-founded Alpe d'HuZes, a charity raising nearly €200 million for cancer research. In 2012, he received an honorary doctorate for his work..

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Mariia Kovalova, USA

Mariia Kovalova is a Healthcare Technology Researcher at Itransition, a custom software development company headquartered in Denver, CO. Having working experience with both the healthcare and IT industry, she is constantly on the lookout for technologies that will help providers optimise their processes, enhance patient experiences and build up more resilience in the face of the rapidly changing world

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Albérto Leìtë, Brazil

Albérto Leìtë is a journalist and publisher with degrees from UMESP and FGV, plus executive training from Fundação Dom Cabral and Kellogg Business School. He has been an entrepreneur since 2013, founding healthcare companies like Healthers, Health Minds Academy and Saúdeweek. With over 700 articles published, he has spoken in 20 countries for more than 150 companies. Currently, he is the CEO of Healthers, a professor at FIA MBA and a director of the Brazilian Hospital Managers Federation..

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Lim Sing Yong is the Director of Community Care Operations at the National Healthcare Group's Population Health Campus. She is a seasoned healthcare administrator with over 15 years in public healthcare. She has experience in both the private and public sector, demonstrating expertise in operational leadership, strategic planning and community engagement. She has led teams, co-developed care models and built partnerships to improve the health and well-being of residents in the Central and Northern regions of Singapore. She is dedicated to contribute towards building an accessible, inclusive and integrated health and social care ecosystem for a healthier, happier and empowered community and population.

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Dr. Loh Yong Joo is currently a senior consultant and head of department in TTSH Department of Rehabilitation Medicine. His clinical sub-specialty is in neurorehabilitation and research interests are in rehabilitation technologies especially in the areas of virtual reality, wearable sensors, telehealth, serious gaming, robotics and AI/deep learning in rehabilitation. He is currently also Director of Clinical Innovations in TTSH Clinical Research & Innovation Office (CRIO), member of TTSH Clinical Research Committee and Clinical Director of NHG/LKC Games for Health Innovations Centre (ALIVE). He has also completed Masters in Clinical Investigator programme in 2014.

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An Internist MD, Management PhD and Master in Law, Prof. Martins headed SPMS (Portugal) leading numerous nationwide eHealth projects and co-chaired the EU eHealth Network. He consults and teaches digital health, health transformation, management and leadership.

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Celine Ong is the Director of the Centre for Health Activation at the Centre for Healthcare Innovation. She has over 20 years of public and private healthcare experience. Through the course of her 20-year public healthcare career in Tan Tock Seng Hospital, she has helmed a wide spectrum of portfolios including population health, strategic planning and marketing communications, regional and local business development, community and volunteer engagement, health activation and literacy, hospital operations and customer service training and planning of large-scale community events. She leads the Centre's design, curation and implementation of innovative health activation programmes and resident engagement initiatives, gleaning powerful insights into the actions, opinions and motivations of patients, advocates, caregivers, volunteers and residents.

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Debarati Sengupta has more than 10 years of experience in healthcare technology research and consulting. Her expertise lies in emerging technology trend analysis, developing strategic roadmaps and assessing opportunities for stakeholders. She has experience covering medical devices, imaging, diagnostics and digital health sectors.

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Márcio Silva is an experienced business consultant and entrepreneur specializing in operational optimisation and growth strategies for companies in the healthcare and service sectors. With a strong background in financial analysis and process management, he supports businesses in achieving efficiency and scalability. Márcio's results-driven approach and deep expertise in finance, marketing and innovation make him a trusted advisor for companies seeking sustainable growth and impactful market presence.

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Tru Performance, USA

Tru Performance is a Managed Services Provider that drives sustainable business transformation by integrating advanced technologies and exceptional customer experience. Besides Healthcare IT and RCM (Revenue Cycle Management) services, Tru Performance also provides Digital & Web, Data Analytics, Marketing, Technology, BPO and KPO solutions. With AI-powered insights & a continuous commitment to innovation, creative & motivated domain experts empower organisations to streamline operations, elevate brand visibilityand improve efficiency while working within compliances and guidelines and keeping the costs low and quality high.

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Precious Chisom Uzoeghelu, Cyprus

Precious Chisom Uzoeghelu is a dedicated educator and healthcare professional at Cyprus International University, where she has been teaching in the Faculty of Health Sciences, Nursing Department since 2019. With a BSc in Nursing from Near East University and an MSc in Healthcare Organisations Management, she is now pursuing a PhD in Management Information Systems. Precious specialises in critical thinking, health policies and nursing ethics, with a passion for optimising healthcare education and management systems.

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Eleonora Varntoumian is the Policy Manager at the European Health Management Association (EHMA). She serves as a Board Member at the Institute of Cancer and Crisis and was elected President of the European Health Parliament (EHP7) from 2021-2022. Her experience as President of the EHP7 is invaluable to EHMA for understanding the mechanisms of European institutions.

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Alan Zettelmann, UAE

Alan Zettelmann, a partner at Innovation 360 Group AB in UAE, has over 17 years of experience in technology and entrepreneurship. He holds a Master's in Business Innovation and Administration from the University of Deusto and won an Innovation Award in Austria in 2017. Based in Dubai, he's known for strategic innovation consulting and measuring organisations' 'Innovation IQ.' He also teaches at CEU, Deusto Business School and EOI, and is the founder of INNOCONSULT, a consultancy focused on Space travel, Immortality and ESG projects.

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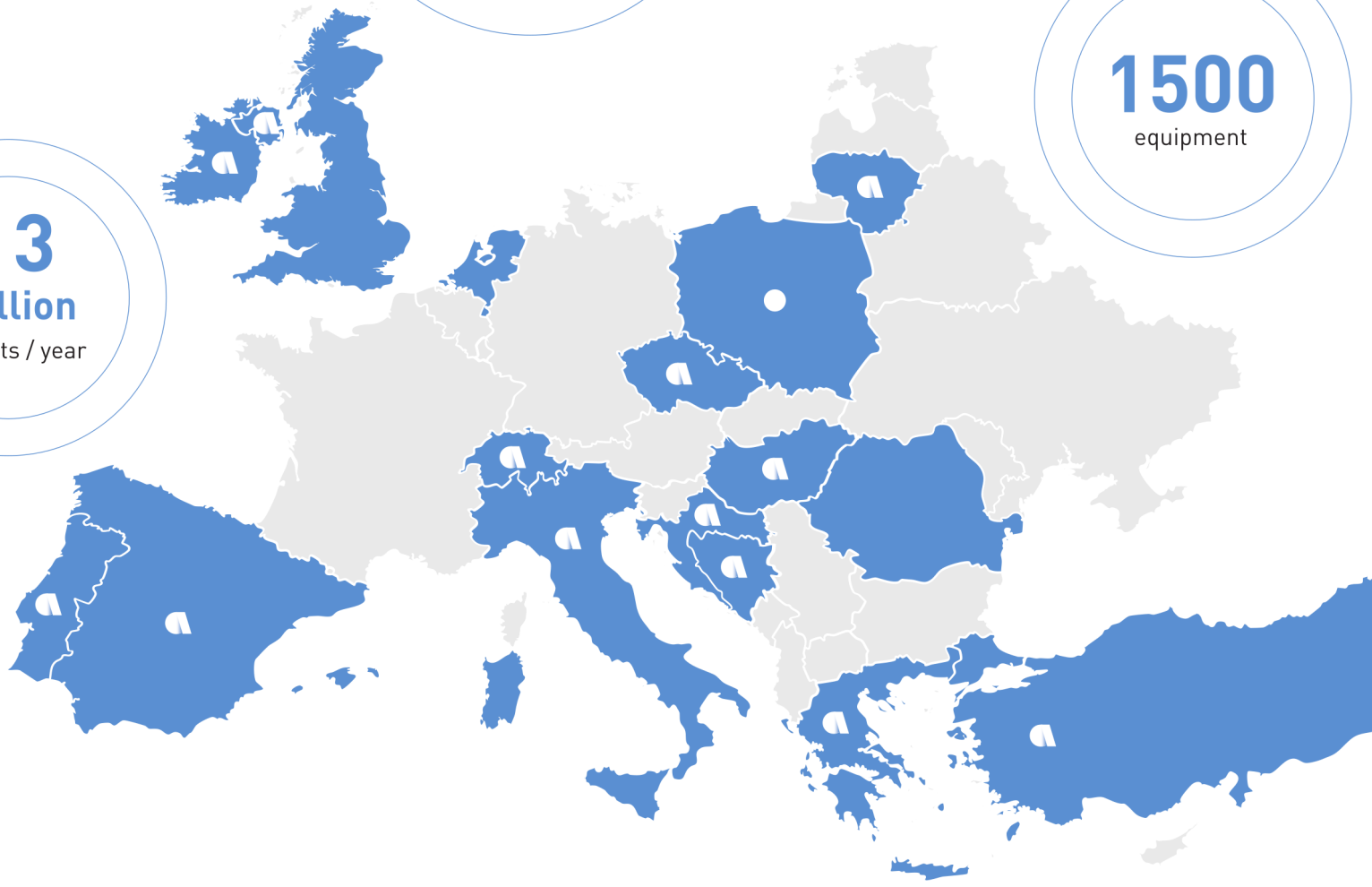

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Editorial Board

Spotlight

8 Reasons Why Düsseldorf is a Strong Choice for Medical Conferences

Düsseldorf is a prime location for medical conferences, offering excellent transport, modern venues like the Düsseldorf Congress Centre and strong medical expertise. Attendees benefit from diverse accommodation, cultural experiences and an eco-conscious environment. Supported by a proactive local government and high safety standards, the city provides an optimal setting for impactful, memorable events.

DIMITRI BELOV

Head of Health Marketing I Düsseldorf Convention I Düsseldorf, Germany

key points

- Düsseldorf offers excellent international and regional transport accessibility.
- The city provides advanced venues like the Düsseldorf Congress Centre for events.
- Düsseldorf's strong medical expertise supports impactful conferences.
- Attendees enjoy diverse accommodations and cultural experiences in Düsseldorf.
- The city prioritises sustainability, safety and government support for events.

Düsseldorf, the dynamic capital of North Rhine-Westphalia in Germany, has become a sought-after destination for international medical conferences. Its strategic location, advanced infrastructure and robust healthcare ecosystem offer a unique blend of convenience and innovation for events focused on advancing medical knowledge. Renowned for its strong medical research community and state-of-the-art facilities, Düsseldorf provides an ideal setting for idea exchange, collaboration and professional development. From accessibility and modern venues to cultural richness and a commitment to sustainability, Düsseldorf is a practical choice for hosting impactful medical conferences.

Strategic Location and Accessibility

Düsseldorf's central European location is a significant advantage, especially for conferences that draw attendees from multiple countries. Situated along the Rhine River, Düsseldorf is easily accessible from most parts of Europe and beyond. Düsseldorf International Airport, one of Germany's largest and busiest airports, offers a variety of direct flights to cities across the globe, making international travel seamless for conference participants. For those travelling within Europe, Düsseldorf's central location allows for convenient and often economical rail connections. The German railway network, Deutsche Bahn, provides high-speed connections from major European cities, and the city's own

well-integrated public transport network, including trams, buses and local trains, offers efficient and affordable mobility within the city limits.

This accessibility benefits conference organisers by widening the pool of potential participants. For attendees, it reduces travel time and costs, allowing them to focus on the event itself. Düsseldorf's efficient public transportation system also makes local commuting easy, helping conference participants travel between hotels, venues and other parts of the city without needing personal vehicles. As sustainability gains traction in the events industry, Düsseldorf's transit options also provide an environmentally friendly alternative to personal transport, with many venues easily accessible by public transport.

Advanced Conference Infrastructure and Facilities

When it comes to hosting large-scale events, Düsseldorf boasts an impressive array of conference facilities designed to accommodate events of varying sizes and requirements. For example, the Düsseldorf Congress Centre (CCD) is a major draw for event organisers, with its expansive space, modern technology and support for diverse conference needs. With over 37,000 square meters of conference area, including multiple halls, auditoriums and meeting rooms, the CCD can simultaneously host small seminars, large conferences and even exhibitions. The facility's commitment to providing high-quality technical support and reliable service ensures that conference operations run smoothly and effectively, which is crucial for high-profile medical events where cutting-edge presentations and real-time demonstrations are often part of the agenda.

Additionally, Düsseldorf offers a range of other versatile venues that can be adapted for medical conferences, workshops and networking events. Many of these facilities are equipped with advanced audio-visual systems, high-speed internet and breakout spaces, enabling event organisers to create engaging, interactive experiences. The quality of these facilities is further enhanced by the professionalism of local event support services, including catering, technical assistance and logistical planning, which together enable smooth event execution. This strong infrastructure foundation provides peace of mind for organisers and contributes to a positive experience for attendees, allowing them to focus on the core goals of knowledge sharing and professional networking.

> "Düsseldorf's central location allows for convenient and often economical rail connections."

In 2025, a new venue will be unveiled, the EUREF-Campus Düsseldorf. As a partner of Dusseldorf Convention, the new campus will be a place where ideas are conceived, implemented and tested for their success. The use of intelligent architecture, regenerative energy sources, new forms of energy storage and systematic networking of state-of-the-art technology, will create a highly visible place of the future and an example for many metropolitan areas around the world. EUREF-Campus Düsseldorf will also meet the German Federal Government's CO_2 climate protection targets for the year 2045 – right from the start.

Medical Expertise and Industry Innovation

One of Düsseldorf's distinguishing factors as a conference destination is its status as a hub for medical research, healthcare innovation and industry expertise. The city is home to numerous prominent healthcare institutions, including the University Hospital Düsseldorf, known for pioneering research and advancements in various medical fields. The city's academic and medical institutions foster a culture of innovation that is particularly valuable for organisers of medical conferences. The presence of renowned medical professionals, researchers and scientists in Düsseldorf means that conference organisers have access to a highly skilled talent pool, making it easier to secure top-tier speakers and draw an audience engaged in the latest developments in healthcare.

Düsseldorf's medical ecosystem is further enriched by numerous pharmaceutical companies, medical device manufacturers and biotechnology firms, contributing to an environment conducive to knowledge exchange and collaboration. The city's commitment to advancing medical science is visible in its support for research institutions and innovation hubs, which also benefit from close cooperation with industry players. This close-knit network of medical professionals and businesses makes Düsseldorf

a fertile ground for networking and partnerships. Conferences held here provide attendees with unique opportunities to connect with leading experts, explore cutting-edge technologies and gain insights into emerging trends in the medical field.

Accommodation and Hospitality Options

Düsseldorf provides a wide range of accommodation options that cater to different budgets and preferences, an essential factor for any city hosting international conferences. The city is home to various high-end hotels offering luxury experiences for those seeking premium comfort and budget-friendly options for attendees with modest accommodation needs. Many hotels are conveniently located near the primary conference venues, particularly around the Düsseldorf Congress Centre, simplifying logistics for attendees. This accessibility helps streamline attendees' experiences, as they can move easily between their accommodations and the event venues.

Beyond its diverse accommodation options, Düsseldorf has a thriving hospitality sector known for excellent service and a wide range of dining experiences. The city's restaurants, cafes and bars provide a taste of German cuisine and international options, catering to various dietary preferences. This abundance of dining choices enhances the overall experience for conference attendees, giving them opportunities to enjoy meals or informal gatherings between sessions. Additionally, many hotels in Düsseldorf offer in-house dining and room service, adding convenience for attendees with packed schedules.

Cultural and Recreational Opportunities

A city with a rich history and dynamic cultural scene, Düsseldorf offers ample recreational opportunities that add value to any conference experience. The historic Altstadt (Old Town), often called "the longest bar in the world" due to its high concentration of pubs and bars, is a popular attraction. Attendees can enjoy Düsseldorf's unique blend of traditional and modern culture by exploring its museums, art galleries and theatres. The Kunstpalast, a renowned art museum, the Museum Kunstpalast houses impressive collections of art, and the Deutsche Oper am Rhein offers an array of performances for those interested in classical music and opera.

> "The Düsseldorf Congress Centre (CCD) is a major draw for event organisers, with its expansive space, modern technology and support for diverse conference needs."

For shopping enthusiasts, Königsallee, known as the city's luxury shopping boulevard, provides a chance to experience high-end retail in a picturesque setting lined with trees and a canal. These cultural attractions give conference participants a chance to unwind and experience the city's atmosphere after long conference days, enhancing their overall visit and offering them an experience that extends beyond the professional realm. This blend of business and leisure opportunities makes Düsseldorf particularly appealing for international events, as it allows visitors to make the most of their time in the city.

Commitment to Sustainability

Düsseldorf has made significant strides in sustainability, a feature that aligns well with the growing emphasis on eco-friendly practices within the events industry. The city's commitment to reducing its environmental impact is evident in initiatives such as energy-efficient lighting, renewable energy sourcing and waste reduction programs implemented across many public spaces and conference venues. Event organisers increasingly value cities that promote sustainable practices, as these align with the environmental values of attendees and help reduce the overall carbon footprint of large gatherings.

Conference venues like the Düsseldorf Congress Centre have adopted sustainable practices, integrating environmentally conscious options into their facilities to minimise waste and energy usage. This dedication to eco-friendly operations not only reflects Düsseldorf's forward-thinking approach but also adds an appealing dimension to conferences held in the city, as organisers and attendees alike become more attuned to the importance of environmental responsibility. By choosing a city that prioritises sustainability, conference organisers

can align their events with global goals of reducing ecological impact, attracting participants who value eco-conscious practices.

Supportive Local Government and Industry Networks

Düsseldorf's local government actively supports the city's conference and events industry, providing valuable resources and services to assist event organisers. The local government offers various incentives and support services, including assistance with planning, logistics and permits, which simplifies the organisation of large events. This proactive support from local authorities can make a significant difference in ensuring that conferences run smoothly, as it provides organisers with a reliable infrastructure and the administrative assistance needed to address logistical challenges effectively.

In addition to government support, Düsseldorf benefits from strong industry networks that foster collaboration and provide resources to support the medical and events sectors. These networks include associations and professional organisations that bring together professionals from various fields, enhancing the collaborative potential of conferences held in the city. Such networks create additional opportunities for conference participants to engage with industry professionals, facilitating partnerships and collaborations that can extend beyond the duration of the event itself.

Safety and Security

Safety is a fundamental consideration for conference organisers, and Düsseldorf excels in this regard. The city is known for its high safety and security standards, providing peace of mind to attendees and organisers. Local authorities work closely with event organisers to implement comprehensive security measures, especially for large-scale international events. This cooperation between law enforcement agencies and event organisers helps create a secure environment, allowing attendees to focus entirely on the conference without concerns about their well-being.

> "The city's commitment to reducing its environmental impact is evident in initiatives such as energy-efficient lighting, renewable energy sourcing and waste reduction programs."

The city's commitment to maintaining a safe environment extends to its public spaces, transportation systems and hospitality venues, ensuring visitors feel secure throughout their stay. Knowing that Düsseldorf is equipped to handle security needs allows organisers to concentrate on the core aspects of their event, enhancing the overall experience for participants.

Conclusion

Düsseldorf's combination of accessibility, advanced conference facilities and strong medical expertise positions it as a premier destination for medical conferences. The city's rich cultural offerings and dedication to hospitality add to the experience, allowing attendees to enjoy both professional and recreational pursuits. Düsseldorf's focus on sustainability and safety further reinforces its appeal, meeting the evolving needs of modern event organisers and participants. With these advantages, Düsseldorf provides an ideal setting for impactful medical conferences, offering everything needed to create successful, memorable events.

Conflict of Interest

None

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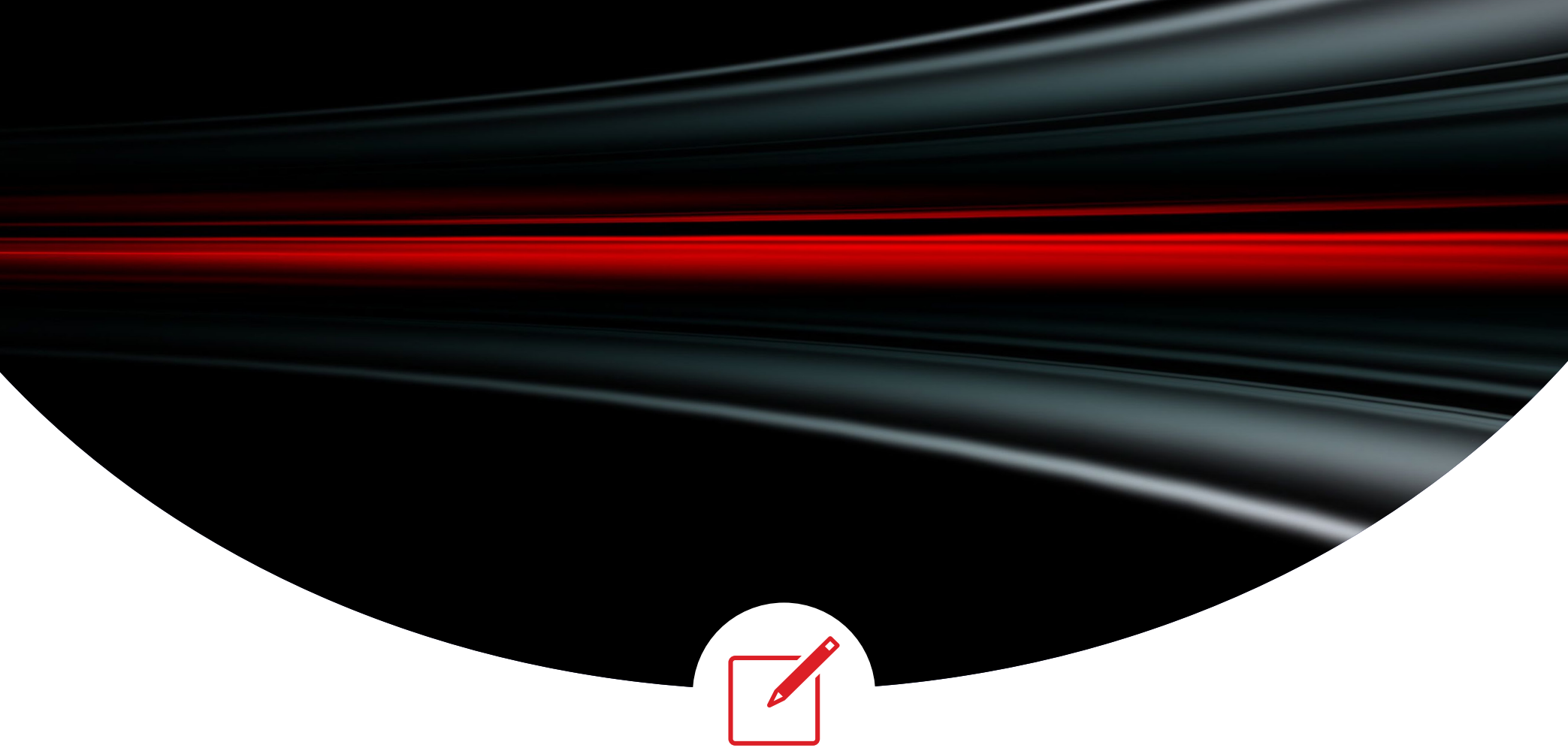

Cover Story

Leading Tomorrow: Adapting Leadership for a Dynamic and Evolving World

The concept of leadership has evolved in recent years. Instead of hierarchical structures, contemporary approaches like transformational and distributed leadership emphasise flexibility, collaboration and shared vision. The rise of automation and technology necessitates upskilling, reskilling and pre-skilling to maintain competitiveness. Effective leaders must foster a culture of continuous learning, supported by public policies and partnerships, to ensure a future-ready workforce and resilient organisations.

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key points

- Leadership shifted from rigid hierarchies to flexible, collaborative approaches.
- Transformational leadership promotes shared vision and innovation amid dynamic challenges.
- Upskilling, reskilling and pre-skilling are crucial for adapting to technological changes.
- Leaders must embrace continuous learning to sustain organisational competitiveness.
- Public policies and partnerships support workforce development and future resilience.

The Evolution of Leadership: From Hierarchies to Collaborative Models

Leadership has been a central theme in the social and organisational sciences for decades, and our understanding and practice of it have changed significantly over the generations. Historically, leadership was often associated with rigid hierarchical structures and an authoritarian style, where power and decision-making were concentrated at the top of the organisational pyramid. This model, largely influenced by the classical management theories of Taylor (1911) and Fayol (1916), emphasised efficiency, control and standardisation as key elements for organisational success.

However, as social, economic and technological conditions have evolved, the conception of leadership has also undergone a significant transformation. New paradigms, such as transformational leadership introduced by Burns (1978) and Bass (1985), highlight leaders who inspire, motivate and influence their followers, promoting a shared vision and encouraging innovation. This approach is becoming increasingly relevant as organisations face more dynamic and uncertain business environments.

With technological advancement and globalisation, the contemporary business environment requires a new form of leadership. Younger generations, such as Millennials and Gen Z, have brought different values and expectations regarding work and leadership. These generations value flexibility, collaboration and purpose at work, which challenges our self-leadership capabilities.

According to studies by Deloitte (2019), new generations expect leaders to be not only effective managers but also mentors and facilitators who promote a culture of continuous learning and inclusion. Values-based leadership centred on empathy and social responsibility has become imperative to attract and sustain talent in an increasingly competitive market.

In addition, the concept of distributed leadership (Spillane 2006) has become more prevalent, especially in organisations that adopt more agile and horizontal structures. This model defends the idea that leadership is not exclusive to a formal position but can be exercised by multiple individuals at different levels of the organisation. This aligns with the expectations of the new generations, who prefer more collaborative and less hierarchical work environments.

The Critical Role of Upskilling, Reskilling and Pre-skilling

The rapid evolution of technologies such as artificial intelligence, automation and big data is transforming the future of work in an unprecedented way. Once essential skills are quickly becoming obsolete, creating a significant challenge for companies that need to adapt to these changes. In this context, upskilling (updating existing skills), reskilling (acquiring new skills) and pre-skilling (early preparation of skills) emerge as crucial strategies to ensure the competitiveness and sustainability of our organisations.

> "Whenever we collectively move forward together,
>
> We will be on the right side of change."

Upskilling involves enhancing employees' existing skills or teaching them new ones, enabling them to take on more complex tasks and adapt to changing market demands. According to a 2023 study by the World Economic Forum, by 2027, approximately 23% of global jobs are expected to change, with 69 million new jobs created and 83 million eliminated. Automation and emerging technologies will be the main drivers of these changes. Professions in technology, such as data analysts and artificial intelligence specialists, are expected to see growth, whereas administrative and support roles are likely to decline.

Companies like Amazon and PwC have long invested billions of dollars in upskilling programmes for their employees, recognising that continuous upskilling is essential to competing in a global market. These programmes not only improve workers' employability but also increase innovation and organisational agility, resulting in a more resilient and future-proof environment.

On the other hand, reskilling involves preparing workers for entirely new roles due to automation or digital transformation, especially in rapidly changing sectors like manufacturing, finance and technology. It should be noted that public services cannot be left behind either. McKinsey & Company (2020) forecasts that by 2030, around 14% of the global workforce, or 375 million workers, will need to shift professional categories due to technological changes. Companies that fail to adapt may face reduced competitiveness, higher employee turnover and dissatisfaction.

Leadership plays a crucial role in this process. Leaders need to identify areas affected by technological changes and implement reskilling strategies that align employee skills with the company's current and future needs. This requires a clear vision of the future of work and a willingness to invest in human capital development.

While upskilling and reskilling address skills needs in response to changes already underway, pre-skilling focuses on preparing skills in advance that are known today and will be needed in the future. This proactive approach is increasingly vital in a world where technological and market changes are very rapid and unpredictable.

Pre-skilling involves training workers in critical future skills before demand arises. A 2017 report by the Institute for the Future highlights that companies investing in pre-skilling can quickly adapt to new opportunities, maintaining a competitive edge. It

also helps address skills shortages in industries like technology, healthcare and engineering, ensuring a ready talent pool for innovation and growth.

However, for upskilling, reskilling and pre-skilling to be effective, these strategies must be integrated with the organisation's long-term vision and objectives. This requires strong and visionary leadership, the ability to articulate the importance of continuous skills development and the mobilisation of resources to support these initiatives.

Building a Learning Culture: Leadership, Collaboration and Policy for Future Skills

Effective leaders need to foster a culture of continuous learning, where skills development is seen as a shared responsibility between the company and employees. This can be facilitated through mentorship programmes, project-based learning and innovative teaching technologies such as e-learning platforms and artificial intelligence.

In addition, leaders must be prepared to lead by example, investing in their professional development and demonstrating a commitment to continuous learning. Not only does this strengthen the credibility of leaders, but it also inspires employees to adopt a culture of constant growth. Many leaders should constantly remind themselves, "When was the last time I did an evaluated training?"

Although companies play a crucial role in skills development, the support of public policies and partnerships with educational institutions is essential for the success of these initiatives. Governments can undoubtedly facilitate upskilling, reskilling and pre-skilling efforts by providing greater tax incentives, subsidy programmes and regulatory instruments that promote continuous training. This training should be conducted during protected time and without any censorship, whether declared or undeclared by organisations. Such support is crucial for nurturing the personal and collective investment of professionals.

> "Whenever we are able to lead in an agile way,
>
> We will be on the right side of change."

Research on trends and partnerships between companies from various sectors, universities and technical schools are also essential to ensure that teaching curricula align with the needs of the labour market. These collaborations can help create more effective and relevant training and education programmes that prepare professionals for the jobs of the future.

Funding, such as that provided by the current Recovery and Resilience Plan, presents a unique opportunity to accelerate the necessary changes. It should be used to protect the future of employment in our organisations but, more importantly, in our People and society as a whole.

Leading Tomorrow at the University Hospital Centre of Santo António

At the University Hospital Centre of Santo António, we have always believed that the pursuit of knowledge, through the encouragement of training and research, is the DNA of our institution and vital for its sustainability. While we recognise that there are still many actions and projects to implement, we are confident that it is merely a matter of time and commitment from our leaders.

Santo António is the second largest employer in Porto,with over 6,500 employees and an annual budget exceeding 700 million euros. It was established in February 2023 as a result of the merger of the University Hospital Centre of Porto and Magalhães Lemos Hospital. The Board of Directors seized this opportunity to initiate a cultural change and restructure the organisation to better address current and future challenges.

The rebranding of "Santo António" enabled a comprehensive refresh, aligning its image with the industry's best practices of leading international companies. The new regulations facilitated the introduction of innovative management areas and expertise aimed at fostering growth and prosperity through a business culture. The Centre for Digital Surgery and Robotics, the Digital Health Laboratory, the People and Well-Being Department, the Compliance Office, the Innovation and Projects Department, the Customer Experience Department and the Knowledge Management Department are examples of areas that have emerged as vital for daily skills transformation.

Our daily efforts are driven by the creation of high-performance teams to manage innovation and change projects, along with dedicated time for these initiatives, scholarships and support for training and research. We focus on developing young and agile leaders and continuously offer certifications that help us in this mission.

A key element of our strategy is establishing the Knowledge Management area. Its primary goal is to identify, capture, structure, disseminate and develop the organisation's knowledge. This ensures all employees can easily access the existing knowledge within the organisation, promoting personal development and creating a workforce that can make quick and informed decisions. This, in turn, helps generate new knowledge for the institution and society.

The foundation of this approach lies in the question: How do we manage what we do not know? Knowledge is a strategic resource that requires effective management. This necessitates a structure—comprised of people, processes, platforms, tools and a management model—that facilitates the planning, implementation and monitoring of activities aimed at promoting knowledge for both internal and societal benefits in a focused, structured and professional way.

> "When we invest in our people and their knowledge:
>
> We will be on the right side of change."

Achieving this vision requires a guided, cohesive and prepared vision from the top down.

Conflict of Interest

None

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AI-Driven Talent Revolution in Healthcare: Preparing Leaders for Uncharted Territory

The AI-Driven Talent Revolution in Healthcare marks a transformative shift as AI technologies enhance patient care and streamline operations. By leveraging tools like machine learning and natural language processing, AI enables personalised treatments and predictive analytics, improving outcomes and efficiency. However, challenges such as workforce readiness, ethical concerns and adoption resistance remain. Leaders must focus on training, interdisciplinary collaboration and continuous learning to prepare and upskill their workforce for emerging roles driven by AI technologies.

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key points

- AI is reshaping healthcare, enhancing diagnostic accuracy and reorganising operations.
- Leaders must prepare teams for emerging AI-driven roles and promote continuous learning.
- Machine learning and NLP technologies are driving predictive care and personalised treatments.
- Overcoming AI adoption barriers requires addressing workforce readiness and data privacy concerns.
- Diverse healthcare teams ensure ethical AI use, mitigating biases and improving patient outcomes.

The AI-Driven Talent Revolution in Healthcare marks a transformative era where artificial intelligence (AI) technologies reshape traditional healthcare paradigms. From enhancing diagnostic accuracy to streamlining administrative processes, AI in healthcare introduces unprecedented efficiencies and innovations. This shift not only redefines patient care but also revolutionises the roles of healthcare professionals.

Dave Goyal, Co-Founder & CEO of Think AI, explores in this article the challenges and opportunities AI presents to healthcare talent management. It dives into how executives can prepare their teams for roles that don't yet exist but will be critical in the years ahead. As healthcare evolves under the influence of AI, the industry must equip its workforce for this uncharted territory with roles that merge technology and human care at their core.

Understanding the Current State of AI in Healthcare

AI technologies have become integral to the evolving landscape of healthcare. These advancements are not only transforming patient care but also redefining operational efficiency within medical settings.

Machine Learning Algorithms. Machine learning is at the forefront, enabling systems to learn from vast datasets without explicit programming. In healthcare, this technology assists in diagnosing diseases by recognising patterns in medical images and laboratory data.

Natural Language Processing (NLP). NLP bridges communication gaps, allowing computers to understand and process human language. Within clinical environments, NLP facilitates the extraction of meaningful insights from unstructured data such as patient notes and research articles.

Enhancing Patient Outcomes. AI plays a crucial role in improving patient outcomes through predictive analytics. By analysing historical data, AI can predict the likelihood of disease occurrence or progression, allowing for early intervention. Personalised treatment plans are another significant advancement. AI tailors treatment strategies to individual genetic profiles and lifestyle factors, optimising therapeutic efficacy and minimising adverse effects.

Operational Efficiencies. The implementation of AI has led to notable improvements in operational efficiency. Automated administrative tasks such as scheduling and billing reduce human error and save time, allowing healthcare professionals to focus more on patient care.

Deploying AI-driven systems that manage inventory, optimise staffing schedules and ensure seamless communication across departments can streamline workflows.

The integration of these technologies underscores a shift towards a more efficient and personalised healthcare system. As AI continues to evolve, its potential to enhance both patient care and operational processes becomes increasingly apparent.

> "AI in healthcare introduces unprecedented efficiencies and innovations. This shift not only redefines patient care but also revolutionises the roles of healthcare professionals."

Challenges in Implementing AI: Bridging the Gap between Technology and Talent

The journey toward an AI-driven healthcare system is full of challenges, especially when it comes to preparing the workforce. Despite the rapid evolution of AI technologies, there is a significant gap in the availability of trained professionals ready to use these tools effectively. Many healthcare professionals feel underprepared to work with AI technologies, reflecting a widespread skills gap that needs addressing and highlighting a pressing need for better training and education initiatives.

Statistics indicate that over 10% of healthcare professionals in the US use AI, and nearly 50% plan to do so in the future. However, 42% remain unenthusiastic, citing human interaction and data privacy concerns (Noyes 2023). This emphasises the need for a structured approach to incorporating AI into existing healthcare practices, ensuring that both technological and human resources are aligned for optimal outcomes.

Adoption barriers further complicate the situation. Resistance to change remains a common issue, often arising from uncertainty about how AI might change traditional roles within healthcare teams. Concerns about data privacy add another layer of complexity as healthcare organisations struggle to maintain patient confidentiality in an increasingly digital environment.

To overcome these barriers effectively, healthcare leaders must prioritise creating a culture that embraces innovation and continuous learning. By addressing workforce readiness and adopting comprehensive AI strategies, organisations can bridge the gap between technology and talent, paving the way for transformative advancements in patient care.

Preparing Leaders for an AI-Driven Future

The AI-Driven Talent Revolution in Healthcare requires leaders to embrace technological advancements and foster a culture of innovation and adaptability. Leadership development is crucial

in this context, as executives are vital in guiding their organisations through uncharted territories.

Key elements of leadership in this evolving landscape include:

- **Fostering innovation and adaptability.** Leaders must create an environment where creativity thrives. Encouraging team members to experiment with new ideas and technologies can accelerate adaptation to AI-driven changes.
- **Developing essential technical skills.** As AI becomes integral to healthcare solutions, professionals need specific technical skills such as machine learning and data analytics. These competencies enable healthcare workers to efficiently use AI tools, leading to more personalised patient care and improved operational efficiencies. In addition to individual skill development, strategic vision involves fostering interdisciplinary collaboration across various domains.
- **Interdisciplinary collaboration strategies.** Clinicians who provide vital insights into patient care dynamics should work closely with data scientists who analyse vast datasets for actionable insights. IT experts are essential in infrastructure development, ensuring seamless AI integration within existing systems.

The way forward involves empowering leaders to act as catalysts for change. By promoting continuous learning and fostering partnerships across disciplines, they can guide their teams toward a future where AI-driven strategies redefine healthcare delivery.

Building a Future-Ready Workforce: Embracing Continuous Learning and Skill Enhancement

Continuous learning and skill enhancement are crucial for creating a workforce that uses AI technologies effectively. With AI evolving quickly, healthcare professionals must engage in ongoing training to stay skilled and knowledgeable.

> "As healthcare evolves under the influence of AI, the industry must equip its workforce for this uncharted territory, with roles that merge technology and human care at their core."

The Need for Ongoing Training and Education. AI's potential to transform healthcare is constantly growing, which means we need a workforce that is not only technically skilled but also adaptable. Regular educational updates and training sessions help bridge the gap between what we know now and new technologies. This proactive approach ensures that healthcare professionals can effectively integrate AI into their daily practices, improving patient care and operational efficiency.

Implementing continuous learning programmes

Healthcare organisations can adopt several strategies to promote continuous learning:

- **Mentorship initiatives.** Pairing experienced professionals with emerging talents fosters an environment of shared knowledge and experience.
- **Online courses.** Digital platforms make it easy to access up-to-date educational resources tailored to various learning needs.
- **Workshops and seminars.** Hosting regular work shops allows for interactive learning experiences where participants can engage with experts in real-time discussions.

These programmes not only equip employees with the necessary skills but also create a culture of lifelong learning, which is essential for innovation.

Emerging career paths due to AI integration

As AI continues to become more integrated into healthcare, new career paths are starting to emerge:

- **AI Ethicist:** Professionals who ensure ethical guidelines are followed in the development and use of AI technologies.
- **Healthcare Data Strategist:** Experts focused on analysing complex data sets to formulate strategic insights for better healthcare outcomes.

- **AI Healthcare Strategist:** Professionals who develop and implement strategies to integrate AI technologies into healthcare systems, aligning them with clinical and operational goals.
- **Algorithmic Auditor:** Experts who audit AI algorithms in healthcare to ensure they are fair, unbiased, and compliant with ethical and regulatory standards.
- **Digital Health Facilitator:** Specialists who manage the implementation of digital health technologies, ensuring smooth adoption and effective use by both patients and providers.

These roles highlight the diverse opportunities available within the field and offer exciting prospects for career development in an AI-driven future.

Addressing Ethical Concerns with Responsible AI Implementation

Integrating artificial intelligence in healthcare introduces many ethical considerations, particularly concerning data use and algorithmic biases. As AI systems increasingly influence clinical decision-making and patient care, privacy and informed consent issues become paramount. Patients must be assured that their personal health data is utilised responsibly, with stringent safeguards to prevent unauthorised access or misuse.

Equity in AI-driven healthcare solutions is crucial, especially when considering marginalised populations that have historically faced disparities in healthcare access and outcomes. Achieving equitable outcomes from AI algorithms requires deliberate efforts to ensure these systems do not perpetuate existing biases or create new ones. This involves careful examination of the datasets used to train AI models, as biased data can lead to skewed predictions that may adversely affect vulnerable groups.

> "Leaders must guide their organisations toward integrating AI into patient care and operations... preparing for future, yet-to-exist positions."

Mitigating algorithmic biases necessitates a multi-faceted approach:

- **Diverse teams.** Building diverse teams responsible for developing and implementing AI solutions can provide broader perspectives. This diversity helps identify potential biases and ensures that the technology caters to a wide array of patient needs.
- **Rigorous testing protocols.** Implementing comprehensive testing protocols is essential to evaluate the performance of AI algorithms across different demographic groups. Continuous monitoring and adjustment are required to maintain fairness and accuracy in real-world applications.

The Role of Diversity in Healthcare Teams. Diversity within healthcare teams plays a crucial role in developing AI solutions that are not only innovative but also fair and unbiased. A rich mix of backgrounds and experiences can help reduce biases inherent in AI algorithms, ensuring they meet the diverse needs of patients across various demographics.

Importance of Diverse Teams. Integrating diverse perspectives is essential in creating AI-driven healthcare solutions that address the needs of a wide range of patients. When teams include members from different racial, ethnic and cultural backgrounds, they are more likely to identify and correct biases that may arise in data sets or algorithmic processes. This diversity is crucial for developing tools that offer equitable healthcare outcomes.

Enhancing Decision-Making through Diverse Perspectives. Incorporating varied viewpoints can significantly improve decision-making processes within healthcare settings. Diverse teams bring unique insights and problem-solving approaches, leading to more comprehensive and holistic strategies. For example, when addressing health disparities or designing patient care models, diverse teams can anticipate potential pitfalls and propose inclusive solutions that might otherwise be overlooked.

Best practices for building inclusive teams

Creating truly inclusive teams requires deliberate strategies:

- Implement blind recruitment processes, in which specific candidate information such as name, gender or ethnicity is anonymised during the hiring stage to reduce unconscious bias.
- Encourage an organisational culture that values diversity through continuous training and awareness programmes.
- Foster an environment where all voices are heard and respected.

The commitment to diversity not only drives innovation but also ensures that technology serves its intended purpose: improving patient outcomes across all communities. This approach lays a strong foundation for developing robust AI solutions that genuinely reflect the needs of the populations they serve.

Opportunities Presented by the AI Talent Revolution. Integrating AI into healthcare marks a new era of possibilities, fundamentally transforming patient care and delivery models. By leveraging predictive analytics, AI can significantly enhance patient outcomes through early disease detection. This technology allows for the identification of potential health issues before they become severe, enabling timely interventions that improve prognosis and reduce healthcare costs.

Predictive Analytics: A Key Player in Transformation. Predictive analytics plays a pivotal role in this transformation. For instance, AI algorithms can analyse vast amounts of patient data to predict medical conditions such as diabetes or heart disease well in advance. This proactive approach enhances patient outcomes and empowers healthcare providers to tailor personalised treatment plans.

Boosting Productivity in Healthcare Settings. Another substantial benefit of AI integration is the increase in productivity within healthcare settings. Automating routine tasks frees up valuable time for healthcare professionals, allowing them to focus on more complex duties that require human expertise. This efficiency gain alleviates pressures from growing demand and facilitates scaling innovative care delivery models.

The Promise of AI-Driven Technologies. AI-driven technologies thus create an environment where enhanced patient care and increased productivity go hand in hand, setting the stage for transformative changes across the healthcare landscape. These innovations hold the promise of not only meeting existing challenges but also paving the way for future advancements in medical science and care delivery.

In healthcare, the AI-Driven Talent Revolution presents both opportunities and challenges. Leaders must guide their organisations toward integrating AI into patient care and operations. This requires strategic planning, focusing on hiring and training for current roles and preparing for future, yet-to-exist positions. Embracing continuous learning and flexibility will help keep organisations innovative and ready for improved patient care. Forward-thinking leadership will be vital to reshaping healthcare globally, ensuring organisations are equipped for the AI-powered future.

Conflict of Interest

None

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The Future of Work in Healthcare: Preparing for a Talent-Driven Industry

The healthcare sector is transforming rapidly due to technological advancements and changing patient expectations. Organisations must adapt by embracing digital health tools and telemedicine, creating new roles that require flexible work environments. Continuous education is essential for mastering emerging technologies, while a diverse workforce fosters innovation and improves patient care. Healthcare leaders must proactively navigate these changes to secure a skilled workforce and ensure high-quality care in an evolving landscape.

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key points

- Healthcare must adapt to a talent-driven industry amid rapid transformations.
- Digital health tools and telemedicine are reshaping healthcare roles and services.
- Flexibility in scheduling enhances job satisfaction and reduces burnout.
- Continuous learning is essential for adapting to technological advancements.
- A diverse workforce drives innovation and improves patient care outcomes.

The healthcare sector is undergoing rapid transformations due to technological advancements, changes in patient expectations and a dynamic workforce. With an increasingly competitive market for skilled professionals, healthcare leaders must adapt to a talent-driven industry. The future of healthcare work will depend on how organisations prepare to attract, develop and retain the best talents in this ever-changing environment.

Understanding Healthcare Workforce Trends

Current trends in healthcare are characterised by digitalisation, shifting patient care needs, generational expectations and the necessity for a comprehensive approach to service delivery. A notable development is the increasing demand for professionals skilled in digital health tools as traditional roles evolve alongside advanced technologies. The rise of telemedicine, accelerated by the COVID-19 pandemic, has necessitated that healthcare providers become proficient in virtual platforms, leading to the creation of new roles like telehealth coordinators and remote care specialists. Additionally, Artificial Intelligence (AI) is transforming diagnostics, predictive analytics and treatment planning, which requires a workforce capable of integrating AI into clinical workflows. For example, radiologists now need to interpret AI-generated imaging results, while primary care physicians must leverage AI for patient risk stratification.

Creating a Flexible Work Environment

To attract top talents, healthcare organisations must adopt a flexible and adaptive work environment, moving away from rigid traditional models. Flexibility in the workplace has become a crucial factor for healthcare professionals seeking not just financial compensation but also a better work-life balance. By offering flexible scheduling, remote work options and diverse telemedicine roles, healthcare organisations can significantly enhance job satisfaction, reduce burnout and improve employee retention.

Rethinking Work Schedules: From Shift Rotations to Customised Plans

Flexible scheduling is especially important in the healthcare industry, where the demanding nature of shift work often contributes to high stress and burnout rates. Hospitals and clinics are beginning to explore customised work schedules that go beyond the conventional 12-hour shifts. Examples include:

Staggered Shifts. Instead of adhering to the traditional day or night shifts, some healthcare providers now offer staggered shifts. For instance, nurses can opt for 6-hour or 8-hour shifts at different times of the day, allowing them to accommodate personal obligations like childcare or education.

Condensed Workweeks. Another emerging trend is the implementation of condensed workweeks, where professionals work longer hours over fewer days. For example, a physician may choose to work four 10-hour days instead of the standard five 8-hour days, granting them an additional day off during the week. This arrangement is particularly appealing to those who need more personal time without sacrificing their full-time status.

On-Call Flexibility. For specialities such as radiology, emergency medicine and mental health, on-call flexibility allows clinicians to work remotely, responding to patient needs as they arise. This model provides autonomy to professionals who can manage their schedules while ensuring that critical patient care is not compromised.

> "The future of healthcare work will depend on how organisations prepare to attract, develop and retain the best talents."

Remote Work in Healthcare: Expanding Beyond Telemedicine

Remote work is not limited to telehealth consultations; it encompasses a range of healthcare functions that can be performed virtually. With the integration of advanced digital health tools, roles such as medical coding, billing, insurance claim processing and even patient education have successfully transitioned to remote settings. This change not only broadens the scope of job opportunities but also allows healthcare organisations to tap into a wider talent pool. Some examples of remote healthcare roles include:

Virtual Case Management. Case managers can now work remotely, using telehealth platforms to monitor patients with chronic conditions, coordinate care and provide follow-up support. This approach enables them to work from any location, enhancing job satisfaction and attracting professionals who prefer flexibility.

Remote Diagnostics. Certain specialities, like radiology and pathology, are increasingly adopting remote diagnostic practices. Radiologists can review digital images from home, providing expertise across multiple facilities. This remote model is advantageous for healthcare systems, particularly in rural or underserved areas, as it allows access to specialised diagnostic services without the need for on-site staff.

Health IT and Data Analysis. As healthcare becomes more data-driven, remote roles in health IT and data analytics are gaining prominence. Professionals in these fields can work from anywhere, managing electronic health records (EHRs), analysing patient data and optimising healthcare processes. This flexibility not only attracts top IT and analytics talent but also enables healthcare organisations to implement data-driven decision-making efficiently.

Job-Sharing and Part-Time Opportunities: Creating a Balanced Workforce

Job-sharing is another strategy that healthcare organisations are adopting to enhance workplace flexibility. It involves two or more employees sharing the responsibilities of a single full-time position, each working part-time according to their availability. This arrangement is especially beneficial for roles that

demand around-the-clock presence, such as nursing or administrative support. Some key advantages include:

Skill Diversification. Job-sharing allows healthcare workers with varying expertise to bring their strengths into a single role. For instance, one nurse with expertise in paediatric care can share a position with another nurse skilled in geriatrics, thus broadening the care scope offered to patients. This model enhances patient care and provides employees with opportunities to learn from each other.

Work-Life Balance. By participating in job-sharing arrangements, healthcare professionals can maintain their clinical practice without compromising personal commitments, such as continuing education, caregiving or pursuing hobbies. This balance is crucial in reducing burnout, a common challenge in the healthcare sector.

Continuity of Care. Unlike traditional part-time roles, job-sharing ensures continuity of patient care. As the responsibilities are clearly divided and schedules are synchronised, patients experience seamless transitions between professionals, minimising disruptions in care delivery.

Embracing Telemedicine: Building a Flexible Workforce for the Future

Telemedicine has transformed patient care by making healthcare accessible and convenient, but it has also opened new flexible job opportunities for healthcare professionals. With the adoption of telemedicine, clinicians can offer consultations from their homes or remote offices, significantly reducing the need for physical presence in a hospital or clinic. Here's how telemedicine fosters workforce flexibility:

Cross-Location Practice. Through telemedicine, healthcare providers can extend their services beyond local boundaries. For example, a specialist based in a metropolitan area can consult with patients in rural regions without the need for travel. This flexibility attracts professionals who wish to serve diverse populations while enjoying the comforts of remote work.

> "A diverse and inclusive workforce is essential not only for ethical reasons but also as a strategic advantage in healthcare."

Reducing Overhead Costs. Telemedicine reduces the need for physical office space for small practices and independent consultants, thereby cutting overhead costs. This financial flexibility can be redirected towards better compensating skilled professionals, further enhancing talent retention.

Diverse Job Roles. Telemedicine has expanded job roles to include virtual health coaches, telehealth nurses, mental health counsellors and remote patient monitoring specialists. Healthcare organisations that integrate telemedicine into their practice not only increase the variety of roles they can offer but also create opportunities for professionals to design their work schedules around patient demand.

Investing in Continuous Professional Development

The rapid evolution of the healthcare industry necessitates a workforce that is agile and committed to continuous learning. Basic clinical skills alone are no longer sufficient; professionals must engage in ongoing education to master new technologies and best practices. Healthcare leaders play a crucial role in fostering this culture by implementing structured development programmes, providing financial support for certifications and offering incentives for continuous education. Investing in workforce growth cultivates a highly skilled team and demonstrates a commitment to excellence, attracting and retaining top talent.

In addition to enhancing clinical skills, healthcare institutions must prioritise leadership development tailored for clinical staff. Transitioning from clinician to leader requires skills such as strategic planning and team management. By offering targeted training, organisations prepare emerging leaders for managerial roles while improving overall care quality. Engaged leaders inspire their teams and drive quality improvement initiatives, creating a collaborative work environment. This proactive approach to leadership development is essential for succession planning, ensuring a consistent pool of talent to navigate the complexities of the evolving healthcare landscape.

Navigating the Technological Shift. The integration of technologies such as Artificial Intelligence (AI), robotics and telemedicine is transforming the healthcare sector, redefining job roles and expanding the scope of medical care. While concerns exist about automation potentially displacing jobs, technology transforms roles and creates demand for specialised positions. For instance, AI in diagnostic imaging

requires professionals to blend clinical expertise with digital skills, while robotic-assisted surgeries necessitate surgeons trained in advanced systems. Additionally, telemedicine has introduced roles such as remote patient monitoring specialists and telehealth nurses, broadening access to healthcare services.

To adapt to these technological shifts, healthcare leaders must evolve workforce strategies, investing in continuous education and training focused on digital skills, cybersecurity and data analytics. Partnerships with educational institutions can facilitate tailored programmes that help professionals effectively utilise AI in clinical settings. Furthermore, fostering a culture of adaptability and ongoing learning is essential; regular workshops and certifications ensure that staff remain current with advancements. As healthcare organisations embrace these technologies, they must also prioritise cybersecurity training to protect patient data, ultimately creating a more innovative and skilled workforce ready to meet the future of healthcare.

Fostering a Culture of Innovation and Diversity

A diverse and inclusive workforce is essential not only for ethical reasons but also as a strategic advantage in healthcare. Teams with varied backgrounds and experiences foster innovative solutions and improve understanding of the unique health challenges faced by different patient populations. This diversity enhances culturally competent care, as staff members who speak multiple languages or are familiar with specific cultural practices can significantly improve patient communication and trust. For example, having staff members who speak multiple languages or have knowledge of specific cultural practices can significantly enhance patient communication and trust, resulting in improved health outcomes.

> "Flexibility in the workplace has become a crucial factor for healthcare professionals seeking not just financial compensation but also a better work-life balance."

Promoting diversity and inclusion in hiring is just the first step. Healthcare leaders must implement supportive policies that create an inclusive environment where all employees feel valued. This includes mentorship programmes for underrepresented groups, training on unconscious bias, and ensuring leadership positions reflect a commitment to inclusion. Furthermore, diversity drives innovation by encouraging the cross-pollination of ideas and collaboration among professionals from various specialities. Establishing innovation incubators allows employees to explore new methods and technologies, ultimately leading to breakthroughs in patient care and operational efficiency. Recognising and rewarding innovative thinking within the organisation can further motivate employees, creating a culture that continually seeks to enhance care delivery and meet the needs of diverse patient populations.

Conclusion

The future of work in healthcare is clearly centred around talent, with a growing emphasis on digital skills, flexibility, professional development and diversity. Healthcare leaders must adapt proactively to market trends and changing workforce dynamics. By creating a flexible work environment, investing in continuous education, embracing technological advancements and nurturing a culture of innovation, healthcare organisations can attract and retain top talent in a competitive field.

However, challenges remain. Addressing workforce shortages, navigating regulatory changes and ensuring equitable access to professional development opportunities are critical areas that require continuous focus. Future initiatives should aim to build strategic partnerships with educational institutions, leverage technology for workforce planning and implement policies that support employee well-being. By adopting these strategies, healthcare organisations can secure a talented workforce and deliver high-quality patient care in an ever-evolving industry.

Conflict of Interest

None

Project Carer Matters 2: Strengthening the Ecosystem to Support Family Caregivers of Older Persons

In Singapore's ageing society, informal caregivers often face challenges, including burnout and the risk of depression. A program called "Project Carer Matters 2" has been introduced to counter this tendency. It focuses on equipping caregivers with skills, providing emotional support and integrating technology for home care monitoring. The initiative addresses gaps in caregiving resources, builds community connections and aims to scale nationally, ensuring sustained caregiver support.

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key points

- Rapid ageing in Singapore's society increases the caregiving burden on family members.
- Project Carer Matters supports caregivers with training, resources and emotional assistance.
- CarePal app provides easy access to caregiving info and cost estimation tools.
- Smart home monitoring tech ensures the safety of older persons living independently.
- Community support networks reduce caregiver isolation through peer connections and mentorship.

Who Cares For The Carers?

By 2030, 25% of Singapore's total resident population will be 65 years and above, becoming a superaged society (Organisation for Economic Cooperation and Development and World Health Organisation 2020). In the fastest ageing Asian nation after Japan, it is expected that doubling the proportion of individuals aged 65 and above will happen in less than 25 years, compared to up to 150 years in Western Europe (Mehta and Vasoo 2023). This can be attributed to both a high life expectancy at birth, at 75 years for males and 85 for females, and a resident total fertility rate below the replacement rate of 1.10 (Mehta and Vasoo 2023, Ghoh and Sim 2023).

With such a rapid change in the demographic landscape, the burden of care for older persons is managed by a shrinking pool of working adults available, with a projected old-age dependency ratio shooting up from 10 to 30 by 2030 (Mehta and Vasoo 2023). Such care is carried out by informal caregivers and family members who take up the role of looking after aged loved ones, often spouses or adult children. This itself is an expectation by senior policymakers in the country to prevent a flood of older persons needing government-sponsored

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assistance such as access to nursing homes or assisted living facilities to live out the rest of their days (Chan 2021, Chan et al. 2019b, Ong et al. 2022).

However, with a greying society and increased longevity of Singaporeans, there will be fewer family members available to shoulder the burden of care over a longer period, with a projection of 2.7 working adults to support a single older person in 2030 (Ministry of Health 2023). This has been attributed to smaller family sizes, with the bulk of responsibilities being left to one or two children and an aged spouse (Mehta 2023).

A recent survey of informal caregiving found that nearly half of the caregivers hired a migrant domestic worker (MDW) to help provide physical care for the older care recipient (Mehta 2023). However, despite the availability of such support, caregivers still spend an increasing amount of time looking after the older person and are projected to spend an average of 41 hours a week caregiving (Chan 2021). This would make caregiving a 'full-time job' in terms of the time commitment required, taking valuable time away from their own families and potential economic productivity in the workforce.

While it is natural that family members would want to be involved and engaged in the care of an older loved one, and the concept of "family as the first line of defence" is reinforced through current government policy, the reality is that family members can only cope so far before they themselves face burnout (Chan et al. 2019b, Ong et al. 2022, Mehta 2006, Chan et al. 2022b, Chew et al. 2022). This is especially so if family caregivers suffer from limited social and family support in this endeavour, with some reporting their experience of struggling to manage a loved one as "mental torture" (Chan et al. 2019b). This strain often manifests as a 'caregiver burden', a confluence of physical, psychological, emotional, social and financial problems experienced by caregivers (Zarit et al. 1980).

The weight and impact of caregiver burden on family members of older persons in Singapore was reflected in our cohort study of caregivers from 2015-2017, which found that one in three caregivers of hospitalised older adults from our hospital were at risk of depression, high anxiety and a poor quality of life (Chan et al. 2018, Chan et al. 2019a). Left unmanaged, this adds further strain on both the health and social care systems as the caregivers struggle to juggle the responsibilities and management of the older person, often resulting in the institutionalisation of the older person when they feel they are unable to cope. 90% of the instances of decision-making on the institutionalisation of an older person were found to be made by the caregiver (Liu et al. 2016b). As a result, it is critical that we better manage the needs and perceptions of the caregiver if our goal is to enable the caregiver and the older person to thrive and successfully age in place in the community (Liu et al. 2016b).

A solution we established at Tan Tock Seng Hospital, a healthcare institution of the National Healthcare Group, is Project Carer Matters, now standardised into care as Carer Matters Service. This was Singapore's first hospital-to-home framework to redesign the care and support for family caregivers transitioning from the hospital back to the home with the older person. It consisted of 4 key initiatives: (1) A systematic identification of at-risk caregivers by ward nurses, (2) A rapid screening of the

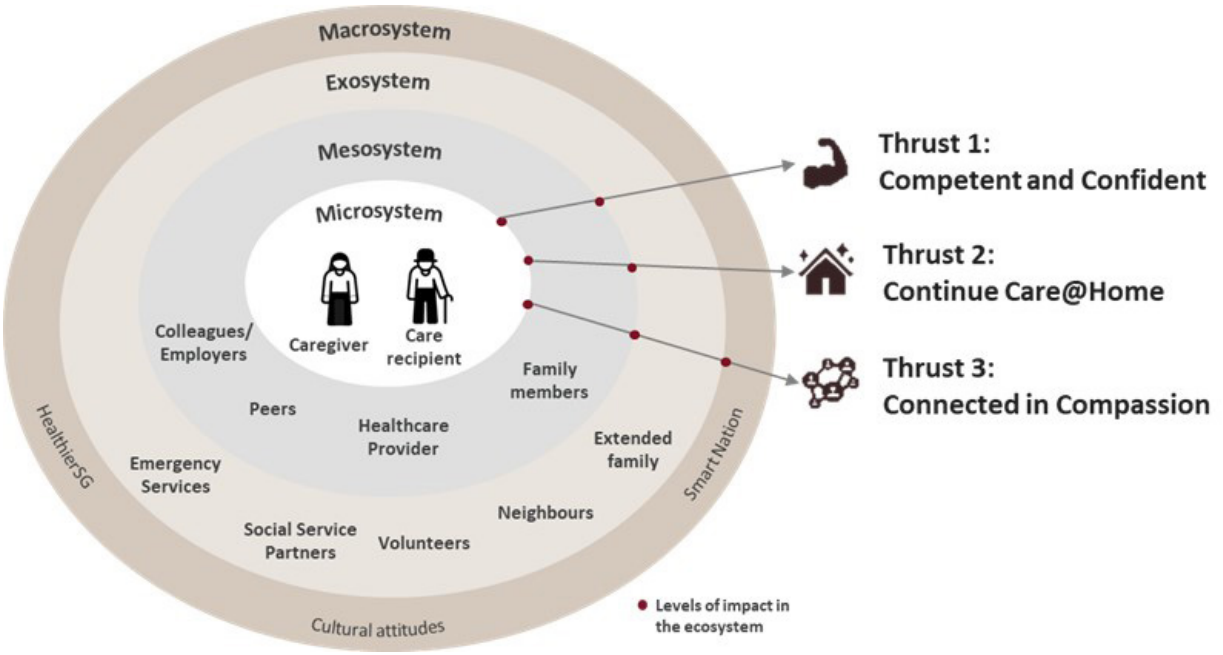

Figure 1: Framework of Project Carer Matters 2

caregivers' needs and stressors, (3) The provision of curated and targeted interventions and (4) Linking caregivers up with community partners. Details of the entire programme are detailed in our earlier publications and research (Ong et al. 2022, Chan and Glass 2022, Chan et al. 2022b, Chan et al. 2022a). Since its inception, Project Carer Matters has benefitted over 700 caregivers, equipping them with the knowledge and skills and increasing their psycho-emotional preparedness for caregiving. Through qualitative interviews, caregivers shared how Project Carer Matters helped them develop new skills and knowledge to sustain their caregiving (*"If not for the course, I really don't understand it [dementia]. I (learned) to have more empathy and be more patient. It's helping me to help him [care-recipient]."*) Caregivers also gained clarity on how to navigate the complex landscape of financial and community aids and were subsequently empowered to find solutions in their caregiving journey (*"Your colleague said that my dad should be able to qualify for (an) eldercare (grant), so after that call, I went and applied."*) In addition, it also alleviated the emotional hardships inherent in caregiving by creating a sense of camaraderie through our programmes (*"It's good to realise that I'm not the only one in this journey. It gives me encouragement. It seriously makes a lot of difference, knowing that we are not alone."*)

Current Gaps In The Caregiving Ecosystem

Through Project Carer Matters, we identified three key gaps that remain across the ecosystem, spanning the hospital, home and community, in support of caregivers.

One critical gap is the absence of centralised access to trusted, reliable information to guide and equip the caregiver with the knowledge for effective caregiving, especially in the continuation of care once they transit back home and manage the needs of their loved one independently, without access to the expertise and knowledge of clinicians from the healthcare institutions. While the Internet is a common tool used to search and access information, there are few digital solutions specifically established to meet the complex, dynamic needs of caregivers, pointing to a clear need for a centralised, one-stop repository of the appropriate information designed to meet the multifaceted needs of caregivers (van Velsen et al. 2013). Over the Project Carer Matters pilot, we experimented with emailing targeted information designed to support caregivers' unique needs based on their self-identified information deficits and requested information. This approach of targeted information was appreciated by caregivers, demonstrating the potential for scaling this strategy to benefit the broader population of caregivers (Chan et al. 2022b).

Another is the need for tools and systems to enable effective continued care for older people transitioning from the hospital to the home setting. A significant concern of caregivers and their older care recipients is the availability of assistance in the event they fall at home. This was reflected in a study of seniors

with fall alarms, which found that the majority were unable to call for help when they fell, delaying their rescue and increasing the risk of prolonged injury and harm the longer they waited for assistance (Fleming and Brayne 2008)This was experienced first-hand during Project Carer Matters, with many caregivers unable to leave the house to attend in-person training programmes because they had to constantly monitor the older person at home to ensure their safety.

The third is the lack of opportunity to connect and support caregivers amongst each other and with the local community where they are residing. Throughout Project Carer Matters, we learnt that a key benefit reported by caregivers was the opportunity to meet together with caregivers facing similar problems and issues in the care of their loved ones, leading to both a shared sense of camaraderie and opportunities for shared problem-solving, both of which led to them to feel better connected and supported as they now had peers and friends to turn to for advice (Chan et al. 2022b). As such initiatives cannot be held and sustained indefinitely by a transition-focused hospital-to-home programme, it is essential to build ground-up community-based structures to enable caregivers to come together and build bonds and networks, finding strength in each other to continue their journey.

With these in mind, we set out to build the next iteration of structure and support for older person caregivers throughout the entire journey from hospital to home and beyond, connected through technology enablers to further raise accessibility—Project Carer Matters 2.

Framework of Project Carer Matters 2

Project Carer Matters 2 is a new care model designed to deliver relationship-based care. It leverages technology enablers to strengthen the current caregiving ecosystem and ensures the continuity of integrated and personalised care for family caregivers of older persons.

> "By 2030, 25% of Singapore's total resident population will be 65 years and above, becoming a superaged society."

We used an adaptation of the Ecological Systems Theory to build our care model (Bronfenbrenner 1979). This allows us to better address the micro-, meso, exo- and macro-caregiving ecosystems, which ensure appropriate assistance is adjusted to caregiving needs over time. This framework marries system thinking together with relationship-centred care, part of the hospital's movement of becoming a 'Hospital Without Walls' (Soh et al. 2020). This way, we plan to transform the current care model—where care is traditionally shouldered by the caregiver alone—to instead leverage stakeholders at different levels of the ecosystem, drawing them in to support caregivers, either directly or indirectly. We also intend

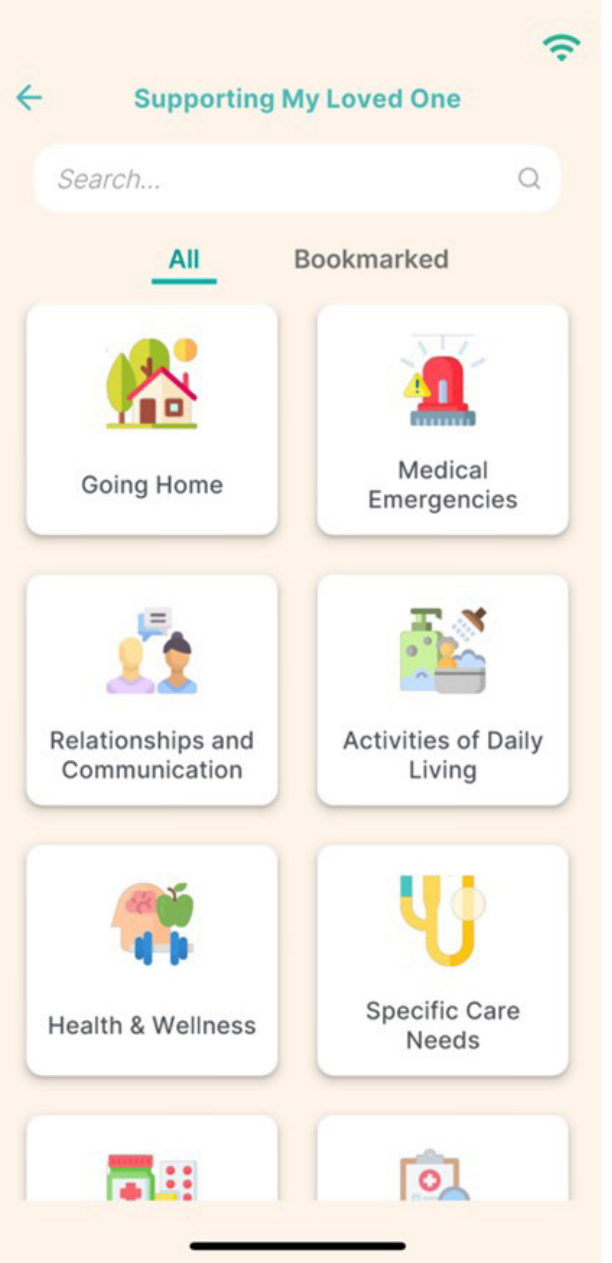

Figure 2: Interface of CarePal

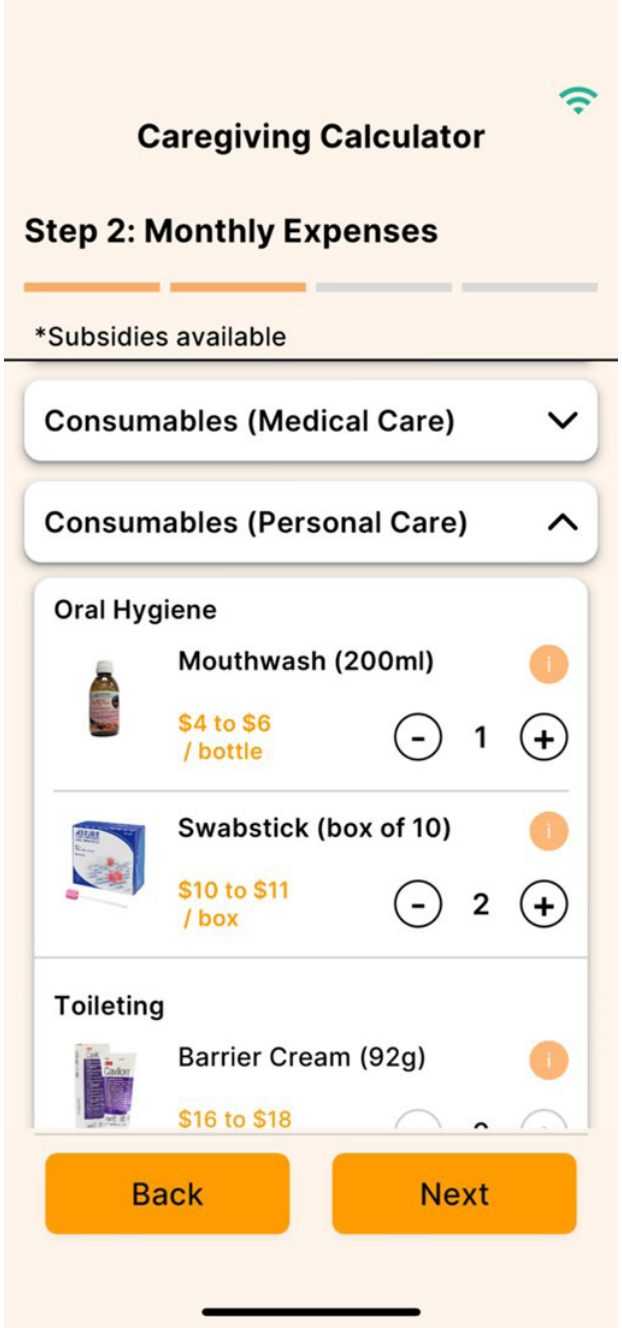

Figure 3: Caregiving Calculator Feature of CarePal

for Project Carer Matters 2 to produce a ripple effect, influencing societal attitudes and norms at the macro-level through regular engagement with top leadership and policymakers.

> "[Project Carer Matters 2] leverages technology enablers to strengthen the current caregiving ecosystem and ensures the continuity of integrated and personalised care for family caregivers of older persons".

Through Project Carer Matters 2, we plan to build and sustain an interconnected caregiving ecosystem of support services and capabilities to meet three key goals, filling in the gaps described above: (1) Ensuring caregivers are competent and confident in the care of their loved one; (2) That caregivers have the peace of mind that the older person is safe at home and (3) That caregivers have a network of fellow caregivers and other forms of community-based assistance that they can turn to for advice, guidance and support. These are met through 3 overarching thrusts, guiding the development and deployment of appropriate solutions to meet these goals.

Thrust 1: Getting caregivers competent and confident

Thrust 1 aims to connect and match caregivers with the most appropriate information and resources to meet their information needs regarding the care of their loved ones so they have what they need, when they need it.

While we do have a central repository of health information at the Tan Tock Seng Hospital Health Library, the data within is static, neither visible nor easily accessible to patients, caregivers and healthcare providers (Okan et al. 2019). This pointed to the need for an interactive solution that is able to provide information to the caregiver at the 'palm of their hand' with immediate access to accurate, trusted information to guide the care of their loved one.

With that in mind, we developed CarePal, the first mobile application in Singapore explicitly designed for the needs of caregivers of older persons. This is a one-stop library with easy access to all the information and resources related to the patient and their caregiver. Seeking inputs and opportunities for collaboration with other agencies involved in the support of caregivers, such as the Ministry of Health Transformation Office and the Agency for Integrated Care, we have pulled together all relevant information to aid caregivers in better knowing how to care for their loved one and themselves and the avenues of help available that they can turn to.

With expert feedback from clinicians, nurses and therapists, we built a structured resource recommender to 'push' targeted information and resources based on the older person's functional needs and the expressed needs of the caregiver. This relieves them from manually sifting through the different websites and resources to find the 'most

relevant' information. The involvement of clinicians in this co-creation process of resource identification and prioritisation was key as it allowed them to plan and structure the information as to how they would provide it in their clinical setting, allowing CarePal to become a useful adjunct in the clinician-patient encounter. Since the prototype app's development, we have deployed the pilot of CarePal in different clinical settings where it is used by doctors, nurses and allied health professionals in their caregiver education processes, pointing out the needed information on the app. This, in turn, allows the caregiver to 'save' such needed information on their own app within their mobile phones, removing the need for printed leaflets and booklets that could be easily misplaced and lost once they leave the clinic or hospital.

Another key feature within CarePal is a caregiving cost calculator. This was designed in conjunction with our Occupational Therapists and Medical Social Workers to allow caregivers to project better and budget the one-time, weekly, monthly and annual costs of caregiving to help them better anticipate the costs ahead of elements such as purchasing a motorised wheelchair or a year's cost of nasogastric tube feeding. Frequently updated with the latest pricing and adjustments, this is not intended to produce 'sticker shock' when seen by the caregivers but to give them an unbiased estimate of the costs before their engagement with the social workers and therapists on the subsidies that can be applied for through the clinicians to reduce the costs.

Through CarePal's ongoing pilot, we have got good feedback from clinicians and caregivers alike. They have seen it as a useful adjunct that they "no longer have to Google" when searching for reliable information to guide the care of their loved ones. This demonstrates this tool's potential to empower and enable caregivers with the knowledge and skills to better manage their loved ones.

> "Even as we continue developing and deploying these solutions, (…) we are continuing to identify their key characteristics and ingredients of success, building a blueprint to detail the elements essential to maintaining their effectiveness and capacity for implementation with fidelity"

Thrust 2: Enabling older persons to confidently live safely at home

Thrust 2 aims to equip households with non-intrusive smart in-home monitoring to help ageing-in-place. Such tools can enable older persons to confidently live safely at home with their caregivers (Liu et al. 2016a, Morris et al. 2013). Examining the research in this field, we can see that smart monitoring devices at home are easily accepted and adjusted to by older persons, pointing to this being a feasible solution in households of older persons in Singapore (Morris et al. 2013; Pal et al. 2017).

A potential solution that we plan to introduce is a home-based fall detection and rescue system. Across Singapore, falls remain a major cause of older persons seeking emergency treatment at the hospital (Yeo et al. 2009). As falls can lead to serious injuries such as hip fractures and head injuries necessitating hospitalisation and treatment, the average cost of treatment following a fall in Singapore can amount to $31,189 (Tzuu Ling et al. 2017). Our earlier research reflected the gravity of this issue faced by caregivers at home, with some reporting *"Having to stay alert… like in wartime"* when looking out for the slightest sign that the older person might have fallen somewhere in the house, preventing them from having sufficient rest themselves (Chan et al. 2019b). Hence, we are developing the integration of a locally developed home-based fall alarm system with a national alert and response system.

The alert system uses a combination of thermal and motion sensors to detect if the older person has fallen onto the floor. Once the system detects a fall in the household, the system sends an alert to the caregiver through text message with footage of the incident. The caregiver can then request to activate a response team to attend to the household if the caregiver is unable to check in on the older person and, if necessary, activate emergency medical assistance. This can prevent delayed rescue and complications

that the older person could develop while waiting for help, such as pressure injuries, pneumonia and dehydration, which could raise mortality by 50% within the subsequent six months (Tinetti et al. 1993, Tinetti et al. 1988, Wild et al. 1981).

This way, we aim to alert the risk of we hope to provide the caregiver with a greater 'peace of mind' on the safety of the older person even when they are outside the house.

Thrust 3: Supporting caregivers through the community

Thrust 3 aims to support caregivers in the community setting. This is established through collaborations with the wide network of community partners around the hospital in an organic and sustainable manner. This way, we hope to enhance further the community of care for caregivers around our area.

A key protective factor for caregivers is the ability to build and sustain strong, meaningful social ties and kinship with peers and other caregivers, contributing towards more robust psychological well-being (Donaldson et al. 2015). This was also observed in our caregiving workshops and programmes over Project Carer Matters, with caregivers feeling better supported and less isolated after meeting, connecting and befriending other caregivers along similar trajectories of the caregiving journey (Chan et al. 2022b).

Another valued source of support was a dedicated telephone support line for caregiver-related enquiries provided through the Project. Caregivers who used the phone line reported the peace of mind it provided: the comfort that help and support was just a phonecall away (Chan et al. 2022b).

To address this, we are partnering with community-based social support organisations to provide three tiers of support for caregivers. The first, most basic level is the availability of a dedicated telephone support service for caregivers, such as Careline. Staffed by individuals from a social service organisation, it is well-suited to receive telephone-based enquiries from caregivers nationwide and route them to appropriate support services and sources of assistance where appropriate.

The second tier is a network of peer support groups managed by one of our community support providers. This offers a group-based engagement level for caregivers to connect, meet and learn from others alongside their journey.

The third is a one-to-one mentorship relationship facilitated by a community partner. Caregivers are matched to a 'senior', more experienced caregiver who can advise and guide the mentored caregiver along their own journey.

Through this three-tiered support structure, we endeavour to ensure each caregiver can get the appropriate level of social and community support according to their needs. This will help caregivers feel better supported and that they are not 'walking alone'.

Aiming to benefit caregivers and older people across the region

Even as we continue developing and deploying these solutions through Project Carer Matters 2, we are continuing to identify their key characteristics and ingredients of success, building a blueprint to detail the elements essential to maintaining their effectiveness and capacity for implementation with fidelity. This would guide the deployment and scaling of these initiatives across the National Healthcare Group and wider society.

We will continue to relook, adapt and refine processes and workflows to simplify and streamline them, enabling other organisations to adapt them swiftly and easily into their organisations and settings. We plan a horizontal scaling approach, expanding the solutions and initiatives to support caregivers across more sites and regions until we can benefit as many caregivers and older persons across the nation as possible.

Through this, we hope to ensure family caregivers have equal access to the support, skills and resources available to help them better manage care for the older person, helping both thrive in the golden sunset years.

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CONFLICTS OF INTEREST

None

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Advancing African Healthcare Through Leadership

Africa's healthcare system faces a high disease burden, limited workforce and resource constraints. Effective leadership is crucial for optimising resources and driving improvements, as seen in task-shifting and public-private partnerships that boosted service access and reduced mortality rates. Transformative leaders foster innovation, shape culture and establish collaborative networks. Adapted frameworks like Six Sigma, tailored to local contexts, and community engagement are key to achieving sustainable progress.

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key points

- Africa faces a high disease burden with a limited healthcare workforce and resources.
- Nigeria's healthcare system struggles with high maternal and infant mortality rates.
- Task-shifting and partnerships improve healthcare access and service delivery.
- Leadership initiatives have reduced mortality and improved facility performance.
- Disparities in spending call for innovative leadership to optimise resources effectively.

Overview of Healthcare Leadership in Africa

The healthcare challenges across Africa are substantial, with the continent bearing 25% of the global disease burden while possessing only 3% of the world's healthcare workforce. This disparity underscores the urgent need for effective leadership to optimise limited resources and drive systematic improvements. The shortage of healthcare workers is particularly severe, with a current ratio of just 2.3 healthcare workers per 1,000 people. This is significantly below the World Health Organisation's minimum requirement of 4.45 per 1,000 for delivering essential health services.

In Nigeria, these challenges are starkly reflected in the nation's healthcare statistics. Nigeria has a high rate of maternal and infant mortality, with approximately 512 maternal deaths per 100,000 live births and an under-five mortality rate of 100 per 1,000 live births. The healthcare system also suffers from inadequate funding, receiving only about 5.7% of the national budget—well below the 15% target set by the Abuja Declaration. Additionally, Nigeria faces a significant brain drain as healthcare professionals leave for other countries to seek better working conditions and pay. With a healthcare worker density of 1.95 per 1,000 people, improving service delivery requires deliberate leadership to address these deficits and enhance capacity.

Strategic leadership in African healthcare has led to resource optimisation and capacity building, significantly improving service delivery and healthcare access. Task-shifting initiatives have expanded capacity by up to 50%, while public-private partnerships, driven by innovative leadership approaches, have increased healthcare availability, with Uganda reporting a 40% rise in service access. These efforts have resulted in measurable progress, including a 39% reduction in maternal mortality (2000-2017) and a 46% decrease in under-five mortality (2000-2019). Leadership-driven strategies also reduced HIV/AIDS-related deaths by 39% and malaria mortality by 60%.

Furthermore, the African Leadership Academy for Healthcare Management reports that participating institutions have achieved an average 45% improvement in facility performance metrics, demonstrating the tangible impact of focused leadership development. Cross-border training initiatives have increased specialised medical capacity by 30% in participating regions, showcasing the potential of collaborative leadership approaches in addressing shared challenges.

Healthcare spending in Africa varies significantly, with nations like Burundi spending less than $20 per capita compared to over $1,000 in South Africa. These disparities underscore the need for innovative leadership to mobilise and allocate resources effectively. Despite financial constraints, successful leadership initiatives have shown that substantial health improvements are achievable even in low-resource settings. Effective leadership can bridge gaps and optimise resource use to enhance healthcare outcomes.

The evolution of African healthcare leadership is driven by emerging challenges and opportunities, particularly highlighted by the COVID-19 pandemic, which accelerated innovation in healthcare delivery models. Leaders have adapted to these challenges by pioneering new approaches to service provision and strengthening health system resilience. Looking ahead, the focus is on sustaining and scaling successful initiatives while fostering innovation. The documented successes of national and regional efforts provide valuable lessons for healthcare leaders across the continent, demonstrating that leadership can yield significant benefits in diverse and resource-constrained environments.

> "The continent bears 25% of the global disease burden while possessing only 3% of the world's healthcare workforce."

Leadership as a Catalyst for Change and Innovation in Healthcare

Contemporary healthcare environments are constantly transformed and driven by technological advancement, evolving patient expectations, regulatory shifts and emerging care delivery models. In this dynamic landscape, leadership emerges as

Figure 1: Six Effective Leadership Strategies in Healthcare

the fundamental catalyst for converting theoretical potential into practical innovation and sustainable change. Healthcare leaders serve as architectural engineers of organisational transformation, creating environments where innovation flourishes and change becomes embedded in the organisation's DNA.

These are essential strategies adopted by transformative leaders in healthcare:

- **Growing Innovations:** going beyond traditional management by cultivating innovation ecosystems that encourage psychological safety, experimentation and systematic approaches to change management. This creates environments that blend creative thinking with clinical excellence and operational efficiency. By establishing innovation incubators, transformative

leaders provide protected spaces for new ideas to grow without immediate pressure for returns, enabling rapid prototyping, controlled experimentation and structured evaluation of new approaches to care and efficiency.

- **Cultural Engineering:** shaping an organisational culture that prioritises change and innovation. Catalytic leaders systematically dismantle barriers to innovation, creating an environment of psychological safety where staff at all levels feel empowered to challenge established practices and propose new solutions. This cultural architecture supports continuous experimentation while maintaining essential stability in clinical operations.
- **Innovation Diffusion:** establishing knowledge management platforms to capture and share innovative practices, developing networks of change champions who promote the adoption of new approaches and creating feedback mechanisms that allow for the quick refinement of innovations. This systematic approach to innovation diffusion ensures that beneficial changes are effectively scaled throughout the organisation.
- **Maintaining Human-Centred Care:** balancing potential benefits of technology adoption against implementation challenges. Transformative leaders must ensure that technological innovation serves rather than overshadows patient care objectives. This requires a sophisticated understanding of both technological capabilities and healthcare operations.
- **Engaging Stakeholders in Supporting Innovations:** creating collaborative networks spanning clinical staff, administrative personnel, patients and community partners. These networks accelerate the co-creation of solutions, ensuring that innovations address genuine needs and gather broad support for implementation.

> "Nigeria has a high rate of maternal and infant mortality, with approximately 512 maternal deaths per 100,000 live births."

This systematic approach to innovation and change leadership enables healthcare organisations to evolve continuously while maintaining operational excellence and advancing patient care quality.

Frameworks and Models Supporting Continuous Improvement

The advancement of healthcare in Africa centres on developing frameworks and models that address the continent's unique challenges while fostering sustainable improvement. These frameworks must prioritise cultural sensitivity, efficient resources utilisation and adaptability to diverse healthcare environments.

Effective models such as the Plan-Do-Study-Act (PDSA) cycle are tailored to incorporate traditional practices and local decision-making, emphasising the roles of community health workers and tribal leaders. Similarly, Lean methodology, when adapted to preserve cultural practices, has been successfully implemented in Nigerian hospitals, reducing wait times and increasing staff engagement by 30%.

The Triple Aim framework, which focuses on patient experience, population health and cost reduction, also requires adaptation. African healthcare benefits from an expanded focus on community resilience and cultural preservation. By integrating traditional healing practices with formal medical systems, we can demonstrate the interconnectedness of both healthcare approaches, thereby improving access to care, particularly in rural areas. Models of Continuous Quality Improvement (CQI), adjusted to involve community feedback, have significantly improved patient satisfaction in Ethiopia. This highlights the importance of making gradual, context-sensitive changes in healthcare.

Transformational leadership, which blends collective decision-making with modern theories, empowers both healthcare workers and their communities. In Africa, knowledge management frameworks also incorporate oral traditions to ensure that insights are effectively shared. While respecting hierarchical and cultural norms, change management strategies introduce innovations without disrupting social harmony. Performance measurement frameworks emphasise qualitative community feedback, complementing traditional metrics, while resource optimisation encourages the creative use of limited resources.

Innovation adoption frameworks must balance modernisation and maintaining trust in traditional methods. Sustainability frameworks focus on long-term community ownership to ensure continued progress. Monitoring and evaluation approaches that blend traditional and modern assessment methods can effectively track improvements in healthcare. As African healthcare systems evolve, these adapted frameworks will provide a foundation for meaningful and sustainable progress, ensuring modern solutions meet the continent's diverse needs while preserving cultural values essential to African life.

Six Sigma in Healthcare

Six Sigma, particularly the **DMAIC cycle** (Define, Measure, Analyse, Improve, Control), is a data-driven methodology aimed at eliminating defects, reducing variability and enhancing processes to improve quality and efficiency. This is especially important in healthcare, where patient outcomes, resource management and operational effectiveness are at stake. African healthcare systems, which often face resource constraints, diverse cultural practices and infrastructural challenges, can significantly benefit from this structured approach.

1. **Define.** In the Define phase, healthcare organisations identify the specific problem or area for improvement. For example, many African healthcare systems face challenges such as long patient wait times, high maternal mortality rates or inefficient resource allocation. In the context of African healthcare, it is essential to engage local stakeholders, such as community health workers, tribal leaders and patients, to ensure that the definition of the problem aligns with local priorities and cultural norms. This approach mirrors the Plan-Do-Study-Act (PDSA) framework, which emphasises collaborative planning and community engagement in healthcare improvement efforts.

> "Task-shifting initiatives have expanded capacity by up to 50%, improving service delivery and healthcare access."

2. **Measure**. The Measure phase focuses on collecting data to quantify the problem. In healthcare, this may involve tracking metrics such as patient wait times, infection rates or medication errors. Data collection can be challenging in many African settings due to infrastructural limitations. However, mobile health technologies and community health workers are essential in gathering relevant data. This phase highlights the adaptability of Six Sigma, as measurement systems in Africa must integrate both quantitative and qualitative feedback from communities. This approach aligns with the performance measurement frameworks discussed earlier, which combine technical metrics with indicators of community well-being.

Figure 2: Six Sigma and the DMAIC cycle

3. **Analyse**. In the Analyse phase, the root cause of the problem is identified. In healthcare, this often involves examining patient flow, resource allocation or treatment protocols to uncover inefficiencies. This analysis must be contextualised for African healthcare systems, considering cultural practices, resource constraints and the relationship between formal and informal healthcare systems. For instance, traditional healers may play a significant role in patient care in rural areas, so understanding their influence on patient behaviour is essential. As previously mentioned, systems thinking approaches recognise this interconnectedness and the role of informal healthcare providers.

4. **Improve.** The Improve phase is where solutions are implemented. In African healthcare, these solutions must be practical, cost-effective and culturally sensitive. For example, in rural hospitals, simple changes such as better scheduling or community-driven healthcare programs can significantly reduce patient wait times or improve maternal health outcomes. The Lean methodology, which aims to eliminate waste while preserving valuable traditional practices, is highly relevant here. In the African context, "improving" often means optimising limited resources without sacrificing cultural sensitivity, ensuring that healthcare innovations are accepted and sustained within communities.
5. **Control.** The Control phase ensures that the improvements are maintained over time. In healthcare, this involves setting up monitoring systems to track performance and ensure that improvements are sustainable. Control mechanisms often necessitate ongoing community engagement and capacity building to integrate improvements into local systems. The sustainability frameworks discussed earlier emphasise the importance of long-term community ownership and continuous improvement, ensuring that progress is preserved over time.

"Leadership-driven strategies reduced HIV/AIDS-related deaths by 39% and malaria mortality by 60%."

Adapting this structured methodology to local contexts requires a deeper understanding of the cultural, resource and operational dynamics at play. It is essential to explore how cultural beliefs and practices can be integrated into improvement efforts, ensuring that interventions resonate with communities and gain acceptance.

There is also a need for research on optimising resource use in low-resource environments, where waste reduction and efficiency are critical. Strengthening community engagement frameworks will be essential, ensuring that traditional leaders and local health workers actively participate in decision-making processes. Lastly, initiatives should explore strategies for embedding Six Sigma's Control phase within healthcare systems to promote long-term sustainability, ensuring that improvements are maintained through continuous community ownership and monitoring. Addressing these areas will unlock the full potential of structured improvement models, driving meaningful and lasting change across healthcare environments.

CONFLICT OF INTEREST

None

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The Influence of Leadership Styles on Job Satisfaction and Organisational Commitment in Healthcare

Effective leadership in healthcare directly impacts job satisfaction, performance and commitment. A study of private hospitals in the Turkish Republic of Northern Cyprus revealed the strong influence of leadership styles. Transformational leadership, noted for fostering motivation and growth, showed significant benefits, enhancing job satisfaction and loyalty. While transactional leadership also boosted performance through structured incentives, it lacked deeper employee engagement. Integrating both styles and emphasising motivation, communication and recognition can create a balanced, efficient workplace.

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key points

- Transformational leadership boosts job satisfaction and commitment.
- Transactional leadership aids in task efficiency but lacks emotional engagement.
- Data from private hospitals shows leadership impacts performance and satisfaction.
- Blending leadership styles enhances both employee and client outcomes.
- Leadership training and participative management improve organisational success.

Leadership remains fundamental in fostering job satisfaction, enhancing employee performance and nurturing organisational commitment, especially in healthcare. This analysis explores how different leadership styles impact these aspects, based on findings from a comprehensive study conducted in private healthcare organisations in the Turkish Republic of Northern Cyprus (TRNC). The research reveals essential relationships between leadership styles and employee outcomes, shedding light on effective management strategies in the healthcare sector.

Balancing Leadership Styles for Effective Healthcare Management

Healthcare organisations operate in a dynamic environment where the demand for exceptional service delivery, coupled with constant pressure, makes effective leadership indispensable. Leaders in these settings face the challenge of choosing appropriate leadership styles that not only motivate and retain employees but also align with long-term organisational goals. The complexities in healthcare, such as the need for adaptability and strong interpersonal relationships, require leadership that can address these

multifaceted demands. Effective leadership styles can bridge the gap between administrative objectives and employee needs, fostering an environment where staff feel valued and engaged. This balance is crucial as it influences job satisfaction, employee performance and, ultimately, the overall efficiency of the organisation.

Research highlights that transformational leadership is particularly impactful in healthcare settings due to its focus on inspiring and nurturing employee growth. This leadership style places emphasis on personal development, empowering employees to contribute more meaningfully to their roles and fostering a strong sense of belonging within the organisation. Transformational leaders achieve this by encouraging open communication, recognising individual contributions and creating a supportive atmosphere where employees feel motivated to exceed expectations. In contrast, transactional leadership, based on structured incentives, performance monitoring and clear hierarchical protocols, can be effective in achieving specific operational targets. However, it often lacks the deeper emotional connection and sense of shared purpose that transformational leadership cultivates, which are critical for sustaining long-term engagement and organisational commitment.

Quantitative Analysis of Leadership Impact in Healthcare

This study gathered data through a quantitative, cross-sectional approach involving 139 employees from five private hospitals in Nicosia, TRNC. These institutions included prominent names such as Kolan British Hospital and Elite Hospital. A structured questionnaire based on a 5-point Likert scale was employed to collect insights into job satisfaction, organisational commitment, leadership style and employee performance. Reliability testing using Cronbach's Alpha confirmed the internal consistency of the survey, with values surpassing 0.7, indicating robust reliability across all measured constructs.

> "Leadership heavily influences how content employees feel within their roles."

Two primary statistical methods were used: regression analysis and correlation analysis. The correlation analysis explored the degree of association between leadership styles and variables such as job satisfaction, while regression analysis examined causal relationships. This dual approach gave a comprehensive understanding of how leadership influences healthcare employees.

Four Key Findings on Leadership and Performance

1. **Leadership Style and Job Satisfaction.** A significant positive correlation ($r = 0.773$, $p < 0.05$) was found between leadership style and job satisfaction. The regression analysis further confirmed this, showing that a unit increase in leadership style resulted in a 1.314 increase in job satisfaction. This finding underscores that leadership heavily influences how content employees feel within their roles.
2. **Leadership and Organisational Commitment.** The relationship between leadership style and organisational commitment was also positive and statistically significant ($r = 0.469$, $p < 0.05$). The regression model demonstrated that an increase in leadership effectiveness contributed to a 0.569 increase in commitment, suggesting that employees are more likely to be loyal and dedicated when leadership is supportive and inclusive.
3. **Leadership and Employee Performance.** A strong correlation ($r = 0.773$, $p < 0.05$) was observed between leadership style and employee performance, indicating that effective leadership substantially improves productivity and task execution. The regression analysis highlighted that each enhancement in leadership quality led to a 0.627 increase in performance, showcasing leaders' vital role in guiding teams toward achieving organisational goals.
4. **Client Reviews and Employee Performance.** Employee performance significantly impacted client reviews and comments ($r = 0.503$, $p < 0.05$), as confirmed by regression analysis. A unit increase in performance was linked to a 0.660 improvement in positive client feedback, illustrating the direct effect of internal employee dynamics on external client satisfaction.

The Role of Transformational Leadership in Healthcare

Transformational leadership emerged as a particularly influential style in the study. Leaders who adopted this approach emphasised individual consideration, motivational techniques and active engagement with employees. This leadership style fosters a work environment where employees feel valued, heard and motivated to excel.

Key Attributes of Transformational Leadership

- **Individual Consideration:** Leaders provide personalised support, addressing employees' unique needs and aspirations. This fosters an environment of trust and loyalty.
- **Inspirational Motivation:** Leaders articulate a clear and compelling vision that inspires employees to align their personal and professional goals with those of the organisation.
- **Intellectual Stimulation:** Employees are encouraged to think creatively and challenge the status quo, which promotes innovation and continuous improvement.

These attributes contribute significantly to job satisfaction and organisational commitment. Employees who feel supported and inspired by their leaders are more likely to display higher job satisfaction and remain committed to the organisation. The study's findings align with existing literature, reinforcing that transformational leadership is particularly effective in healthcare settings where empathy, adaptability and motivation are crucial for success.

Challenges Faced by Healthcare Leaders

Despite the positive outcomes of effective leadership, healthcare leaders face numerous challenges. One notable issue highlighted by the study was the difficulty in maintaining consistent leadership practices amidst the operational strains brought on by the COVID-19 pandemic. The pandemic limited face-to-face interactions and created an environment of uncertainty and heightened stress, making it harder for leaders to maintain employee morale and job satisfaction.

Other challenges included:

- **Linguistic Barriers:** In TRNC, most healthcare workers are native Turkish speakers. This posed communication challenges, particularly for leaders managing a diverse workforce.

> "Employees who feel supported and inspired by their leaders are more likely to display higher job satisfaction."

- **Resource Limitations:** Limited access to training programmes and leadership development opportunities can restrict leaders from adopting modern, effective leadership practices.
- **High Workload and Pressure:** Healthcare environments are inherently high-pressure, which can detract from a leader's ability to engage in the transformative, empathetic practices that are the most beneficial.

Insights on Transactional Leadership

While transformational leadership had more profound effects on job satisfaction and commitment, transactional leadership, characterised by structured roles and performance-based rewards, also showed value. Transactional leadership is effective for achieving specific short-term goals and maintaining order through clear expectations and defined incentives.

Key Elements of Transactional Leadership

- **Contingent Rewards:** Employees receive tangible rewards based on their performance, creating a straightforward cause-and-effect relationship between effort and reward.
- **Management by Exception:** Leaders intervene only when performance deviates from set standards, which can optimise processes but may lack the motivational aspect of transformational methods.

Although less impactful in fostering deep employee commitment, transactional leadership can still drive efficiency and compliance in routine tasks. The study indicated that while transactional leadership contributed to performance metrics, it did not yield the same level of emotional and professional investment seen with transformational leadership.

The Interplay of Job Satisfaction, Performance and Client Perception

One of the study's more nuanced findings was the relationship between job satisfaction, employee performance and client perception. High job satisfaction and employee commitment were linked not only to better individual performance but also to more favourable client reviews. This underscores that leadership practices extend beyond internal metrics and can influence an organisation's reputation and client satisfaction.

Satisfied employees are more likely to provide high-quality care, leading to better patient experiences and positive feedback. This finding highlights the importance of nurturing employee well-being as a strategic priority in healthcare management. Leaders who invest in creating a supportive work environment contribute to the organisation's internal success, public perception and client trust.

Recommendations for Enhancing Leadership in Healthcare

Based on the findings, healthcare organisations can adopt the following recommendations to enhance leadership effectiveness and, consequently, job satisfaction, performance and organisational commitment:

1. **Adopt a Blended Leadership Approach.** While transformational leadership proved highly beneficial, integrating elements of transactional leadership, such as clear performance expectations and rewards, can create a balanced leadership model that caters to various organisational needs.
2. **Invest in Leadership Training.** Regular training programmes focused on developing transformational leadership skills can empower leaders to better engage and inspire their teams. This training should include strategies for individual consideration, intellectual stimulation and maintaining open communication channels.

> "Transformational leadership is particularly effective in healthcare settings where empathy, adaptability and motivation are crucial for success."

3. **Encourage Employee Participation.** Involving employees in decision-making processes fosters a sense of ownership and belonging. This inclusion helps bridge the gap between leadership and the workforce, enhancing commitment and job satisfaction.
4. **Foster a Culture of Recognition.** Both financial and non-financial recognition are vital. Leaders should establish systems that acknowledge employee achievements and provide incentives aligned with individual and organisational goals.
5. **Prioritise Communication and Support.** Leaders must maintain regular, transparent communication with their teams and offer support, particularly in high-stress periods. This can help sustain morale and ensure that employees feel valued and understood.

While this study provided significant insights, it also highlighted areas for further exploration. Future research could expand the scope beyond the TRNC to include a more diverse range of healthcare settings, such as public hospitals or international institutions. Additionally, examining the long-term effects of leadership training programmes on job satisfaction and organisational outcomes could provide deeper insights into how to sustain positive leadership impacts.

Leadership style is a critical determinant of job satisfaction, employee performance and organisational commitment in healthcare settings. This study's findings reinforce that while transactional leadership plays a role in achieving operational goals, transformational leadership has a more significant positive impact on employee well-being and loyalty. Leaders who emphasise motivational strategies, individual growth and collaborative decision-making foster environments where employees feel empowered and engaged.

Healthcare organisations seeking to improve their outcomes should prioritise leadership development programmes promoting transformational and transactional strategies. By doing so, they can create a workplace culture that supports high performance, job satisfaction and long-term employee retention, ultimately benefiting both employees and clients. Adopting inclusive leadership practices that emphasise empathy, support and strategic incentives

can be a powerful tool for sustaining productivity and improving patient care in healthcare institutions.

Conflict of Interest

None

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The Importance of Multidisciplinary Teams in Digital Healthcare

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Multidisciplinary teams in healthcare, enhanced by technology experts, offer a comprehensive approach to patient care. By incorporating data analysts and AI specialists, teams can utilise real-time health data from wearables and digital platforms, improving diagnostic accuracy and enabling personalised treatments. As digital health data grows, the need for tech-savvy teams will intensify, transforming healthcare through enhanced collaboration, predictive analytics and proactive interventions.

key points

- Multidisciplinary teams address complex health needs through diverse expertise.
- Technology experts enhance data-driven, personalised healthcare.
- Wearables and AI improve real-time health monitoring and decision-making.
- Predictive analytics support preventive care and reduce hospital readmissions.
- Collaborative platforms optimise resources and enhance patient experience.

In today's healthcare landscape, the complexity of health challenges requires a coordinated and diverse approach that only multidisciplinary teams can provide. Health issues are increasingly multifactorial, encompassing everything from chronic diseases to new threats like pandemics and environmental changes. This context demands the involvement of multidisciplinary teams that extend beyond traditional roles like doctors, nurses and pharmacists. It is essential to include technology experts with crucial skills in data analysis, digital health and technology. These teams facilitate effective collaboration among professionals from various fields to address patient needs with a comprehensive approach.

Expanding Multidisciplinary Teams in Digital Healthcare

A multidisciplinary team in healthcare comprises professionals from various fields working together to manage patient care. This collaboration may include doctors, nurses, pharmacists, social workers, physical therapists, nutritionists, psychologists and other health specialists, each contributing their unique expertise. As healthcare becomes more digitised, the composition of these teams has expanded to include technology and data experts. Data analysts, systems engineers and digital health specialists play crucial roles in collecting and processing health information provided by patients, as well as in integrating technologies that enhance care delivery. By combining these specialities, teams can develop more

comprehensive and personalised strategies for each patient, addressing their physical, mental and social health needs.

Advances in remote monitoring technologies, wearables and digital health platforms have broadened the range of data available on patients, allowing for a more continuous and thorough view of their health. However, healthcare teams need professionals skilled in analysing and interpreting large volumes of information for this data to be useful in clinical decision-making.

The Current Healthcare Landscape and the Impact of Technology on Patient Care

In modern healthcare, the digitalisation of services and the increasing amount of data generated have reshaped care methods. Wearable devices now allow continuous monitoring of various factors such as heart rate, physical activity, sleep and other biomarkers. This information provides a valuable source of real-time data that, if properly analysed, can significantly improve the accuracy and speed of diagnosing and treating chronic diseases.

Additionally, integrating big data and predictive analytics enables more personalised approaches to medical care. However, these benefits can only be fully realised by including data analysts and technology experts in healthcare teams. These professionals interpret data in meaningful ways for clinical practitioners. In this sense, technology does more than complement medicine; it transforms the traditional healthcare model.

Integrating Technology Experts in Healthcare

The emergence of wearable devices and the explosion of user-generated health data are transforming healthcare. This shift makes it essential for multidisciplinary teams to incorporate professionals skilled in emerging technologies and data analysis. According to IDC projections, by 2027, 40% of health data will be provided directly by patients through wearables. To effectively make decisions based on this data, technology experts will be indispensable members of healthcare teams.

“According to IDC projections, by 2027, 40% of health data will be provided directly by patients through wearables.”

Advances in remote monitoring technologies, wearables, and digital health platforms have broadened the range of data available to patients, allowing for a more continuous and comprehensive view of their health. AI and AGI technologies enable these data to be analysed in real-time, providing actionable insights that can significantly improve clinical decision-making. For example, AI algorithms can predict potential health deteriorations, allowing for proactive interventions that enhance patient care and reduce hospital readmissions.

The Necessity of Advanced Technology: AI and AGI in Healthcare

As healthcare systems become increasingly digitised, integrating advanced technologies such as Artificial Intelligence (AI) and Artificial General Intelligence (AGI) has become indispensable. AI technologies facilitate the processing and analysis of vast amounts of health data, enabling more accurate diagnoses, personalised treatment plans and predictive analytics that can anticipate patient needs before they arise. AGI, with its potential to understand, learn and apply knowledge across a wide range of tasks, promises to revolutionise healthcare by providing even more sophisticated decision-making support and automation capabilities.

AI-driven tools, such as machine learning algorithms, can identify patterns in patient data that may be imperceptible to human clinicians, leading to earlier disease detection and more effective interventions. Although still in developmental stages, AGI holds the promise of enhancing these capabilities by offering a more adaptable and comprehensive understanding of complex health scenarios. This would support multidisciplinary teams in making more informed and holistic decisions.

Integrating AI and AGI into healthcare teams ensures that technological advancements are leveraged to their full potential, enhancing the capabilities of healthcare professionals and improving patient outcomes. These technologies are not merely supplementary tools; they are becoming central components of modern healthcare delivery, making their inclusion in multidisciplinary teams necessary.

Advantages of Multidisciplinary Teams in Healthcare

- **Improved Communication and Coordination in Data-Guided Care**. One key benefit of multidisciplinary teams with technology experts is enhanced communication and coordination through digital systems and centralised data. For instance, electronic health record (EHR) systems allow all team members to access the most up-to-date patient information, reducing redundant tests and communication errors. Technology experts can also set up data flows that facilitate real-time decision-making, contributing to more timely and efficient care.
- **Holistic and Personalised Approach.** Integrating technology and data analysis in multidisciplinary teams allows for a more precise and personalised approach to patient health. This is particularly critical for managing chronic diseases, where data from wearables and other digital devices enables continuous monitoring tailored to each patient's specific needs. Data specialists can identify patterns and trends that help anticipate potential complications, allowing for early intervention and improved health outcomes.
- **Resource Optimisation and Reduced Healthcare System Burden.** Including technology experts not only facilitates more effective care but also optimises the use of healthcare resources. By implementing predictive analytics, teams can better anticipate and manage patient needs, reducing the risk of hospitalisations and associated costs. Automating processes through information technologies allows clinical staff to focus on more specialised tasks while data experts process large volumes of information more quickly and accurately.

> "AI algorithms can predict potential health deteriorations, allowing for proactive interventions that enhance patient care and reduce hospital readmissions."

- **Enhanced Patient Experience.** Patients' ability to receive personalised care based on their own data—enriched with insights from similar cases through large-scale data analysis—boosts their sense of control over their health. A multidisciplinary team that includes technology professionals can design applications and digital health platforms that provide easy access to information on their health status, along with personalised reminders and advice. This creates a more centralised and coherent care experience, increasing patient satisfaction and trust.

Similarly, robotics combined with 5G technology can connect professionals remotely, overcoming geographical barriers by enabling surgeries or prescribing treatments without the need to be physically present at the patient's location.

Examples of Technology-Focused Multidisciplinary Teams in Different Health Areas

- **Chronic Disease Management.** Chronic conditions, such as diabetes and hypertension, greatly benefit from wearables and real-time data analysis tools. A multidisciplinary team that includes technology specialists can develop continuous monitoring systems that alert healthcare professionals when anomalies are detected in patient data. This rapid and individualised response improves patients' quality of life and reduces complications.
- **Mental Health Care.** In the field of mental health, technology integration can include wellness apps and telemedicine platforms. Professionals within the multidisciplinary team develop tools for symptom tracking, allowing continuous mental health monitoring. This enables therapists and psychiatrists to receive real-time alerts and make immediate adjustments to treatments, enhancing both effectiveness and personalisation in care. However, achieving the expected outcomes requires a multidisciplinary team of doctors, therapists and technologists.
- **Palliative and End-of-Life Care**. Palliative care is another area where multidisciplinary teams with technological support have a positive impact. Through wearable and remote monitoring devices, teams can provide more comfortable

and personalised care, allowing patients to stay home while maintaining constant symptom monitoring. Data experts analyse the generated information and share it with doctors, ensuring that any change in the patient's condition is quickly detected.

Challenges and Considerations in Implementing Technology-Focused Multidisciplinary Teams

Integrating technology into multidisciplinary teams presents several challenges. One major issue is the need to create adequate interoperability infrastructures and communication systems that facilitate teamwork across different professional roles. Implementing effective shared platforms and EHR systems is essential, though it requires significant investment and organisational change.

Continuous training is also crucial. Both healthcare and technology professionals must understand each other's roles within the team and foster a collaborative culture so that data is correctly interpreted and used in clinical decision-making.

The Future of Multidisciplinary Teams with Integrated Technology in Healthcare

In the future, as the amount of data directly from patients via wearables increases, multidisciplinary teams in healthcare will become even more focused on technology. Big data analytics and artificial intelligence are expected to enable not only continuous monitoring but also advanced predictive capabilities. This shift will lead to more preventive and personalised healthcare and enable multidisciplinary teams to rely on increasingly accurate data to collaborate effectively across various disciplines.

> "These teams facilitate effective collaboration among professionals from various fields to address patient needs with a comprehensive approach."

In conclusion, multidisciplinary teams in healthcare, enhanced by the integration of technology experts, will not only improve patient care but also transform the health system to meet future needs better. In a context where real-time information and predictive analytics are becoming essential, collaboration between clinical professionals and technology experts will be crucial for addressing the challenges of 21st-century healthcare.

Conflict of Interest

None

EHMA 2025

Taking action to improve health for all

4 - 6 June 2025 - Rennes, France

Digital Transformation

Digital Transformation in Brazil: Navigating the Future

Brazil's digital transformation is rapidly advancing across key sectors such as healthcare and finance, driven by increased connectivity and innovative technologies like AI and cloud computing. While challenges such as infrastructure gaps, healthcare integration and economic inequality persist, the country has significant opportunities for growth through start-up investments, sustainable development and government initiatives. Brazil can position itself as a global digital leader by fostering inclusivity and innovation.

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key points

- Brazil's digital transformation is driven by mobile internet, AI and cloud computing.
- Healthcare adoption of telemedicine is reshaping access, but integration challenges persist.
- Infrastructure gaps and digital divide remain major obstacles, especially in rural areas.
- Economic inequality hampers access to digital tools for low-income populations.
- Start-up innovation and government investment are key to Brazil's digital future.

Digital transformation is reshaping industries worldwide, and Brazil, as one of Latin America's largest economies, is no exception. Over the past decade, the country has witnessed a remarkable shift driven by technological advancements, innovation and the flourishing digital economy. While Brazil's political environment presents its own challenges, the digital landscape is evolving nonetheless, offering opportunities for growth, modernisation and increased global competitiveness.

Landscape of Digital Transformation

In recent years, Brazil has made substantial progress in adopting digital technologies across various sectors. The rise of mobile internet, cloud computing, big data analytics and artificial intelligence (AI) has revolutionised how businesses operate and engage with their customers. According to a report by the Brazilian Institute of Geography and Statistics (IBGE), nearly 80% of households in urban areas now have access to the internet, a figure that continues to grow

as infrastructure expands. This growing connectivity is the backbone of Brazil's digital transformation, enabling businesses to innovate and compete in a global marketplace.

Healthcare is one of the key industries driving transformation in Brazil. Telemedicine and digital health platforms have gained significant traction, particularly in remote areas with limited access to healthcare services. The COVID-19 pandemic catalysed the rapid adoption of these technologies, resulting in enhanced accessibility to medical services for millions of Brazilians. However, challenges remain, particularly in terms of integrating health information systems across both public and private sectors. Many hospitals in Brazil have yet to fully digitise their operations, with over 2,000 facilities still using outdated systems. However, the potential for further technological integration in healthcare is vast.

Challenges to Overcome

Despite progress, Brazil faces several significant challenges on its path toward complete digital transformation.

Infrastructure: While internet access in urban areas is growing, rural and remote regions still face significant connectivity gaps. Bridging this digital divide is essential for ensuring all Brazilians benefit from technological advancements.

Healthcare System Integration: Many Brazilian hospitals have not fully embraced digital transformation. Moreover, the hybrid nature of Brazil's healthcare system, which involves both public and private sectors, adds another layer of complexity to integrating health information systems and ensuring data interoperability across different institutions.

> "The rise of mobile internet, cloud computing, big data analytics, and artificial intelligence (AI) has revolutionised how businesses operate and engage with their customers."

Cultural Barriers: A cultural shift is necessary to facilitate the widespread adoption of digital technologies in certain sectors. For instance, many first-generation physicians in Brazil are accustomed to traditional, paper-based record-keeping methods, which can hinder the transition to electronic health records and telemedicine platforms. Bridging this gap by focusing on training and education will be crucial to accelerating healthcare digitalisation.

Model: Brazil's healthcare system presents a unique challenge compared to other countries like Canada, the United Kingdom, or the United States. Unlike these nations, which have more clearly defined healthcare systems—Canada and the UK with predominantly public healthcare systems, and the US with a largely privatised approach—Brazil operates under a hybrid model.

In this model, the public and private sectors coexist, often following different regulations, funding mechanisms and service delivery frameworks. This creates complexities in terms of integration and consistency of care. Therefore, any digital transformation in healthcare must navigate these divergent models, ensuring that both public and private sectors can benefit from technological advancements while working towards greater integration and collaboration.

Economic Inequality: Brazil's socioeconomic disparities also present a challenge in driving digital transformation. While wealthier urban populations have ready access to digital tools, the lower-income population, particularly those reliant on public services, may find it difficult to access and afford advanced technologies. Thus, any digital transformation initiative must be inclusive and consider the needs of economically disadvantaged populations.

Opportunities Ahead

Regardless of the challenges, Brazil's potential for digital transformation is immense, with ample opportunities for growth and innovation.

Investment in Start-ups: Brazil's vibrant start-up ecosystem is a key driver of innovation. Both domestic and international venture capital investments have fuelled the growth of tech start-ups developing

cutting-edge solutions in various sectors, including finance, healthcare and education. Supporting this ecosystem through favourable policies, infrastructure investment and entrepreneurship initiatives is crucial to ensuring continued innovation.

Sustainable Development: Digital technologies can play a pivotal role in promoting sustainability in Brazil. Integrating green technologies, energy-efficient practices and smart city initiatives aligns with global efforts to combat climate change. For example, renewable energy solutions powered by AI and data analytics can help Brazil transition to a more sustainable energy model.

Government Initiatives: The Brazilian government actively promotes digital transformation through various initiatives to enhance connectivity, support innovation and foster entrepreneurship. Continued investment in infrastructure, such as the expansion of 5G networks, and policy reforms encouraging technological adoption will be critical in ensuring long-term success.

Conclusion

Brazil's digital transformation is a dynamic, evolving process marked by significant achievements and ongoing challenges. The country has made notable strides in integrating digital technologies. However, there is still much work to be done to ensure that these advancements benefit all segments of society.

> "Telemedicine and digital health platforms have gained significant traction, particularly in remote areas with limited access to healthcare services."

By fostering an inclusive digital economy, investing in innovation and addressing infrastructural and cultural barriers, Brazil can position itself as a leader in the digital age. With the right policies and investments, the nation will drive economic growth and innovation for years to come.

Conflict of Interest

None

Building the European Digital Health Ecosystem for Format and EHDS: A Call to Action

The XpanDH project aims to activate and mature the European Electronic Health Records Exchange Format (EEHRxF) ecosystem by fostering digital health innovations and facilitating cross-border interoperability across the EU. Using a Network of Networks approach, XpanDH has expanded stakeholder collaboration in digital health by establishing the Community of Doers (CoD) and the X-Nets. The project employs co-creation methodologies to ensure participatory engagement and created the concept and early versions of tools like the X-Bundles and X-Bubbles to support the maturation and adoption of the EEHRxF. These efforts contribute to building a sustainable, scalable ecosystem that will continue through future initiatives such as the xShare project and the Xt-EHR joint action.

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key points

- Anyone (individual or organisation) interested in digital health and data sharing across and within European member states can engage and participate, contributing to the creation of better sharing of health data across Europe for the benefit of all.
- XpanDH employed a participatory design methodology in its Network of Networks approach, engaging each healthcare stakeholder type, respecting their specificities in the co-creation of digital health tools and services tailored to the actual needs of patients, industry, hospitals, regulators, etc.
- XpanDH developed these interoperability assets to guide and stimulate the adoption of EEHRxF. X-Bundles aggregate key artefacts supporting health data exchange, while X-Bubbles model real-world implementation scenarios.
- The project's outputs, including the X-Nets and CoD, will be integrated into the xShare project and the Xt-EHR joint action, ensuring the long-term sustainability and scaling of the EEHRxF ecosystem across Europe.

Introduction

XpanDH is an ambitious project preparing and building capacity in individuals and organisations to be ready to use the European Electronic Health Records Exchange Format (EEHRxF) by establishing a pan-European effort through a Network of Networks approach (Martins et al. 2023). A short video introduction to the EEHRxF can be seen here. The project goal is to help establish, accelerate, and support a mature, sustainable and scalable interoperability environment in Europe for digital health innovations based on the EEHRxF, involving both the supply and demand sides of healthcare provision. It aims to motivate, inspire and support multiple digital health actors involved in Europe to advance the adoption and use of the EEHRxF. This involves working with field examples (through experimentation and the so-called X-Bubbles), aggregating interoperability assets around the EEHRxF (the so-called X-Bundles) and consolidating guidance and recommendations for ongoing and future work on the EEHRxF, also nicknamed "the Format". Whether you are a healthcare provider, policymaker or technology expert, you can play a

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crucial role in shaping the future of European digital health. Engage and be part of the community driving the EEHRxF forward.

An ecosystem approach to digital health innovation and the creation of conditions for new cross- and intra-border interoperable environments around a proposed set of standards (the EEHRxF) is different from the EU cross-border initiatives so far which has been mostly government-led. Understanding digital health as an ecosystem means accepting and/or fostering some emerging systemic properties:

- Open innovation
- Multiple leaderships
- Concepts are often as important as action plans
- Governments and official entities can act as coordinators
- Industry and active end-users are involved
- Co-creation spaces are created and need to be populated

XpanDH's ecosystem methodology was inspired partly by the PatientUp initiative, its collaborative approach, and the concept of health data activism. The XpanDH project's vision entails a participatory involvement from all relevant end-users, such as patients, formal and informal caregivers, and healthcare and IT professionals, in the implementation, adoption, and dissemination of the EEHRxFIn this vision, these groups are not merely passive recipients, or users of digital services aimed at improving health or healthcare. They are also not simply stakeholders to be consulted in a one-directional manner but are integral participants in the process, from ideation phases and early discussion to revisions of specifications.

XpanDH's proposal is that key stakeholders should have full access to health data and be called to co-create the AEIOU (Accessible, Engaging, Interoperable, Operational and Useful) digital health tools of the future. This participatory design approach has two main implications: 1) all key stakeholders are actively involved in the co-creation of the EEHRxF ecosystem in all project phases, and 2) the consortium ensures the necessary flexibility and openness to manage potential changes and needs that arise from the co-creation, to ensure real acceptance (Bowen et al. 2013; Boyd et al. 2012; Thabrew et al. 2018).

Co-creation as a Vector of Ecosystem Activation

Co-creation was first introduced as a term for marketing purposes in the collaborative design of new products and services. Several authors and researchers have contributed to proposing methodological approaches and models (De Koning et al. 2016).

It is a collaborative process where multiple stakeholders engage in the design and delivery of products or services, enhancing value within ecosystems (Eckhardt et al. 2021). It is not limited to science; it spans various sectors, promoting collaborative efforts that strengthen community engagement and innovation. In platform ecosystems, co-creation leads to increased sales and business performance for small vendors, highlighting the economic benefits of collaborative partnerships (Ceccagnoli et al. 2012). This approach fosters

innovation and responsiveness to user needs, particularly in complex environments like healthcare (Indurti et al. 2023). Co-creation offers several advantages for ecosystem activation, including increased EU competitiveness in healthcare delivery and digital tool deployment as compared with competing regions.

Co-creation relies on active stakeholder engagement, which encompasses behavioural, cognitive, and emotional dimensions. This engagement leads to cooperation and collaboration, ultimately resulting in co-creation, which is essential for activating ecosystems (Viglia et al. 2023). In healthcare, involving diverse stakeholders—patients, providers, and policymakers—ensures that services are tailored to actual needs, enhancing overall effectiveness (Adlakha et al. 2020). While co-creation offers significant advantages, it can also present challenges, such as managing diverse stakeholder interests and ensuring effective communication. Balancing these dynamics is crucial for successful ecosystem activation. Using co-creation, the XpanDH method applied a democratic participatory strategy to growing the EEHRxF and the pan-European digital health ecosystem.

XpanDH has made the creation, maintenance, and stimulation of a pan-European digital health ecosystem centred around the EEHRxF one of its core objectives. By fostering co-creation and collaboration through both the X-Nets and the Community of Doers (CoD), XpanDH has employed a participatory, multi-stakeholder approach to address the diverse needs of healthcare systems across Europe. This strategy ensures that all relevant actors, from policymakers and healthcare professionals to patients and developers, can contribute to the adoption and refinement of the EEHRxF. The engagement of these stakeholders is essential to achieving a scalable and sustainable ecosystem capable of evolving with the ongoing challenges and opportunities in digital health. The next sections will focus on the practical implementations of this approach, beginning with the X-Nets and followed by the CoD.

The X-Nets

Definition of X-Nets

XpanDH operates as both a Network of Capacity, helping organisations assess their readiness regarding the necessary interoperability assets for EEHRxF implementation, and a Network of Action, enabling large-scale and pan-European collaboration through the deployment of X-Nets. These networks represent a collection of organisations from EU Member States, united by common interests and objectives, actively participating in the broader pan-European digital health landscape.

Concept of X-Nets

The concept of X-Nets is grounded in the need to promote the adoption of the EEHRxF across multiple sectors of the healthcare ecosystem. Each X-Net connects stakeholders who share common features and likely have a relatively homogenous set of interests in digital health and interoperability, creating a space for collaboration and idea-sharing. X-Nets are designed to foster innovation and accelerate the practical implementation of the EEHRxF by enabling cross-border and cross-sector collaboration and are inspired by the Hospitals-on-FHIR (HoF) initiative launched in 2022 (Martins et al. 2022).

The operational mechanism of each X-Net is flexible and not set in stone, but some attributes are key. First, it is led by an "activator" responsible for initiating and maintaining the network. These activators (ten partners from the XpanDH consortium) manage the network's assembly and coordinate activities, such as online and in-person workshops, webinars, and focus group discussions. X-Nets engage stakeholders through various communication channels, including newsletters and social media platforms, to ensure continuous interaction and idea exchange. As X-Nets mature, they become increasingly self-sustaining, as exemplified by HoF X-Net chair and co-chair assignment to two hospitals in Italy and Portugal, allowing stakeholders to take ownership of their development and long-term goals. The collaborative nature of X-Nets supports the ongoing creation, refinement, and dissemination of digital health solutions across Europe.

The XpanDH project adopted a systematic X-Net strategy, acknowledging the diverse expertise, experiences, and expectations of stakeholders involved in digital health and health data exchanges. To ensure effective engagement, the X-Net outreach strategy was customised for each stakeholder group based on the following characteristics:

Type of Institutions Involved: Identify typical institutions that form the core of each X-Net group, including both physical and legal entities. These institutions range from hospitals, research organisations and patient associations to IT firms, government bodies, and regional health authorities and regulators, ensuring broad representation across the health data landscape.

Influence and Impact: Recognise the varying levels of influence and impact that different stakeholder groups can exert on the digital health ecosystem. Some groups, such as regulators or hospital networks, play critical roles in decision-making processes, while others may be more focused on operational or advocacy functions, or be in a traditional position of receivers. Understanding each group's influence allows for targeted engagement strategies.

Barriers to Engagement: A key element of the X-Net strategy is identifying and addressing potential barriers to engagement. These can include a lack of awareness, perceived complexity of the EEHRxF, or limited resources to adopt new technologies and/or create a framework for the upskilling of the future workforce on digital skills. By understanding these barriers, XpanDH can develop targeted solutions to mitigate them, such as offering training, simplifying processes, or demonstrating quick and mutually beneficial wins to encourage active participation.

Stratification: To further refine outreach efforts, some X-Nets, such as the Patient Associations, are broken down into specific sub-groups based on factors such as geographical region, operational focus, and organisational type when applicable. This stratification enables the project to address the unique needs and characteristics of different sub-groups within a larger stakeholder network, ensuring more precise and effective communication.

Concrete Benefits from XpanDH/EEHRxF: Provide each stakeholder group with a clear outline of the tangible benefits and added value that participation in XpanDH and the adoption of the EEHRxF offer. Whether through enhanced interoperability, improved patient care, or streamlined research opportunities, stakeholders are able to share how the X-Net and the EEHRxF can meet their specific needs.

Engagement with own Community: X-Nets are encouraged to interact within their own community networks by leveraging established communication channels and producing relevant content tailored to their audience. Whether through webinars, newsletters, or collaborative forums, the X-Nets aim to engage stakeholders in ways that resonate with their organisational culture and sector-specific challenges.

Specific Engagement Methods for X-Net: Each X-Net agitator uses tailored engagement methods based on the characteristics of the group and the intended outcomes. For example, patient associations might require advocacy-driven, participatory approaches, while regulatory bodies may focus on compliance and governance-oriented engagements. The rationale for these methods is grounded in the stakeholders' role within the ecosystem and their potential to drive the adoption of EEHRxF.

Relations with Other X-Nets: The X-Nets are not isolated entities. Their relations with other X-Nets are carefully considered, as collaboration across networks can amplify their collective impact. For instance, the HoF network may work closely with the Professionals Associations and Biomedical Research groups to align clinical data sharing with research objectives. In this line of thought, various multi-stakeholder focus group workshops have been organised online that brought together multiple representatives of each X-Net, making different stakeholder groups join forces. These "Network of X-Nets" efforts will culminate in an in-person gathering in November 2024 in Brussels.

(Potential) Members: Each X-Net has a defined set of current and envisioned members, with participation spanning a broad range of organisations across Europe. Regular updates are made to this membership list to reflect new partnerships, emerging stakeholders, and ongoing initiatives that align with the objectives of XpanDH, in order to continuously enable X-Nets to grow in numbers.

The X-Nets collaborate through online and in-person workshops. They stimulate the ecosystem via newsletters and LinkedIn. X-Nets are resource networks that may be engaged in a variety of ways, such as inviting stakeholders to events or setting up consultations. Examples are workshops held at prestigious conferences like the Madeira Digital Transformation Week or the EHMA annual conference, where many stakeholders convene to deliberate on the most recent advancements in the field of digital health and beyond. To ensure cross-collaboration and representation, X-Nets also convene multi-stakeholder focus group sessions. The forthcoming Brussels event (more info on the XpanDH project website), which will take place on 14 November 2024, immediately after the Second EEHRxF Expert Summit, is a good example of this kind of cooperation. It will bring together representatives from all X-Nets for an in-person strategic summit aimed at promoting deeper integration and strategic planning among the networks' activities.

Overview of X-Nets and Focus Areas

XpanDH has established ten X-Nets, each focused on a specific area within the healthcare ecosystem. Table 1 lists the ten X-Nets, their description, and the number of their gatherings to date. These networks

bring together a diverse range of stakeholders, and their development varies depending on their focus and the needs of their members.

Each X-Net has progressed at a different rate, but all networks have engaged in one or more gatherings, enabling cross-collaboration and fostering the growth of the EEHRxF ecosystem. The Citizens and Society X-Net sparked debates on individual and civil rights and EHDS (European Health Data Space) regulation, while the ERNs X-Net gathered nearly all existing European Reference Networks, generating interest in EEHRxF for rare diseases. Health Managers and Health Authorities X-Nets played key roles in disseminating updates, refining strategies, and aligning policies on digital health. HoF focused on FHIR standard implementation in around 70 hospitals across several countries, and Innovation Hubs promoted awareness of EEHRxF's potential for innovation. HoF has approved a maturity model to be followed by hospitals and other healthcare providers willing to be ready to use these technical standards, which lay at the core of the Format (Martins et al. 2022).The Patient Associations X-Net tailored its approach to a Member State to overcome language barriers (events in French, German and Portuguese), and the Industry X-Net contributed to the co-development of the XpanDH Readiness Model, ensuring industry alignment with EEHRxF adoption. Collectively, these networks drive ecosystem activation and collaboration for the future of digital health.

X-Net	Description	Gatherings
Biomedical research	Network of researchers and initiatives in life sciences and biomedical research collaboration.	1
Citizens and society	Network of citizen associations, consumer groups, and civil society representatives, including media.	2
European Reference Networks (ERNs)	Network encompassing all European Reference Networks (ERNs) and their related constituencies.	1
Health Managers	Network of health management professionals and associations.	3
Heath National and Regional authorities	Network of authorities responsible for healthcare provision, oversight, and planning.	4
Hospitals-on-FHIR	Network linked to HL7 Europe's Hospitals-on-FHIR initiative focused on FHIR standard implementation and overall technical interoperability readiness.	3
Innovation hubs	Network of partners from the innovation cycle, including venture capital funds and incubators.	1
Patient Associations	Network of patient organisations and associations.	3
Professionals Associations	Network of chambers, unions, and associations representing healthcare professionals at national and European levels.	1
Industry	Network of digital health companies and industry associations.	6

Table 1: List of XpanDH X-nets and its short description

Membership and Participation in X-Nets

Joining an X-Net is an inclusive and open process. Stakeholders from various sectors, including healthcare providers, patient associations, industry representatives, and policymakers, are invited to participate in XpanDH's X-Nets. Participation can be initiated through direct engagement with network activators by attending workshops, webinars, and events hosted by XpanDH or simply by reaching out to the authors of this paper and to the project coordinator.

X-Nets also maintain communication through newsletters, social media platforms, and other collaborative forums, where potential members can

learn about opportunities for engagement. Each X-Net encourages stakeholders to invite others from their professional networks, helping to expand participation and influence. Major events, such as the Second EEHRxF Expert Summit in Brussels in November 2024, provide further opportunities for stakeholders to join and collaborate with existing X-Nets. Don't wait—become a member of this growing network. If you are working in healthcare, technology, or related fields, you can join an X-Net today and help create solutions that will shape the future of interoperable health data exchange in Europe. Visit our website or contact the authors to learn how you can participate in this critical effort.

The Community of Doers (CoD)

As the other aspect of its collaborative approach, XpanDH operates through the Community of Doers (CoD), which comprises the Co-Creation Community of Patients, Professionals, and Programmers (or other Internet Service Providers and developers). This community seeks to bridge the long-standing divide between these three categories of digital health players, which has posed serious challenges to the development of useful tools and services for patients and providers alike. The CoD fosters a participatory, bottom-up approach to the co-creation of digital health tools and services, ensuring that the needs and values of end users are central to the development process.

Concept of the CoD

An inclusive pan-European environment requires mutual understanding, a shared repertory, and a common language. The "3C- 3P" community was founded on, but it extends beyond, the previous OpenNCP (Fonseca et al., 2015) community concept that was developed in epSOS (Europe Launches Its Health Data Exchange Pilot EPSOS 2008). The CoD is rooted in a participatory design approach where end users' input is crucial from start to finish. Since end users are the ones who ultimately use the developed service and/or benefit from it as patients, this is a method of directly gathering ideas and feedback from business owners and users. This aims to increase the likelihood that the service or deployed solution will be adopted. The effectiveness of a digital solution in a healthcare setting depends on how well patients and professionals use it. The intent is to create value from the earliest stages of design. Establishing this community followed an open-source community and collaborative approach (Boyd et al. 2012; Thabrew et al. 2018), inviting end-users to participate and support developers, and was framed by the patient participation from a Personal Health Data Space perspective (Moen et al. 2022).

How does CoD work?

In the context of XpanDH, the CoD focuses on bottom-up research and the definition of new or revisited use cases with the active participation of end users, looking at new concepts and innovative use of the EEHRxF. The approach is to define real-life needs where the adoption of the EEHRxF would provide added value to all stakeholders, with the notion of jointly developing an end-to-end service that adheres to the principles of the recently adopted European Health Data Space law "by design."

Co-creation brings together those who need service, solution or process with those who can realise it. In our case, we start by bringing together patients' associations, healthcare providers, and implementers (vendors, academia) to investigate future uses of the EEHRxF in business use cases that reflect real needs. The result is that co-created solutions have a better chance of being adopted and operated by the end users. During the process, we also Iterated with other XpanDH stakeholders to provide feedback on the X-Bundles, expand X-Bubbles, test EEHRxF specifications, build proof of concepts, and review the proposed readiness model. During the CoD working group meetings, we managed to define risks, issues, and problems, as well as opportunities and needs, and foresee the future, trying to mature new ideas and investigate new domains.

The methodological approach used is a 7-step process into the issues and challenges of progressing a new use case, as depicted in Figure 1.

The CoD is organised into Working Groups that seek to form teams of eHealth actors, each with a single main objective: investigating and delivering concrete recommendations for formalising an evolution of the current services in the context of EHDS into new adoption domains or new approaches to the specification of existing data categories. Specifically, there are three working groups, working respectively on the evolution of services for the following use cases:

a. Multidisciplinary tumour boards for cancer patients
b. Electronic prescription, electronic dispensation, and electronic product information
c. Medical imaging for patients; enabling patient-mediated access and view of medical imaging reports

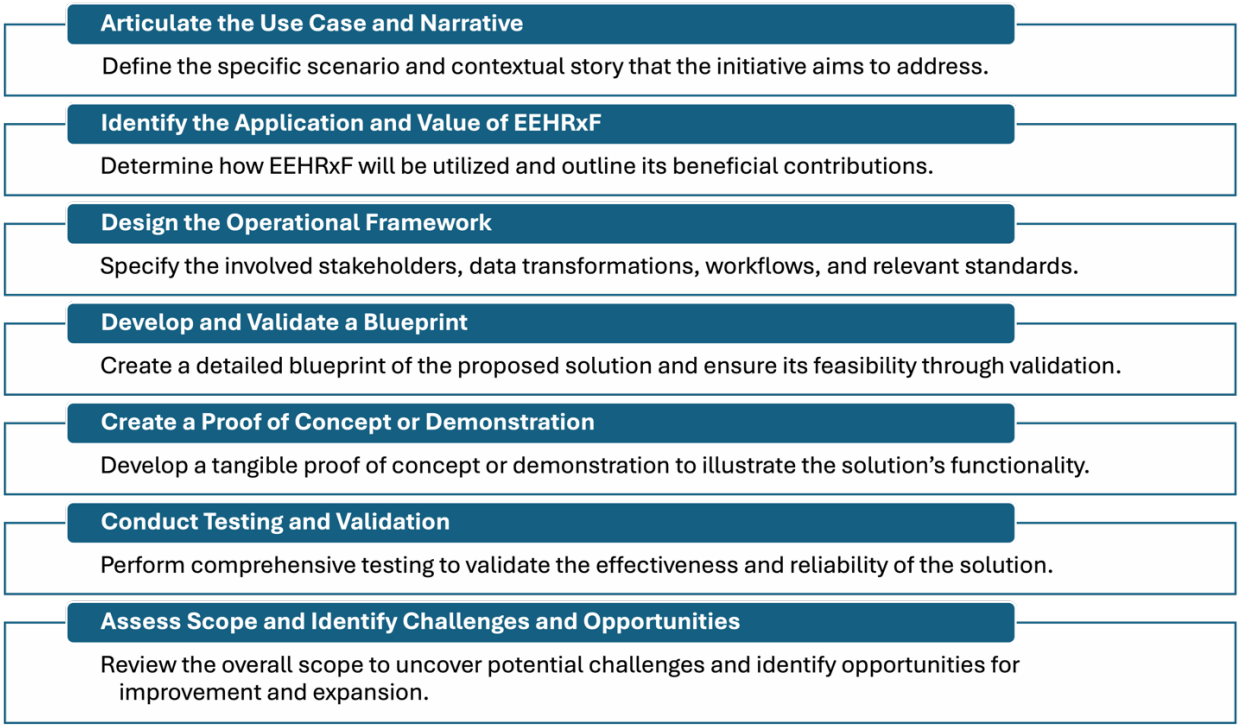

Figure 1: Community of Doers methodology (adapted from Alexander Berler)

Overview of the CoD Working Groups and Their Focus Areas

Table 2 briefly provides some information about these three working groups. During the process of operating those working groups under XpanDH, the co-creation processes demonstrated that collaboration and bottom-up design are enablers for the design of easily adoptable new innovative services and solutions.

Membership and Participation in the CoD

Participation in the CoD is open to any stakeholder interested in contributing to the co-creation of digital health services that align with the EEHRxF and EHDS frameworks. The CoD encourages continuous collaboration, inviting new members to contribute their expertise and insights, ensuring that the co-creation process remains dynamic and responsive to evolving healthcare needs. The CoD welcomes participation from patient associations, healthcare providers, and IT professionals across Europe. By joining the CoD, you can directly influence the design of digital health tools that meet real-world needs. Your voice matters—whether you're a patient, healthcare professional, or developer.

Looking Ahead

The work initiated by XpanDH to stimulate the EEHRxF ecosystem is only the beginning. While the project has laid the groundwork with careful planning, strategic development, and stakeholder engagement, the ecosystem will not stop evolving when the project concludes at the end of 2024. XpanDH's contributions were always envisioned as the first phase of a much larger and longer-term effort to build a sustainable, scalable digital health ecosystem across Europe.

Upon project completion, the established networks—X-Nets and the Community of Doers (CoD)—will be handed over to new initiatives to ensure continuity and growth. The X-Nets will be transferred to and maintained within the xShare project (Expanding the European EHRxF to share and effectively use health data within the EHDS), while the outputs of the CoD will be integrated into the Xt-EHR joint action (Extended EHR@EU Data Space for Primary Use). More specifically, Xt-EHR will prepare implementation guides, technical specifications, and a conformity assessment framework for the adoption of the EEHRxF at a European Level, effectively informing policy, regulatory, and practical facets of the format's advances. These projects will not only continue the work initiated by XpanDH but also expand it, developing further tools, guidelines, and technical specifications to facilitate the widespread adoption of the EEHRxF.

However, the potential for these networks goes far beyond these transitions. XpanDH has demonstrated that these functional networks are robust and capable of growing autonomously, driven by the ongoing engagement of their members. As the network effect takes hold, the X-Nets and CoD have the capacity to double, triple, or even multiply exponentially,

Acronym	Title	Short Description
3C-3P-MDT	Multidisciplinary Tumour Boards for Cancer Patients	The working group was initiated as a real-life need in Greece as a support working group in the process of adopting the EEHRxF in the workflow of the tumour board operations. The working group is sponsored by ELLOK, the Greek cancer patient association, the industry and IT services providers in oncology (Gnomon, Care Across), the Academia (Aristotle University of Thessaloniki, University of Thessaly), Providers associations and hospitals (EOPE, Agios Savvas Hospital) and the Greek Government (Ministry of Health, IDIKA, KETEKNY). The working group has already held several online and f2f meetings to discuss workflows, legal requirements, patient consent, inputs and outputs, etc., with the active participation of more than 47 stakeholders for the 3Ps.
3C-3P- EPD	eP/eD and Product Information	The working group was initiated during the digital transformation conference in Madeira, Portugal, with a participation of more than 30 delegates representing all stakeholders. The working group investigates innovative ways of patient-mediated ePrescription, eDispensation and Personal information sharing based on the EEHRxF, taking inspiration from the innovative cross-border services in Europe (MyHealth@EU) and large-scale projects such as Unicom and Gravitate-Health.
3C-3P – MIM	Multi-Country WG on Imaging - CoD (Hosted by IHE-Europe)	This working group was identified as a need during the IHE Europe Connectathon event in Rennes in 2023. Medical imaging is currently being redesigned at the global scale by incorporating new standards and technologies, providing new ways of managing images for primary and secondary use, and with the active participation of the patients. This group is inspired by the work performed in France (Segur), the recommendation provided by IHE Europe under the multi-country working group, and the new developments adopted by the eHealth Network, X-eHealth and XpanDH.
3C-3P-TER	Telehealth—Teleconsultation Encounter Report	This newly established working group focuses on teleconsultation encounter reports supported by the EEHRxF to facilitate cross-border and national telehealth services in the EU. Having met in 4 online workshops to date, this group aims to further identify and address technical, regulatory, socio-cultural and clinical aspects required for teleconsultation reports to be interoperable across and within borders. Developments will build on lessons learnt from success stories of participating countries with related telehealth use cases.

Table 2: XpanDH Community of Doers Working Groups

reaching new stakeholders and further embedding the EEHRxF into the fabric of European healthcare. The groundwork has been laid, but much more can be done in the future.

Through the efforts described in this article, XpanDH has provided a solid foundation. Yet, the true potential of the EEHRxF ecosystem will be realised when these networks take on a life of their own, expanding across Europe and beyond. With the continued collaboration of all stakeholders, the network effect will transform these initial efforts into a self-sustaining, dynamic ecosystem that grows organically, enabling faster and more comprehensive interoperability across borders and sectors.

Conclusion

The XpanDH project has taken significant strides in activating and maturing the European Electronic Health Record Exchange Format (EEHRxF) ecosystem, laying the foundation for a more interoperable and collaborative digital health landscape across Europe. Through the establishment

of the X-Nets and the Community of Doers (CoD), the project has demonstrated the power of co-creation and stakeholder engagement in shaping solutions that address the diverse needs of healthcare providers, patients, policymakers, and industry players.

However, the true potential of this ecosystem lies not just in the progress achieved during the lifetime of XpanDH but in its capacity to grow and evolve beyond the project's conclusion. With the handover of these initiatives to xShare and Xt-EHR, the groundwork laid by XpanDH will continue to flourish, potentially multiplying through network effects and extending its impact across sectors and borders. The success of the EEHRxF ecosystem depends on the continued engagement and expansion of the communities formed during XpanDH's tenure.

From a scientific perspective, the approaches documented in this article contribute valuable insights into the potential of co-creation, digital health ecosystems, and cross-border interoperability. Future research can build on the experiences and methodologies outlined here, further exploring how such ecosystems can be activated, sustained, and scaled across different healthcare settings. The lessons learned from XpanDH offer rich material for academic discourse, contributing to both practical and theoretical advancements in digital health.

Yet, above all, this paper serves as a call for engagement. Don't be a spectator in this transformation—be a participant. Join us in building and expanding the EEHRxF ecosystem and make a lasting impact on European healthcare. Contact us now and take your place in the co-creation of Europe's digital health future. We invite all stakeholders—whether from healthcare, government, industry, academia, or civil society—to join us in building and expanding the common European asset the EEHRxF is. Together, we can ensure that this ecosystem not only survives but thrives, delivering better health outcomes, fostering innovation, and accelerating the digital transformation of healthcare in Europe.

Conflict of Interest

None.

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Improving Patient Safety With Hospital Management Software

Approximately 1 in 10 patients is harmed in healthcare, with organisational and technological issues being key contributors. Improving staff coordination, safety guidelines, and automating management systems can help reduce unsafe care.

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key points

- No healthcare setting is immune to safety incidents.
- There are four distinct root causes: organisational issues, technological issues, issues related to medical professionals and external issues.
- Hospital management software (HMS) streamlines clinical and administrative workflows.
- It is a multi-module system with functionality that varies depending on the healthcare organisation's needs.
- It contains data aggregation and centralisation features, business, patient, and facility management, and tools for team communication and collaboration.

According to WHO estimations, although patient safety remains a priority in the healthcare industry worldwide, around 1 in every 10 patients is harmed in healthcare. The research also shows that organisational and technological issues are among the main factors negatively impacting patient wellbeing. Taking into account the type of problems leading to unsafe care, one of the ways to mitigate this issue is investing in hospital systems that improve staff coordination, help develop more effective safety guidelines, and automate patient and facility management.

Factors Associated With Unsafe Care

Doctors swear not to harm as they step into the profession. Yet sometimes, their good intentions and professionalism are not enough to make healthcare fully safe. Currently, no healthcare setting is immune to safety incidents. Such incidents most commonly include:

- misdiagnosis,
- failure to adhere to or administer proper treatment,
- surgery-associated complications,
- infections due to prolonged hospital stays or poor injection practices,
- pressure ulcers,
- patient falls,
- patient misidentification,
- blood clotting,
- blood transfusion complications.

Factors leading to such situations vary, but the majority belong to four distinct root causes:

- Organisational issues that include staff and resource shortages within medical organisations, outdated processes and procedures, and insufficient personnel training.

- Technological issues, such as poor internet connection, which disrupt communication between personnel and facilities, failure to access electronic health records, or troubles with medical device software.
- Issues on the side of medical professionals, like burnout, or on the patient's side, like medical illiteracy.
- External issues, ranging from natural disasters to economic instability.

While large-scale external factors are somewhat difficult to predict and mitigate, healthcare organisations can focus on preventing the first three categories of problems. Naturally, improving patient safety calls for a complex approach that combats harmful factors at multiple levels. Still, the right choice and usage of healthcare software can make a significant difference.

How Hospital Management Software Ensures Patient Safety

Hospital management software (HMS) streamlines clinical and administrative workflows. It is usually a multi-module system with functionality that varies depending on the healthcare organisation's needs. It can contain features for data aggregation and centralisation, business, patient, and facility management, as well as tools for care teams' communication and collaboration.

The patient management module helps centralise patient data. Medical personnel or patients can input information into the system via the patient portal. However, patient data often enters the system through integrations with other healthcare systems such as EHR, medical CRM, medical devices, and telehealth apps. Data aggregation and centralisation allow medical professionals to get a comprehensive view of patients' health histories, leading to more accurate diagnosis and treatment. It also helps validate patient information to avoid duplicates, misspellings, or other types of errors.

Improving patient safety calls for a complex approach that combats harmful factors at multiple levels

Inventory management capabilities allow healthcare organisations to track the location, quantity, and condition of medical devices and resources. This way, hospital software helps businesses ensure the proper function and accessibility of resuscitation carts, single-use syringes, disinfectants, and other equipment and materials that are vital for preserving patient safety.

Each medication can be traced down from arriving at the hospital facility to being dispensed to a particular patient with the pharmacy management module. Pharmacy management systems (PMS) integrated with the pharmaceutical track and trace software, can even trace drugs back to the point of manufacturing. PMS lowers the chance of administering counterfeit or expired medications or fulfilling the wrong prescription. Order management functionality helps healthcare personnel monitor hospital pharmacies' stocks and replenish them promptly. Assured availability of medications such as automatic epinephrine or adrenaline injection systems is critical for patient safety.

Healthcare organisations utilise a practice management module within the HMS system to properly allocate the workforce and distribute tasks. When medical teams have a clear view of their own tasks and those of other team members, they can attend to patients according to the severity of their conditions. At the same time, administrators can quickly re-distribute tasks or promptly redirect patients to other points of care in times of increased workload.

A ward management module provides a complete view of bed availability for each medical facility, including specialised units. It allows patient service teams to find appropriate patient placements for their specific care needs. Proper medical organisation's specialisation and bed type lower the risk of medical errors and hospital-related injuries.

Hospital management software can have much more capabilities. The feature set of this type of solution can be customised depending on the particular healthcare organisation's requirements. It can also be expanded via integrations with other healthcare software applications or devices.

Common HMS Integrations for Improving Patient Safety

In terms of hospital safety, the Internet of Medical Things (IoMT) is a very promising technology. Smart sensors constantly measure air quality, humidity, bacterial load, and other environmental metrics that have a serious impact on patients' wellbeing and safety. Smart beds monitor patients' body position, vital metrics, and movements, identifying the abnormal patterns that can indicate a risk of the condition deterioration, fall, or pressure ulcers. Smart resuscitation carts gather and store information about personnel's actions during the code blue event. Hospital management software integrated with such devices helps medical personnel oversee each patient's condition and the overall state of care facilities. Therefore, care specialists know exactly when to take preventive actions and have all the necessary information to develop more effective resuscitation procedures.

Patient engagement tools, including patient portals, or health and wellness mobile apps, integrated with hospital management software help provide patients with relevant information about their condition and care options. They also help gather patient feedback. Properly informing patients about the care processes and procedures they must undergo lowers the risk of treatment dropouts and consultation no-shows. At the same time, feedback aggregation ensures that medical professionals know about care gaps or patient concerns. This allows healthcare experts and decision-makers to create and implement strategies for safety improvement.

What's Next for HMS

There are many ways to utilise hospital management software to improve patient safety. Still, some medical organisations don't use their systems to their full potential. It often happens because personnel lack relevant training or decision-makers view HMS as an unreasonably large investment.

Partnering with experienced software consultants is a good way for healthcare organisations to overcome the above-mentioned barriers. Software experts can provide training sessions, suggest software customisations and configurations that cover the organisation's patient safety needs, and support the entire implementation process while keeping it within budget limits.

Conflict of Interest

None.

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Women’s Health

Digital Technologies Shape the Future of Women's Health

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Digital technologies are transforming women's healthcare by addressing disparities and improving accessibility. Femtech apps and wearables drive awareness and health monitoring, particularly for reproductive and mental health. Emerging technologies like AI, ML and wearables enhance precision care, while digital therapeutics offer new solutions for pelvic floor disorders and depression. Increased investment and regulatory focus are crucial to fostering future innovations.

key points

- Digital tools improve women's health accessibility and empower self-management.
- AI/ML-enabled wearables offer personalised, proactive health insights for women.
- Next-gen wearables track menstrual cycles, predict fertility and manage menopause.
- Digital therapeutics treat mental health and pelvic floor disorders with remote care.
- Femtech attracts increasing VC investments, boosting innovation in women's health.

According to a 2024 report by the World Economic Forum and the McKinsey Health Institute, women have a higher health burden. They spend an average of 25% more years dealing with debilitating health conditions than men. Throughout their lives, women experience several health issues and are at a higher risk of cardiovascular diseases, osteoporosis or certain types of tumours. This disparity in health burden is due to several biological and social factors, such as hormonal differences or disparity in socioeconomic status, and the need for the hour is continuous monitoring and management of health and wellness in women. The industry is also realising that women's health is much more than just maternal and reproductive health. The leading cause of death for women in the United States is heart disease. According to the Global Disease Burden Study 2019, in the European Union, the prevalence of depression in the EU is 1.7 times higher in women than in men, and anxiety disorders are twice more prevalent among women than in men (Institute for Health Metrics and Evaluation 2019). Everest Group is a leading global research firm helping business leaders make confident decisions through today's market challenges and strengthen their strategies by applying contextualised problem-solving and offers below an in-depth overview of how digital technologies can help shape the future of women's health.

Digital Technologies Empowering Women Through Care Accessibility and Disease Awareness

WHO reveals that digital technologies can improve women's health by addressing social, economic and cultural disparities. Digital tools have the potential to enhance care accessibility and educate and empower women to manage their health through self-management tools, making digital interventions an imperative tool for transforming women's health.

The current adoption of digital women's health technologies is heavily skewed toward the consumer health space. Most consumer women's health digital products (mostly women's health apps / Femtech apps) focus on improving disease awareness through educational materials and tracking and monitoring health and wellness parameters. Femtech apps that track reproductive parameters and fertility management provide telehealth or virtual consultation services and connect users to support groups or communities are gaining traction. Recent technological advances have expanded the scope of digital technologies beyond tracking and monitoring or information dissemination.

AI / ML-Enabled Wearables, Digital Biomarkers and Digital Therapeutics Transform the Future of Care for Women

As the healthcare industry moves toward precision and predictive care, there is a shift from mHealth applications and health monitoring wearables. Emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), Virtual Reality (VR) and Augmented Reality (AR) are transforming the future of women's health industry. These AI / ML algorithms integrated into wearables and mobile apps provide personalised and proactive healthcare recommendations and insights to the female user, improving care outcomes.

> "Digital tools have the potential to enhance care accessibility and educate and empower women to manage their health through self-management tools."

Next-Generation Wearables for Monitoring and Therapy

Technological advancements in wearables have transformed them from simple monitoring and tracking devices to sophisticated personalised health management devices. The industry is developing next-generation wearables uniquely designed to address women's healthcare needs. These wearables can track menstrual cycles and irregularities, predict and monitor fertility windows and diagnose perimenopause or menopausal symptoms. They integrate sensors with AI / ML algorithms and are used for preventive and predictive care. For example, researchers at the California Institute of Technology have developed a wearable aptamer biosensor for non-invasive estradiol monitoring (in human sweat) for personalised reproductive hormone monitoring. Bloomlife received FDA approval for its prescription-based maternal and fetal monitoring wearable device€—MFM-Pro. The wearable patch has ECG sensors that remotely record all perinatal-related health signals for high-risk pregnancies. Dublin-based IdentifyHer is partnering with University College Cork to test its prototype wearable biosensor for detecting menopause symptoms.

AI / ML has become integral to improving diagnosis and personalising care. For example, Switzerland-based Ava fertility trackers' wearable sensors can track physiological parameters (pulse rate, breathing rate, sleep, heart rate variability and temperature) and apply machine learning algorithms to detect fertility windows in real-time. Similarly, US-based Zepp Health Corporation, along with Wild.AI, is developing Amazfit smartwatches that use ML algorithms to provide personalised health recommendations and insights based on users' hormonal cycles. Oura Ring by Oura Health Ltd., Finland, can track sleep and physical activity. Oura Health offers an AI assistant called Oura Advisor, which offers personalised wellness recommendations and uses generative AI to answer questions related to health parameters.

The collection, interpretation and analysis of health data collected from these wearable devices can be translated into digital biomarkers, which gives critical insights into the health and well-being of the user/ patient. Digital biomarkers provide precise interventions or insights based on health status

and can also provide predictive care. For example, researchers at West Virginia University and the experts at Boston, US-based wearable company WHOOP are evaluating maternal heart rate variability (HRV) as a digital biomarker for predicting the risk of preterm delivery. South Korea-based Samsung wearables, with a large pool of biomarker data, is working with one of the big consumer health companies, German consumer health company Bayer, to understand sleep disturbances during menopause better. The future of wearables for female health is expected to be much more than just tracking and monitoring. It will give more personalised, detailed health insights so that proactive measures can be taken to prevent health issues.

Next-generation wearables can also deliver therapy through noninvasive neurostimulation, such as noninvasive transcutaneous electrical nerve stimulation for period pain relief (Manchester-based Myoovi) or dorsolateral prefrontal cortex stimulation headbands for treating premenstrual symptoms and menstrual pain (London-based Samphire Neuroscience Ltd).

Digital Therapeutics and Immersive Digital Therapeutics to Gain Traction

Digital therapeutics are evidence-based digital interventions to treat various diseases affecting women. Digital therapeutics to treat mental health conditions offer behavioural therapy with psychoeducational materials for managing mood and depression symptoms. Digital platforms can also provide pelvic floor muscle training and rehabilitation for treating urinary incontinence. The next-generation digital interventions integrated with AR / VR help create an immersive environment. It has applications in reducing fear and anxiety for labour pain management. Researchers from Franco European Multidisciplinary Endometriosis Institute (IFEMEndo), France, are investigating the use of VR-based digital therapeutics, also known as immersive digital therapy, to reduce debilitating pelvic pain associated with endometriosis.

Digital therapy offers remote care and treatment to women, giving them much-needed flexibility and convenience while maintaining their privacy. These emerging digital interventions (both next-generation wearables and digital therapeutics) are expected to profoundly impact women's health in the next 2-3 years (Table 1).

Emerging digital interventions are most impactful for conditions beyond general wellness tracking. For accurate menstrual tracking and for predicting fertility windows, the next-generation wearables and digital therapeutics have a high impact or high capability to improve (treat or manage) the disease or condition. Further, next-generation wearables have the potential to enable precise tracking of maternal health, detect the onset of menopause

Women Health Issue	General Wellbeing	Menstrual and Fertility Health Management	Maternal Health	Menopausal Health	Pelvic floor disorders	Mental Health	Cancer symptom management	Cardio-metabolic health
	Physical, mental and socio-emotional wellness	Menstrual pain, ovulation disorders	Prenatal health, childbirth, pregnancy	Menopause symptom management (hot flushes, changes in mood, sleep)	Urinary incontinence, faecal incontinence, pelvic organ prolapses	Anxiety disorder, post-partum depression, etc.	Breast, cervical and ovarian cancer	Heart disease, polycystic ovary syndrome
Next-generation								
Digital Therapeutics								

High Impact **Medium Impact** **Low Impact** **Industry impact** measures the improvement in care outcomes through these digital tools.

Commercialised/ established applications for women's health | **Early-stage commercialised applications for women's health** | **Research stage applications for women's health**

Table 1. Impact of Emerging Digital Health Tools Across Key Women's Health Issues

or help manage its symptoms, and can also treat pelvic floor disorders. Digital therapeutics also play a crucial role in managing symptoms or treating these indications. Cardiometabolics have a high impact potential in the next 4-5 years. Companies such as Hello Inside, Austria, focus on educating women with data and actionable insights to better understand the connection between glucose, insulin and female hormones through continuous glucose monitoring and dynamic hormone testing.

Government Agencies and Funding Availability to Influence Research Activities and Technology Adoption

In 2023, the US government urged Congress lawmakers to pass an €11 billion fund toward women's health research in the US. Earlier that same year, 90 million euros were allocated to the Advanced Research Projects Agency for Health (ARPA-H) to launch the Sprint for Women's Health to fund research for conditions affecting women, such as migraines, heart attacks and menopause. In September 2024, the US Department of Defense committed 460 million euros toward women's health research. Despite all efforts, women's health remains a largely under-researched field. According to a 2023 study published in Nature, the US National Institutes of Health (NIH) funding for women's health diseases is low, or research is underfunded compared with the disease burden (Smith 2023).

This scenario is also mimicked in Europe and the UK. The European Institute of Women's Health, in its EU Strategy for Women's Health report, emphasises providing equitable health for all women. The report clearly states that women are under-represented in medical research but have a high health burden (Euro Health 2024). In the UK, as per 2023 reports, the Government has committed to around 30 million euros investment over the next two years to support women's health hubs. There are high expectations from the new UK Government to implement a women's health strategy and expand women's health hubs. It is imperative that government bodies work towards closing this gap.

> "These AI / ML algorithms integrated into wearables and mobile apps provide personalised and proactive healthcare recommendations and insights to the female user."

However, the digital Femtech industry has started attracting the attention of VC investors. Femtech global VC investments in 2022 were 1.3 billion euros and despite a decline in 2023 to 1.2 billion euros, 2024-25 looks promising, with deal values close to 1.1 billion euros year-to-date (World Economic Forum 2024). Digital health technology companies such as Maven Clinic in New York (an on-demand virtual clinic) and London-based Flow Health (one of the leading consumer women's health apps) are some examples of companies that received funding. In fact, Flow Health is said to be one of the first consumer health apps to achieve unicorn status.

Funding digital start-ups in women's health can foster innovations that create a meaningful impact in the healthcare industry. While the US is one of the primary innovation hotspots, the surge in entrepreneurial initiatives has made Europe home to successful innovative start-ups such as Oura Health, Flo Health, Clue or Natural Cycles, making it a good innovation hub for digital women's health. Emerging economies like India, China and Brazil are looking to venture into this domain with a focus on health monitoring, disease awareness and access to care for women through digital women's health solutions.

Medical devices, such as digital therapeutics and next-generation wearables, are establishing their market presence through regulatory approvals and growing scientific evidence supporting their efficacy. Some of the recent regulatory approvals include US FDA clearance for Bloomlife MFM-Pro wearable patch for maternal and fetal heart rate monitoring, Bone Health Technologies's Osteoboost wearable vibration belt to treat low bone density for postmenopausal women with osteopenia, Curio Digital Therapeutics' MamaLift Plus a prescription digital therapeutic to treat mild to moderate Postpartum Depression (PPD) symptoms and CE marked device (part of the German DiGA program) PINK! Coach (acquired by SideKick Health) a prescription digital therapeutics offering digital coaching to manage breast cancer's physiological and psychological effects.

Strategic Imperatives to Boost Commercialisation

Overcoming data security issues

A 2022 Femtech products privacy analysis published in IEEE Transactions on Technology and Society revealed that the data collected by menstrual cycle tracking apps is often shared with third-party data aggregators for personalised advertising or as a monetisation model (Erickson et al. 2022). This personal health information is not protected when shared with third parties. Over the last few years, the rapid growth of unregulated consumer health digital products for women has led to more common and problematic data privacy inconsistencies. We are also witnessing users exercising extra caution when using these apps, especially in regions with restricted access to abortion, contraception or voluntary sterilisation services, and this data could be used against them.

The regulatory agencies, primarily the US and UK, are closely monitoring potential harms and negative impacts on users. The agencies are reinstating the importance of complying with regulations like the EU's General Data Protection Regulation (GDPR), the US Health Insurance Portability and Accountability Act (HIPAA), and the California Consumer Privacy Act (CCPA). Europe goes one step further with its new EU Cyber Resilience Act, which will improve the cybersecurity of digital products such as software and Internet of Things devices.

To ensure data security, the platforms must adhere to regional regulations and ensure compliant data collection, storage and distribution. To maintain the privacy of sensitive health information, digital health companies should implement true end-to-end encryption for data storage and strictly avoid sharing data with third parties. This can alleviate consumer fears and improve the industry's adoption of new digital technologies.

Addressing the gender data gap

Though the opportunities for women-centric care are huge, the data gap in women's health creates blind spots in disease prediction and diagnosis. It was only after 1993 that women were included as a part of clinical research and trials. And even after 2 decades, women are still often underrepresented in several clinical research studies. Moreover, the underrepresentation of women of colour or another ethnic background further increases the data gap. This gap has led to a fundamental lack of understanding of the influence of the female gender on disease prevalence, presentation and progress. This inequity can have an impact on the AI models. Accurate AI decision-making requires complete, correct and unbiased datasets. Data inequalities can result in a higher risk of misdiagnosis for women. Evidence-based clinical studies of larger diverse cohorts can help address this challenge. Digital technologies can also drive better data collection on women's health.

Future outlook

Current women's digital health products focus on consumer digital health solutions to improve care awareness and accessibility. There is a focus on patient education, awareness and personalised insights and recommendations. Healthcare consumerism is driving the growth of these Femtech solutions, where patients are empowered to take control of their own health through self-management. A January 2024 World Economic Forum report, in collaboration with the McKinsey Health Institute, suggests that reducing the women's health gap could create an annual 925 billion euros GDP opportunity by 2040 (World Economic Forum 2024). Thus, government bodies should look into incorporating digital health solutions through digital inclusion initiatives to improve women's health and well-being.

In the next 2-3 years, the role of digital technologies is set to expand beyond health and wellness. Maternal health monitoring and management, fertility and menopause management, therapeutic interventions such as treating pelvic floor disorders, and mental health management are expected to become mainstream. With the healthcare industry expected to move from prescriptive to more predictive and proactive care, digital technologies for women's health are expected to become integral for health management. AI and digital biomarkers show tremendous potential in predicting the risk of serious women's health conditions. Integrating AI into the devices will be critical for identifying the markers associated with high-risk women's health conditions like cervical or breast cancer or risk of gestational diabetes or hypertension during pregnancy, to name a few use cases.

However, continuous innovation, addressing consumer pain points, customising features, and ensuring accessibility to all demographics can go a long way toward improving adoption prospects and reducing women's health burden.

Conflict of Interest

None

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Policy Update

How A Name and Shame Strategy Supports The Fight Against Tobacco

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The tobacco industry, deadlier than the weapons industry, has caused millions of deaths and knowingly fostered addiction while governments continue to permit its harmful influence. The Economist's acceptance of tobacco funding highlights how entrenched this deadly industry remains, yet recent steps to sever ties with tobacco companies show a positive shift. Governments and society must now take decisive action to prioritise public health, remove tobacco's influence and restore true freedom to those affected by addiction.

key points

- Tobacco kills more people than the weapons industry, causing 100 million deaths in the 20th century and potentially 1 billion in the 21st century.
- The addictive nature of the substance challenges the concept of freedom of choice in using tobacco.
- After being criticised for its ties to the tobacco industry, The Economist ended its engagement.
- Governments are responsible for protecting public health by prohibiting the sale of tobacco.

The tobacco industry is deadlier than the weapons industry, with tobacco being more widely available than even basic necessities like bread. In the 20th century alone, tobacco was responsible for 100 million deaths, and if current trends continue, it is expected to claim 1 billion lives in the 21st century. Tragically, half of all tobacco users will die from its effects. Despite these alarming statistics, governments continue to permit the sale of this deadly product. What is even more concerning is that the tobacco industry has been aware of the carcinogenic and harmful effects of its products for decades, as confirmed by internal documents, and it has long understood the addictive nature of tobacco. It is time for decisive action to prevent further unnecessary loss of life and to prioritise public health over corporate profits.

Addiction and Freedom: The Illusion of Choice

The tobacco industry and government often argue that using tobacco is a matter of personal choice – an exercise of freedom. However, as confirmed by the tobacco industry's own internal documents, they openly acknowledge being 'in the addiction business.' This raises a crucial point: can we truly speak of freedom of choice when addiction is involved? Addiction, by its very nature, strips individuals of their ability to make free and rational choices, creating a dependency that makes people feel they need tobacco. The same principle applies to e-cigarettes, or vaping, which also fosters dependency.

Some short research leads us to an article by Andreas T. titled “Freedom of choice and the tobacco end game.” Below is an excerpt from the abstract that further explores this issue. This clearly calls into question the notion of freedom when addiction is deliberately cultivated by an industry, making the case for stricter regulations and protection of public health.

“Endgame proposals strive for a tobacco-free (or at least cigarette-free) society. Some endgame proposals are radical and include, for example, a complete ban on cigarettes. Setting aside empirical worries, one worry is ethical: would such proposals not go too far in interfering with individual freedom? I argue that concerns around freedom do not speak against endgame proposals, including strong ones such as a cigarette ban. I first argue that when balancing freedom with public health goals in tobacco control, the latter wins out. But I also argue that, in principle, a concern with freedom itself already justifies endgame measures. First, such measures can increase people’s lifetime freedom, that is, the freedom they have across their entire lives. Second, such measures can facilitate a better interpersonal distribution of freedom by increasing aggregate societal freedom and reducing inequalities. Overall, freedom does not preclude strict tobacco control but supports it.” (Schmidt 2022)

It could be argued that ending the sale or use of tobacco and vaping – depending on the approach taken – actually restores freedom to those who were previously addicted. By removing the addiction, individuals can experience true and lasting freedom.

With this in mind, why mention The Economist? What has changed?

Complicity and Contradiction: Unveiling the Tobacco Industry’s Enduring Influence

It’s easy to be naïve, but sometimes we wake up to the harsh reality: tobacco still holds a significant role in our society, and tobacco companies remain integral parts of powerful, wealthy organisations. We refuse to accept this as normal, yet it seems to persist; it’s not just the sight of people smoking; employees of the tobacco industry are everywhere, integrated into everyday business and influencing our world. Regardless of government regulations or corporate ethical codes, the tobacco industry always finds a way to maintain its presence and influence.

> “By accepting funding for your activity from a business whose product is the direct cause of millions of deaths each year, you are legitimising that business.”

Many people claim to despise tobacco, yet ultimately, most of us tolerate the presence of those who work in or support the tobacco industry. Rather than challenging them or urging them to leave the deadliest industry in history, we allow them to remain part of our communities. We are all aware that tobacco kills more people each year than weapons do, yet by accepting these individuals and companies in our midst, we continue to normalise this business. Despite the countless lives lost, we implicitly endorse its existence through our complacency.

On Wednesday, September 11, we were informed by the UICC director that The Economist receives funding from Philip Morris. For those sceptical, search for “Economist and Philip Morris” on Google – this alone will provide enough evidence. Multiple studies conducted by The Economist have received financial support from Philip Morris.

A year ago, we were impressed by the quality of The Economist Impact Congress ‘Annual World Cancer Series’, and we intended to participate again this year. However, upon learning of the connection between The Economist and Philip Morris, we immediately decided to withdraw, along with other speakers, including DG Health Stella Kyriakedis and several MEPs.

How can a respected and well-known organisation like The Economist align itself with the tobacco industry? Even more concerning, how can they host health conferences while accepting funding from an industry that is responsible for so much suffering and death? This is not only contradictory but deeply offensive to all those who have lost their lives due to tobacco and to those impacted by the actions of the industry and its affiliates.

By accepting funding for your activity from a business whose product is the direct cause of millions of deaths each year, you are legitimising that business. This means you are confirming that such business is morally acceptable to you and that you consider such a business to be a normal and equal

partner of society. Claiming to segregate this funding from health-related activities – such as stating that no tobacco money is used for health-related conferences – is merely an attempt to mask your fundamental acceptance. Well-respected organisations can never condone any such acceptance as it is a callous denial of the human suffering of millions.

What Has Been Achieved Already?

The good news is that The Economist has already cancelled congresses due to the withdrawal of various speakers and sponsors. Notably, The Guardian has conducted research and published on this topic. One of their articles highlights the deep ties with the tobacco industry. Their investigation found that Economist Impact, part of the Economist Group (TEG), has deep ties with Philip Morris International (PMI), Japan Tobacco International (JTI) and British American Tobacco (BAT).

Even more encouraging, The Economist Group, including all its divisions beyond just Economist Impact, has decided to end its engagement with the tobacco industry. This decision, announced by the UICC on its website (The Union for International Cancer Control 2024), marks a significant positive change. It reflects a growing commitment among influential organisations to distance themselves from industries that cause extensive harm to public health, promoting greater accountability and ethical standards in corporate partnerships.

Do Governments Have a Responsibility?

Inspire2Live wants to take the initiative not to ban smoking but instead prohibit the sale of tobacco. The key reason for this is to shift the blame away from the individual smoker – addressing the idea of freedom of choice – and onto the industry and governments. Our primary focus is not to sue the tobacco industry but rather to hold the government accountable. While the tobacco industry often loses lawsuits, they are still permitted to continue their harmful business with government approval. We, therefore, believe that the government is not doing enough to protect the health of its citizens. We want to sue the government based on the treaty for the protection of human rights. Article 2, ECHR: 'The right to live' (European Convention on Human Rights). We believe there is a real chance that we will win. After all, the Urgenda case (this was a case against the government based on this ECHR, for not doing enough to protect the citizens against climate change, and this was won at the Supreme Court level) has preceded us, and this new case is entirely in line with that: 'Government; protect your citizens!'

> "It is time for decisive action to prevent further unnecessary loss of life and to prioritise public health over corporate profits."

We Can Do More: Blame and Shame

We have already highlighted that tobacco use, the companies involved and their employees are still viewed as socially acceptable, 'normal phenomena'. There is an urgent need to change this. Reading the book 'The honour code' from Kwame Anthony Appiah we learn how duelling, Chinese foot binding, slavery and honour-killing were brought to an end: the ones that committed these crimes felt shame. They were blamed and shame came across them. Appiah quotes Hegel:

"Anerkennung - Recognition. We human beings need others to respond appropriately to who we are and to what we do. We need others to recognise us as conscious beings and to acknowledge that we recognise them." (Appiah 2011)

As long we are accepted in our behaviour, we continue to do the things we do. Appiah writes in his book about social phenomena, not about individuals. Society must offer 'Anerkennung'. If that changes, the whole thing changes. That is why duelling changed in England: even the poor wretches started duelling. Then, it is time for the nobility to stop and ban it. But when a society feels a sense of shame, this also happens. China was no longer taken seriously because of foot binding. When China realised this and became internationally ridiculed, foot binding stopped within a few years.

Conclusion

So, let's try to bring a strong feeling of shame over the tobacco industry, its employees, its distributors and, of course, the ones who accept money from them. We commend The Economist for their decision to end ties with the tobacco industry, a step that earns our renewed respect. As a result, we are eager to support their initiatives and will gladly attend their conferences again next year. This decision sets a positive example, demonstrating the value of prioritising public health over harmful affiliations.

Conflict of Interest

None

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Finance

Telehealth Reimbursement: How Shared Services Support Digital Transformation

In 2023, telehealth services represented over 13% of outpatient visits in the US, up from 1% in 2019, largely due to the COVID-19 pandemic. This surge prompted regulatory changes that expanded coverage and allowed audio-only visits. However, reimbursement policies differ significantly among Medicare, Medicaid and private insurers, leading to challenges for providers and patients. Integrating advanced technologies like AI and blockchain presents promising opportunities to enhance telehealth's effectiveness and security.

TRU PERFORMANCE

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key points

- Telehealth services surged to over 13% of outpatient visits in the US in 2023, up from 1% in 2019.
- The pandemic accelerated telehealth adoption, with visits increasing by 154% from March 2019 to 2020.
- Regulatory changes expanded telehealth coverage, allowing audio-only visits and more providers.
- Telehealth reimbursement varies significantly among Medicare Medicaid, and private insurers.
- Advanced technologies like AI and blockchain promise to enhance telehealth's future and security.

In 2023, telehealth services represented over 13% of all outpatient visits in the US (Glaser et al. 2023) That is a dramatic increase from just 1% in 2019, reflecting a significant shift in healthcare driven by digital transformation and accelerated by the COVID-19 pandemic. This evolution is reshaping the reimbursement landscape, with insurers reassessing their policies and new technologies emerging to facilitate remote care, marking a pivotal moment in healthcare history. Understanding these developments is essential for navigating the future of medical services, highlighting the importance of exploring how these trends are transforming reimbursement and their implications for the healthcare sector. Business transformation agency Tru Performance offers below an overview of how implementing shared services can enhance an organisation's journey to greater efficiency and innovation.

Navigating the Telehealth Reimbursement Landscape

Before COVID-19, telehealth faced significant barriers such as regulatory restrictions, reimbursement issues and technological constraints. The pandemic, however, dramatically accelerated its adoption. Telehealth visits in the U.S. increased by 154% between March

2019 and March 2020 (Koonin LM et al. 2020). It became essential for managing routine care, chronic conditions and mental health services, facilitating safe and effective remote care delivery.

In response, regulatory bodies expanded coverage and reimbursement for telehealth services by lifting geographic and site restrictions and allowing a broader range of providers to deliver care. They also permitted audio-only visits to address technological disparities.

These changes introduced complexities for revenue cycle management (RCM). RCM teams now face challenges adapting to new billing codes, ensuring compliance with telehealth documentation requirements, navigating varied reimbursement rates and managing cross-state licensing issues. Accurate billing and understanding payer-specific policies are crucial for optimising revenue and ensuring continued access to telehealth services.

Types of Telehealth Services Covered

Now, any provider eligible to bill Medicare for professional services can also bill for telehealth services (Health Resources & Services Administration, 2023). However, significant differences exist in how Medicare, Medicaid and private insurers manage telehealth reimbursement. (U.S. Centers for Medicare & Medicaid Services 2023). The Centers for Medicare & Medicaid Services (CMS) has expanded the list of covered telehealth services, many of which will continue to remain reimbursable by Medicare until December 31, 2024. Notably, some services now permit telephone-only visits without the requirement for both audio and video (U.S. Centers for Medicare & Medicaid Services, 2024). While Medicare does support telemedicine services, it mandates that real-time video calls be used for reimbursement, which is offered at the same rate as in-person visits. These services are primarily accessible in rural areas and specific locations, such as hospitals or clinics, and claims must include a GT modifier.

Medicaid reimbursement for telehealth varies by state due to the lack of a federal mandate. While some states offer coverage for telehealth services, only 13 states, including California, Colorado and New York, provide reimbursement. Each state has its own set of rules and coverage options, leading to a patchwork of telehealth policies across the country. This inconsistency can create challenges for both providers and patients seeking telehealth services, as the availability of coverage may depend significantly on geographic location.

> "Telehealth visits in the U.S. increased by 154% between March 2019 and March 2020."

Private insurers also have differing policies regarding telehealth reimbursement. In 12 states, including California and Texas, insurers are required to cover telehealth services; however, reimbursement rates and coverage may differ from those for in-person visits. These variations can result from state regulations and the specifics of individual insurance plans, adding another layer of complexity to the telehealth reimbursement landscape.

Telehealth reimbursements face several challenges, including regulatory inconsistencies across states and payers, which leads to fragmented reimbursement policies. Although Medicare has relaxed some of its rules, private payers and Medicaid programmes still vary widely in their coverage, creating uncertainty. Additionally, there is an ongoing struggle for equitable access to telehealth, particularly in rural and underserved areas, where technological and infrastructure limitations, such as unreliable broadband internet, can impede the adoption of telehealth services.

The Role of Digital Transformation in Healthcare

On February 21, 2024, a cyberattack on Change Healthcare, a subsidiary of UnitedHealth Group, exposed sensitive information, including medical records, billing details and Social Security numbers of millions of Americans. The breach caused widespread disruption in healthcare operations, leading to a backlog of unpaid claims and highlighting the vulnerabilities in telehealth infrastructure. Such incidents underline the critical need for robust cybersecurity measures as the reliance on digital healthcare platforms increases.

Despite these challenges, the future of telehealth holds immense promise, particularly with the integration of advanced technologies like Artificial Intelligence (AI), the Internet of Things (IoT) and blockchain. These innovations can further digitise healthcare, enhancing data security, patient monitoring and decision-making processes. AI

technologies, including machine learning and natural language processing (NLP), are transforming healthcare by analysing vast amounts of medical data, such as medical images and patient records, to extract crucial insights that support clinical decision-making.

Telehealth also facilitates a shift towards more flexible and value-based care models, enabling shared services and remote monitoring that provide continuous, personalised care. This approach can make healthcare more equitable and efficient, ultimately benefiting both patients and providers.

Shared services are set to play a significant role in the healthcare sector's evolution. By centralising departments that manage common support functions—such as human resources, finance, supply chain management, operations and IT—healthcare organisations can enhance efficiency, standardise processes, and achieve cost savings through service consolidation. This model aims to realise economies of scale, improve service quality and boost productivity while offering flexibility in determining whether services are developed internally or sourced externally. Beyond cost reduction and quality improvement, shared services provide advantages like time zone benefits, domain expertise and enhanced business continuity.These changes introduced complexities for revenue cycle management (RCM). RCM teams now face challenges adapting to new billing codes, ensuring compliance with telehealth documentation requirements, navigating varied reimbursement rates and managing cross-state licensing issues. Accurate billing and understanding payer-specific policies are crucial for optimising revenue and ensuring continued access to telehealth services.

> "Regulatory inconsistencies across states and payers (...) lead to fragmented reimbursement policies."

Conflict of Interest

Tru Performance offers innovative business transformation and shared services solutions that streamline operations and enhance customer experiences. Through advanced digital tools, they aim to drive digital transformation and streamline shared services like IT, human resources and finance for enhanced efficiency and customer satisfaction.

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