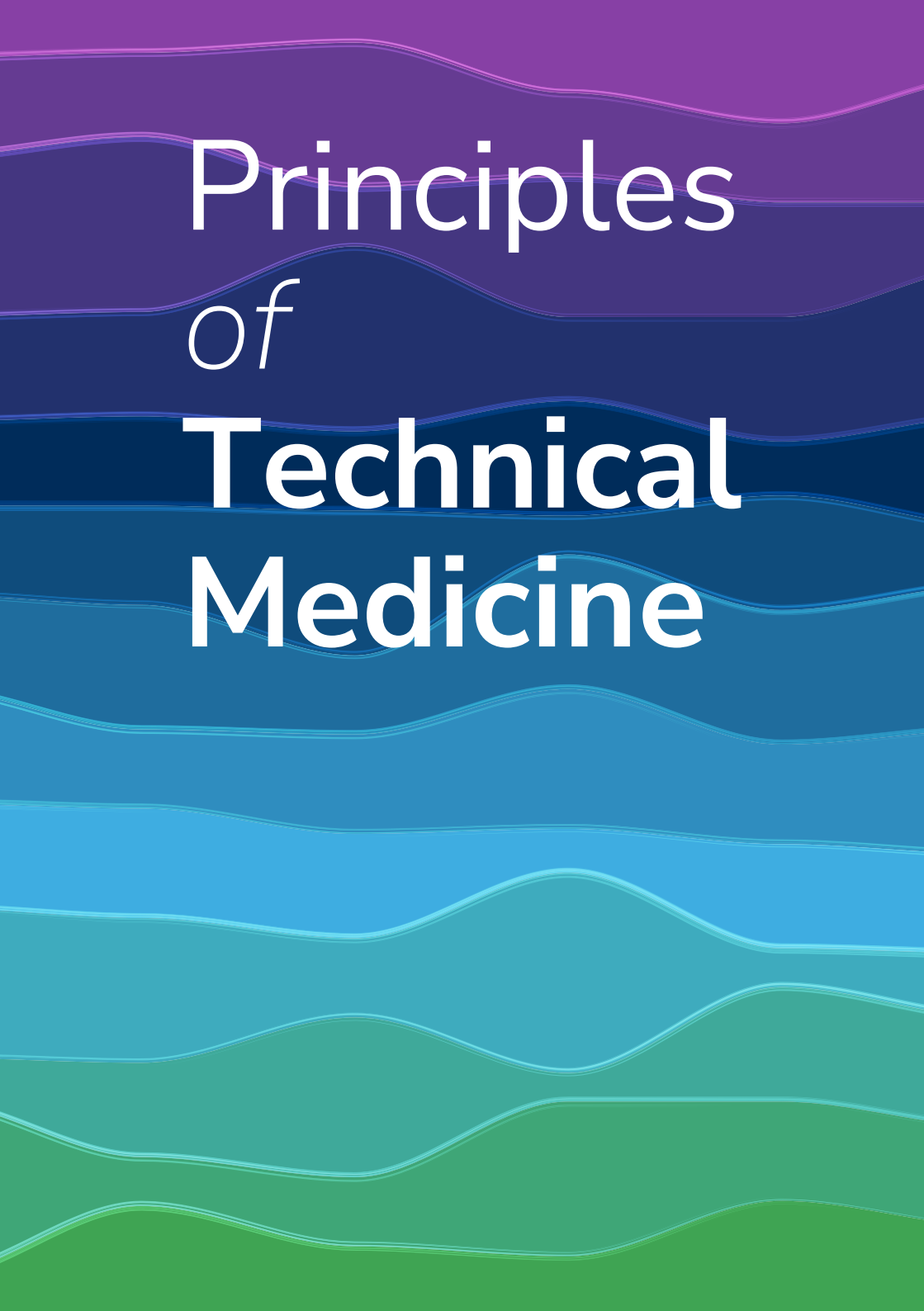




Principles *of* Technical Medicine

Technical Medicine is an evolving discipline at the intersection of medicine and technology. The aim of the discipline Technical Medicine is to develop and apply advanced technical knowledge and methods to improve patient care.

Together with a wide network of professionals, we have been shaping and sharing the **Principles of Technical Medicine**. This movement aims to clarify the discipline's origins, define its practices and highlight its growing role in clinical settings and healthcare as a whole.

By continuously expanding and refining this vision, we seek to show how this group of healthcare professionals can make technology and medicine work hand in hand to advance (direct) patient care.

This brochure offers an overview of our work.

First you will meet the **Editorial Board** (page 3), and the **Principles** of Technical Medicine are outlined (4–5), followed by a short historic **Timeline** of the Technical Medicine programme and profession (6). The **Scientific Foundations** for the discipline are presented (7) and the **Journey from student to Technical Physician** is illustrated (8–9). Finally, the Dutch Society for Technical Physicians (NVvTG) presents their organisation of the Technical Medicine profession into clusters: **Image-Guided Interventions** (10), **Imaging** (11), **Out of Hospital and Remote Care** (12), **Function and Physiology** (13), **Critical Care** (14), and **Healthcare Organizations** (15).

For more detailed information, please scan the QR code on the back and visit **www.principles-of-tm.nl**

Who are we?

The Editorial Board is dedicated group of people who have been working on this project since the beginning of 2023. They have been—and continue to be—deeply engaged in this dynamic and creative process, driving progress in the realization of this movement.

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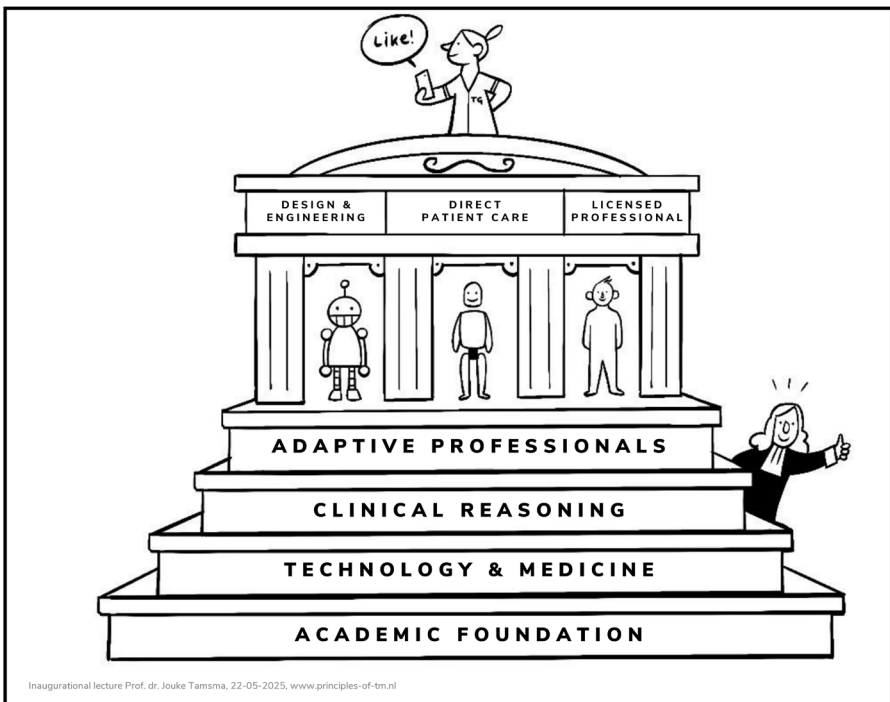
Dr. Roel Verhoeven

*Technical Physician &
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The Principles

Technical Medicine is an **academic discipline** built on a solid scientific foundation, upon which the **integration of technology and medicine** and **clinical reasoning** are further developed.

An important aspect is the **adaptive expertise**: the ability of professionals to respond flexibly, quickly and effectively to changing situations and technological developments. This requires designing new methods when existing techniques are no longer sufficient.

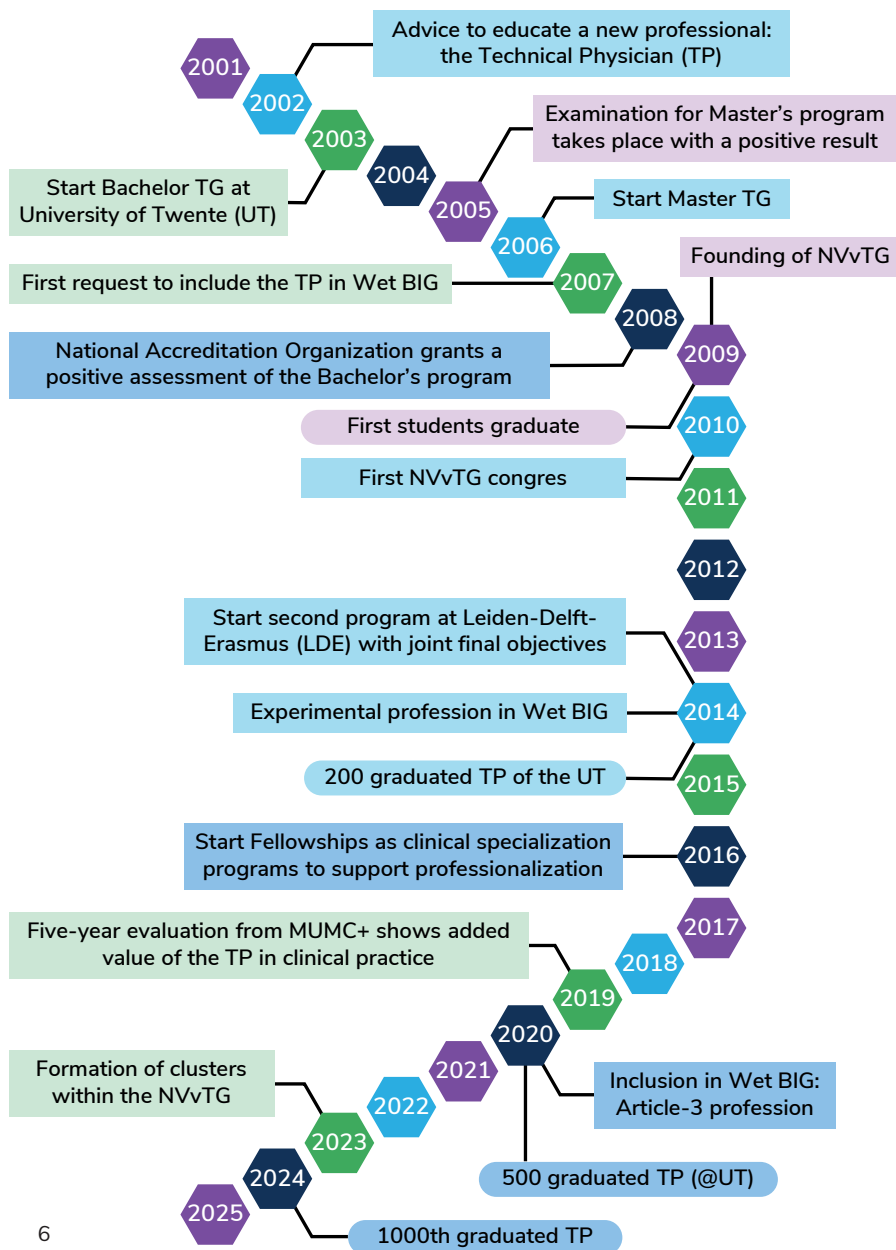


To develop solutions in clinical situations, a Technical Physician uses **design and engineering approaches** (Figure, top left). An environment with engineers is well-suited for acquiring technical knowledge and for following a structured methodology of analysis, design, development and testing – iterating this process until it succeeds.

Also, a Technical Physician holds an independent, legally recognized authority as a **licensed professional** registered under the Wet BIG (Figure, top right) in **direct patient care** (Figure, top centre). Therefore, professional conduct, effective communication, reflection and clinical reasoning are key tenets within this field.

Ultimately, the patient is always at the center of technical-medical practice. Technical Physicians can act independently as treating professionals and are fully accountable for their actions, being subject to medical disciplinary law. Just as doctors carry the legally protected title of “physician” or “doctor (MD)”, Technical Physicians hold the protected title of “Clinical Technologist” in the Netherlands.

Timeline Technical Medicine



Scientific Foundations

As a relatively new profession, the technical physician must **find a clear position** within healthcare. Technical physicians bring complementary competencies and act with independent authority in patient care. To succeed in this role, they need not only advanced technical and medical knowledge but also the ability to build trust, demonstrate competence, and establish strong relationships with colleagues and patients alike. Building **adaptive expertise** helps technical physicians to find their path in the healthcare system and prepares them for new challenges.

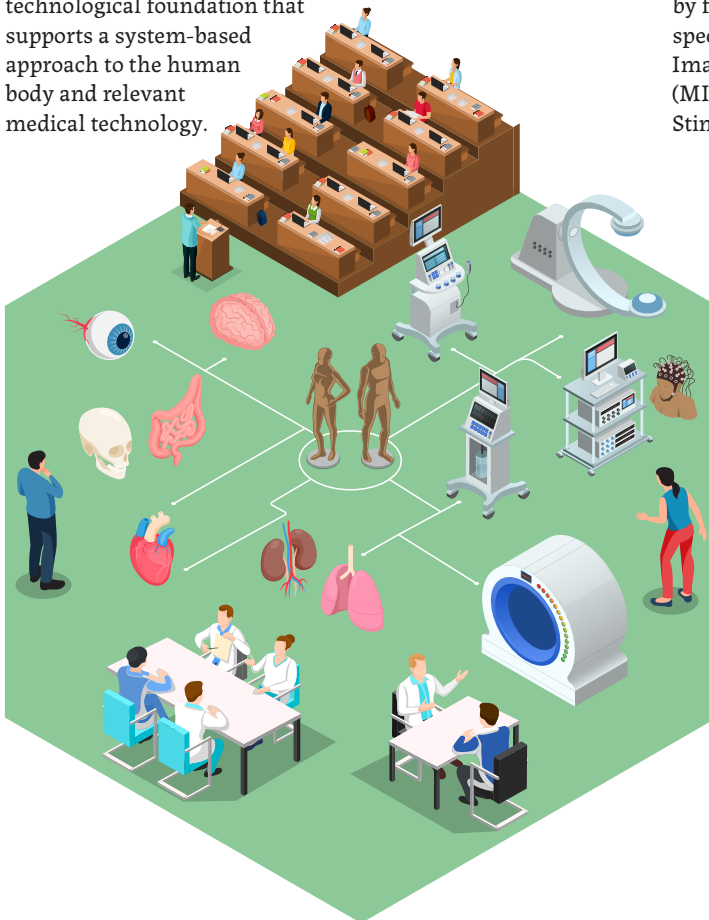
Technical physicians contribute to the safe, effective, efficient, and innovative use of technology in healthcare through their unique, integrative technical medical competencies. They introduce new ways of working in both direct and indirect patient care.

Furthermore, technical physicians contribute to a growing body of knowledge through their scientific output. Over the past 10 years, more than 3,000 scientific papers have been published, and this number is steadily increasing.

Journey from student

Bachelor phase (Years 1–3)

During the first three years (bachelor phase), students are trained clinically in anatomy and (patho) physiology. At the same time, they develop communication skills for patient consulting and build a technological foundation that supports a system-based approach to the human body and relevant medical technology.



Master phase – Year 1

In the first year of the master, students deepen their technical-medical skills in simulation settings and expand their medical-technological knowledge by following one of two specialization tracks: Medical Imaging & Interventions (MII) or Medical Sensing & Stimulation (MSS).



to Technical Physician



Master phase – Year 2

In the second year, students complete four internships in clinical departments. Here, they gain hands-on clinical experience while working on technical-clinical challenges related to innovation, implementation, or research. The fourth internship may also take place abroad or at a technical-medical company.

Master phase – Year 3

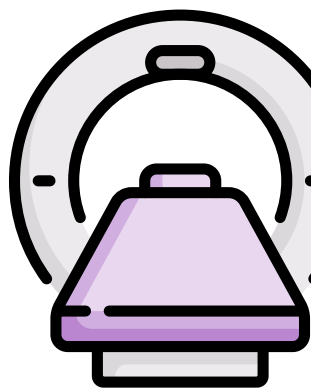
The final year is dedicated to the master's thesis project. In a one-year clinical internship, students demonstrate mastery of all program competencies by tackling a substantial problem while becoming fully integrated into the clinical department and team.



The clusters are part of and organized by the Dutch Society for Technical Physicians NVVTG – www.nvvtg.nl

Image-Guided Interventions

The domain of image-guided interventions envelops advanced imaging diagnostics and monitoring, data-driven artificial intelligence supported surgical interventions and 3D-planning, visualisation and per-operative surgical navigation. As a result, technical physicians apply and develop these technological innovations in surgical domains as cardio-thoracic, colorectal, general (oncological), neuro, orthopaedic, oral and maxillofacial, paediatric, plastic, and vascular surgery, as well as interventional radiology, medical oncology, and pulmonology.



The aim of this cluster is to allow patients throughout the Netherlands the highest level of image-guided interventions provided by technical physicians, quality assurance of technical medical practice including medical device regulation application, and cluster knowledge and skill transfer and development. Technical physicians accelerate innovations in direct patient care in hospitals, and address their clinical need to industry, while industry employed technical physicians target groups of patients and direct research and development into relevant solutions for actual (technical) medical problems.

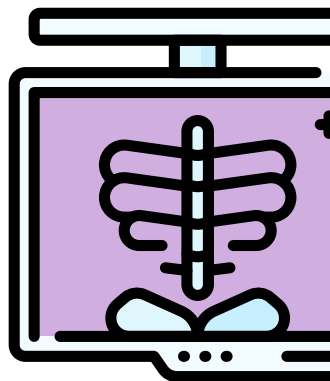


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Imaging

The imaging cluster focuses on both diagnostic and therapeutic applications where imaging is essential in the clinical workflows, including radiology, nuclear medicine, radiotherapy, and pathology. The cluster unites technical physicians from healthcare and the med-tech industry, with expertise in imaging acquisition and processing. As imaging technologies advance, safe and effective implementation demands professionals who understand the possibilities, limitations, and risks.

By combining knowledge of science, medicine, and engineering, technical physicians bridge the gap between technology and clinical practice, ensuring responsible development and application of imaging innovations. The cluster fosters collaboration and knowledge exchange across disciplines and is structured around four themes: diagnostic imaging, radiotherapy, nuclear medicine therapy, and industry.





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Out of Hospital and Remote Care

While the Technical Medicine programme traditionally emphasizes hospital care, the majority of healthcare in the Netherlands takes place outside hospitals. Care outside the hospital is provided by GPs, rehabilitation centres, long-term care, home care and mental health services. These settings face major challenges, addressed in the Integral Care Agreement (IZA), such as reducing administrative burdens, optimizing capacity and improving data exchange: all tasks where technology plays a key role.

Technical physicians, with their integrated medical, technical and communication skills, are uniquely positioned to bridge gaps between care professionals, patients, management and technology providers. They identify bottlenecks, foster collaboration and translate technical solutions into practical improvements. Because of their clear potential in non-hospital care, technical physicians have significant opportunities for impact in strengthening accessible, efficient and patient-centered healthcare.

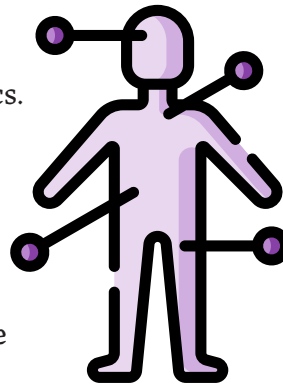




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Function and Physiology

Technical physicians in this cluster may work in fields such as cardiac electrophysiology, clinical neurophysiology, (organ) perfusion, or urodynamics. They use sensor technology to accurately measure the function of the heart, brain, donor organs, or urinary tract, thereby improving diagnostics. Other technical physicians may specialize in neuromodulation. By further developing and effectively applying this technology, they play a key role in the treatment of pain or movement disorders.



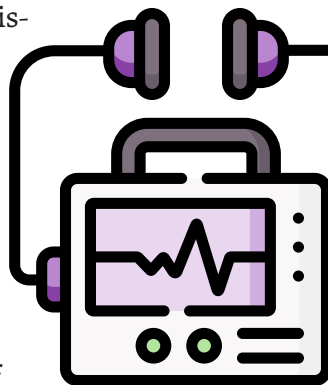
Technical physicians within the cluster are engaged in measuring, interpreting, and modulating (bio)medical signals. They develop, research, and implement medical technologies to assess and enhance the function and physiology of various organ systems.



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Critical Care

Critical care provides highly specialized, interdisciplinary treatment to critically ill patients in intensive care units (adult, pediatric and neonatal), anesthesiology and the emergency department. These environments rely heavily on advanced medical technologies and generate complex, multimodal data. Technical physicians bring a unique combination of physiological insight and technical expertise, enabling the safe and effective use of these technologies.



Their understanding of how data is generated and interpreted ensures accurate evaluation and translation into patient diagnosis and treatment. They also play a key role in implementing innovations such as artificial intelligence and deep learning, acting as a vital link between clinicians, technical departments and industry. Within the critical care cluster, technical physicians collaborate across hospitals and departments to exchange knowledge, develop specialized training and drive innovation: strengthening both clinical practice and research in this demanding field.

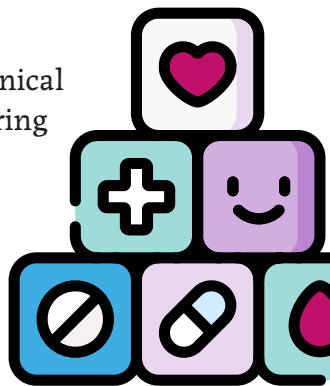


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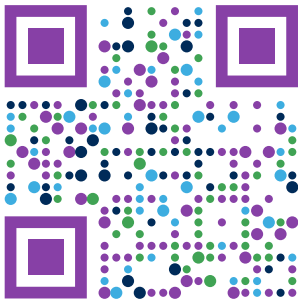
Healthcare Organizations

Technical physicians working in healthcare organizations focus on improving the healthcare system as a whole, beyond individual patient care. Operating within the complex Dutch healthcare landscape, they collaborate with providers, insurers, regulators and government bodies to maintain the balance between quality, accessibility and affordability. Their work includes creating strategies, monitoring safety, managing the implementation of new med-tech innovations and coordinating between departments and organizations.

With their unique combination of medical, technical and analytical expertise, technical physicians bring a helicopter view that allows them to translate complex challenges into practical, multi-stakeholder solutions. By connecting diverse actors and aligning goals across the system, they play a crucial role in shaping a more effective, sustainable and innovative healthcare sector.



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