ACE INNOVATION TRENDS REPORT

Top Emerging Medical Technology Trends in Singapore

2025

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Driving Better Decision-Making in Healthcare

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MEDICAL TECHNOLOGY TRENDS 2025: AN OVERVIEW

The Agency for Care Effectiveness (ACE)'s Horizon Scanning (HS) system for medical technologies (MedTech) serves to identify emerging health technologies that address the top causes of disease burden in Singapore, including:

- Cancer
- Cardiovascular diseases
- Diabetes
- Dementia
- Musculoskeletal diseases

By systematically scanning various health information resources and engaging stakeholders including clinicians, policymakers and representatives of innovation centres, this Innovation Trends Report aims to highlight the top MedTech trends anticipated to disrupt healthcare practices in Singapore in the next five years. It intends to offer the stakeholders a strategic view of the evolving MedTech landscape in Singapore and its potential implications for patient care, service delivery, resourcing and healthcare policy.

The ACE HS system provides advance notice for system preparedness and planning for the potential entry and adoption of promising medical technologies, while providing advance warning against those that are of low value.

TOP TRENDS

The list of emerging MedTech trends identified are listed without any specific ranking or priority:

AI IN CLINICAL DECISION SUPPORT

is used to assist clinical decision-making in improving disease diagnosis or risk prediction, and personalising treatment plans. With the potential to revolutionise healthcare if successfully integrated, AI tools may improve workplace effiency, reduce cognitive burden on healthcare professionals and enhance patient engagement. Its true value can be realised with continuous validation, and by aligning adoption with best practices for AI use.

BIODEGRADABLE IMPLANTS

are designed to be absorbed by the body over time, eliminating the need for removal surgeries. Holding great promises, they showed advantages in reducing complications and optimising healthcare resources in both orthopaedic and vascular applications. Research for new generation of ideal bioresorbable materials and for broader clinical applications is likely to achieve tremendous advancement in the field.

BLOOD-BASED BIOMARKERS FOR SCREENING AND DIAGNOSIS

involve using minimally invasive blood tests to detect specific proteins or other molecules. Although some blood-based biomarkers are already used in the clinical management of advanced cancers, their potential as a convenient and accessible alternative can expand to early disease diagnosis and screening. They can play a critical role in transforming healthcare with continuously improved detection accuracy and prospective validation.

CONTACTLESS PATIENT MONITORING

allows for continuous, non-invasive, remote monitoring of a patient's vital signs. Once technology matures further and integrates successfully to the system, it presents great potential to revolutionise standards in patient monitoring, mitigating the significant burden related to manpower and resource, while reducing infection risk and minimising disruption to patients.

DIGITAL THERAPEUTICS (DTX)

are evidence-based therapeutic interventions delivered via software to prevent, manage, or treat a medical condition. By overcoming technical and other barriers, DTx offers significant benefits through remote, affordable, scalable, personalised solutions that promote treatment adherence, especially for conditions poorly managed by conventional approaches.

MINIMALLY INVASIVE INTERVENTIONS

offer less-invasive alternatives to open surgeries, enhancing precision and agility. With the assistance of robots, minimally invasive interventions have transformed surgical approaches, with the potential to reduce complications and associated healthcare resource use, and enhance patient experience. Competition amongst different technologies in this field may eventually drive down the high upfront and ongoing costs, improving overall efficiency.

POINT-OF-CARE TESTING (POCT)

refers to tests performed outside conventional labs to support timely clinical decisions. POCT is generally simple to use, requires minimal training, and can be conducted in various settings, including primary care, emergency care, and for self-testing. When used properly and in the appropriate context, POCT may transform care across tertiary to primary care settings, accelerate clinical decision-making and improve care outcomes and patient satisfaction.

VIRTUAL AND AUGMENTED REALITY (VR/AR)

uses immersive technologies to simulate or enhance real-world environments, offering transformative opportunities for medical education, patient care, and therapy. By creating a safe, highly realistic and interactive environment, VR/AR has shown promise for both healthcare professionals and patients alike for tasks that would otherwise not be feasible in real-world settings.

WEARABLES AND SENSORS

are non-invasive devices that monitor health parameters in real-time, often enabled by AI advancements. With the continuous proliferation of wearables in healthcare, it has great potential to shift care outside of traditional settings to home, improving healthcare resources utilisation. The integration of wearable-collected data can enable coordination among multidisciplinary teams, to allow more holistic care and a shift towards proactive and preventive care models.

TOP 9 TRENDS

AI in Clinical Decision Support

Increasingly, artificial intelligence (AI) is transforming many industries including healthcare. Leveraging large datasets to identify patterns, **AI in clinical decision support** may support clinical decision-making to improve disease diagnosis or risk prediction and personalise treatment plans. It encompasses machine learning algorithms, natural language processing and deep learning models, to efficiently analyse data, extract insights and augment clinical decision-making across various conditions, including cancer, cardiovascular disease, musculoskeletal disease and neurocognitive disorders.[3]

Enhancing Clinical Decision Making

Diagnostic and predictive AI tools generally serve as an adjunct to current standard care, especially when limited manpower and expertise are barriers to timely and accurate interpretation of images or test results. In a systematic review investigating the use of AI in clinical practice, 81% of trials reported positive endpoints related to diagnostic yield or performance.[4]
Evidence further suggested that AI tools may offer increased accuracy and reduced time and costs related to care while minimising human errors.[5] AI also has the potential to reduce cognitive burden on healthcare workers, improve workplace efficiency through automating tasks and streamlining workflow, and enhance patient engagement in the care process via improved patient education and virtual assistance.[6]

Advancing Personalised Medicine & Genomics

The advent of high-throughput genomic sequencing technologies, combined with advancements in AI and machine learning, has laid a strong foundation for accelerating personalised medicine. With this combination, examining extensive genomic datasets allows these techniques to detect intricate patterns often elusive to manual analysis. In the field of oncology, categorising cancers into clinically relevant molecular subtypes has shown great promise, holding substantial implications for diagnosis, prognosis, and treatment selection.[5]

Implementation Challenges and Future Growth

Despite its potential to revolutionise healthcare if successfully integrated, the true value of AI remains to be continuously validated as its impact on patient-centred outcomes, beyond improvement in diagnostic performance, may not always be clear. Lack of quality medical data, along with insufficient representation of the broader population, can lead to inaccurate outcomes, and present one of the challenges to realising the full potential of AI. Moreover, the adoption of such AI technologies would require IT system interoperability (e.g. standardisation of data format, cloud infrastructure), addressing data privacy and cybersecurity risks (e.g. compliance with PDPA, establishing data governance policies) as well as potential liability and malpractice concerns (e.g. establishing best practices for AI use).
The global AI in diagnostics market is expected to grow from USD $1.7 billion in 2022 to USD $12.7 billion by 2034, representing a compound annual growth rate (CAGR) of 24.6%.[7] In Singapore, the local AI in healthcare market is expected to grow from USD $0.01 billion in 2022 to USD $0.17 billion by 2030, representing a CAGR of 45.8%.[8]

Driving Better Decision-Making in Healthcare

Examples of AI in Clinical Decision Support Technologies include:

- **KardiaMobile**, a portable electrocardiogram (ECG) monitor that captures ECG recordings and analyses them by the KardiaAI algorithm for classification of possible atrial fibrillation (AF). Its portability and ease-of-use offers advantages over conventional methods of AF detection, such as 12-lead ECG or Holter monitors, which are restricted by their limited time of surveillance. ACE has previously assessed the ability of KardioMobile in detecting AF. It showed that, in patients with suspected AF referred for ambulatory ECG monitoring, KardioMobile improved AF detection at an earlier time point when compared to standard care. However, careful patient selection is critical to avoid unnecessary healthcare utilisation due to abnormal findings resulting from unreadable or poorly recorded ECGs.

- **Paige Prostate Detect**, an AI software that can support pathologists in identifying suspicious foci for cancer during review of whole slide images from prostate needle biopsies. ACE assessed Paige Prostate Detect to be safe and may improve sensitivity of diagnoses, turnaround time and healthcare resource utilisation. Key limitations include the lack of prospective validation when implemented into routine clinical practice and unclear impact of the software on patient outcomes. New evidence from some ongoing real-world evidence may address the gap.

- **Rapid**, a neuroimaging platform with multiple modules that uses AI to process brain scan images and also provides summary maps to aid clinicians in the diagnosis and treatment of patients with a suspected stroke. ACE's assessment of Rapid identified limited evidence for most Rapid modules, which generally showed moderate to good sensitivity and negative predictive value when used to assist the diagnosis of stroke. However, specificity and positive predictive value vary substantially between studies, reflecting a potentially high false positive rate.

Benefits:

- Enhances clinical decision-making with increased accuracy, reduces time/cost, minimises errors, improves workflow efficiency, and better patient engagement across multiple medical conditions.

Limitations:

- Impact on patient-centered outcomes beyond diagnostic performance remains unclear, requiring continuous validation and comprehensive clinical studies.

Implementation challenges:

- Insufficient quality and representativeness of medical data, IT system interoperability requirements, data privacy concerns, cybersecurity risks, and unresolved liability issues.

TOP 9 TRENDS

Biodegradable Implants

Implants are placed inside or on the surface of the human body, and temporary implants are generally removed after the recovery process. However, infections, excessive fibrosis, persistent inflammation, or bone degradation by stress shielding can make implant removal difficult.[9] **Biodegradable implants** are designed to be absorbed by the body over time, eliminating the need for removal surgeries. Avoiding a second surgery could reduce surgery-related complications and optimise healthcare utilisation.

Clinical Applications of Biodegradable Orthopaedic Implants

Biodegradable materials are often used in orthopaedic surgery as fixation materials, filling materials, and temporary support structures. The ability of biodegradable orthopaedic implants to prevent and tackle implant-associated infections by hindering the development of bacterial biofilms is promising.[10] This is achieved through the intrinsic antibacterial activity of some metallic implant elements (e.g. Mg- and Zn-based alloys), or for other biopolymers and hydroxyapatite-based implants, through the innovative coatings or other components within the implant core structure being loaded with antibacterial properties.[10] However, a narrative review reported similar or, sometimes, worse short-term outcomes between biodegradable implants and conventional treatment options for orthopaedic surgeries.[11] In some cases, the surgical techniques for biodegradable implants may also be more demanding and time-consuming than conventional methods.[11]

Evolution of Bioresorbable Stents in Cardiovascular Disease

Cardiovascular conditions are another key area of growth with the development of bioresorbable stents. These stents are designed to provide the short-term benefit of a permanent stent to patients with coronary artery disease which then completely resorb, allowing for recovery of vasomotor and endothelial function. However, across two independent meta-analyses, drug-eluting stents were shown to be safer and more effective compared to bioresorbable vascular stents (BVS), with less risk of target fusion failure, stent thrombosis and cardiac death.[12] Newer generations of BVS, using different bioresorbable materials, aim to address the suboptimal performance of polymer BVS. Additionally, research for the ideal metallic BVS stent material continues, and further clinical validation is required.[13]

Benefits:

- Eliminates need for removal surgeries, reduces complications including microbial implant infection, and optimises healthcare resources.

Limitations:

- Current evidence indicates that bioresorbable implants perform similarly or, sometimes, worse than conventional options in the short term. Newer generations of bioresorbable implants intend to address the limitations.

Implementation challenges:

- More demanding surgical techniques, expensive development process, challenging clinical translation, and limited applications beyond orthopaedics and vascular use.

Implementation Challenges and Future Growth

Despite substantial advances and some promising results for both orthopaedic and vascular implants, their development is still at an early stage. Current evidence to support the claimed benefits of biodegradable implants is limited, with some biomaterials shown to perform worse than expected and are not recommended for clinical use. These emphasise the need for high-quality clinical studies.[11] The process of developing novel absorbable materials and their clinical translation is time-consuming, expensive, and challenging. A broader clinical applicability for biodegradable implants beyond orthopaedic and vascular uses also needs to be demonstrated.

The global biodegradable implants market size is expected to grow from USD $5.2 billion in 2023 to USD $ 10.3 billion in 2031, representing a CAGR of 8.9%.[14] In Singapore, the local biodegradable implants market size is expected to grow from USD $78 million in 2022 to USD $121.2 million by 2030, representing a CAGR of 6.5%.[15]

Examples of Biodegradable Implant technologies include:

- **ACTIfit**, a synthetic implantable scaffold for partial meniscus loss or knee joint damage. The combination of its polymer's honeycomb structural design and strength promotes the in-growth of new tissues and results in a newly vascularised and functional meniscus.

- **RemeOs Screw**, an absorbable osteopromotive product based on naturally occurring essential metals in the human body, that forms a temporary support for fractured bones to ensure safe healing and allows the bone to reach its normal strength as the implant is resorbed.

- **Freesolve Resorbable Magnesium Scaffold (RMS)**, a new generation RMS that features the biodegradable BIOmag magnesium alloy as an alternative to drug-eluting stents. It is designed to maximise blood flow and minimise the post-implantation risks of stent thrombosis and target lesion revascularisation.

TOP 9 TRENDS

Blood-based Biomarkers for Screening and Diagnosis

Blood-based biomarkers for screening and diagnosis involve using minimally invasive blood tests to detect specific proteins or other molecules. They offer an accessible alternative to traditional diagnostic methods, which may be expensive and invasive. By improving convenience and accessibility, blood-based biomarker testing provides the potential for earlier diagnosis, monitoring, and timely interventions. The identification of biomarkers in biological samples has played a critical role in personalised medicine, enabling risk stratification in refining and individualising management plans, leading to improved health outcomes and reduced healthcare costs.[16, 17] Some blood-based biomarker testing may also provide a valuable tool in primary care settings, facilitating early detection and timely referrals, ultimately enhancing patient care.

Emerging Role of Blood-Based Biomarkers in Alzheimer's Disease

Active research is ongoing in blood-based biomarkers for dementia. Some biomarkers (e.g. amyloid-beta and tau proteins) have shown promise for improving the diagnosis of Alzheimer disease (AD), which currently requires the analysis of core cerebrospinal fluid biomarkers obtained via lumbar puncture, or advanced imaging techniques, such as positron emission tomography. Systematic reviews highlighted the diagnostic value of these biomarkers in distinguishing AD and mild cognitive impairment from cognitively normal individuals.[18, 19] They complement existing diagnostic tools, offering additional value from a blood-based perspective.[18] Ongoing research is also exploring their potential as screening tools to guide drug treatments across various stages of AD.[20] Validated biomarkers can reveal disease-specific pathologies in vivo, enabling better treatment selection, assessing target engagement and enhancing treatment efficacy.[21] However, studies have highlighted that other proteins may strongly interfere with the estimation of AD biomarkers, necessitating highly sensitive and specific assays for more accurate detection.[22]

Expanding Potential of Blood-Based Biomarkers in Cancer Management

Although some tumour molecular profiling from blood samples is already playing an important role in the clinical management of advanced cancers (e.g. circulating tumour DNA [ctDNA] for metastatic lung cancer), the research extending their potential for early cancer detection or screening has grown exponentially.[23] Among the broad range of biomarkers recently investigated, some of the most promising biomarkers include ctDNA, non-coding RNAs (e.g. micro-RNAs and circular-RNAs), aberrant gene methylation, proteins, and antibodies markers (as single-or multi-marker panels).[23-25] For example, micro-RNA marker panels are showing results in detecting pancreatic and colorectal cancer; methylated Septin 9 gene is significantly associated with risk of colorectal cancer, and P16, DAPK, MGMT, and APC genes with non-small-cell lung cancer (NSCLC). Further, the methylation patterns of ctDNA have also demonstrated potential for early detection of multiple cancers.[23, 24, 26, 27] However, most single- or multi-marker panels lack sufficient accuracy to replace conventional diagnostic methods and should currently be used as supplementary tools.[23, 24] Even among the most promising biomarkers, limited prospective validation of their associations can limit their clinical implementation as risk-stratification or screening tools.

Driving Better Decision-Making in Healthcare

Implementation Challenges and Future Growth

Several challenges currently limit the clinical utility of blood-based biomarkers for screening and diagnosis. The overall quantity of some biomarkers is generally lower in plasma or serum compared to other genetic material, making them more difficult to be detected in patient-derived blood samples. There is also the risk of over-fitting and chance findings. Other challenges include the need for centralised labs, skilled technicians, standard quality controls, and scalable methods for rapid and consistent testing and result interpretation.[28] Additionally, variations in sample handling and the influence of comorbidities can further compromise the interpretation of test results.[17, 28] Advancements in testing techniques may help overcome some of these challenges by providing powerful high-throughput screening methods, such as next-generation sequencing and multiplex electrochemical detection techniques incorporating nanomaterials. These technologies have the advantage of detecting more than one specific biomarker at a time, with short analysis times, low detection limits from small biological samples, low consumption of reagents, and with progressively lowered cost.[25, 29] Large prospective studies are needed to validate the performance of various biomarkers, assess their real-world applicability, and guide clinical adoption.[24]

Integrating blood-based biomarkers into clinical practice necessitates a comprehensive evaluation of the entire diagnostic and therapeutic pathway. This includes their use in conjunction with other diagnostic modalities for accurate disease identification and the economic implications of high-cost, disease-modifying therapies post-diagnosis. The global blood-based biomarkers market is expected to grow from USD 7.9 billion in 2025 to USD 11.6 billion by 2030, representing a CAGR of 7.2%.[30]

Benefits:

- Offers accessible, minimally invasive screening and diagnostic options that facilitate potential for early detection and personalised care across various healthcare settings.

Limitations:

- Technical challenges in detection accuracy and further prospective validation needed before clinical implementation.

Implementation challenges:

- Requirements for specialised facilities and expertise, lack of standardisation in testing and interpretation, and quality control needs.

Examples of Blood-based Biomarkers for Screening and Diagnosis technologies include:

- **PrecivityAD test**, a minimally invasive blood test that produces an Amyloid Probability Score (APS) by combining information from plasma Aβ42/40 ratio, ApoE genotype and age to predict the likelihood of brain amyloidosis. ACE has previously assessed the PrecivityAD test in patients who are experiencing cognitive impairment and considered that it demonstrated good discriminative accuracy to identify the relevant biomarkers. However, significant implementation issues exist such as standardisation of the test, lack of agreed cut-off thresholds for the tests and efficient testing platform, requirements of skilled operators, and high cost. Further evidence on clinical utility for patients with mild cognitive impairment is needed.

- **Guardant360 CDx**, a liquid biopsy test that detects genetic mutations in circulating tumour DNA. The test can be used for patients with NSCLC with specific mutations who may benefit from targeted therapy or as a comprehensive genomic profiling tool for all solid malignant neoplasms. Based on ACE's assessment in patients with locally advanced or metastatic NSCLC, Guardant360 CDx was found to be safe and effective if used together with tissue-based tests. However, results are limited by the applicability of findings to low-prevalence mutations and varying clinical judgement in interpreting results, highlighting the importance of staff training.

Driving Better Decision-Making in Healthcare

TOP 9 TRENDS

Contactless Patient Monitoring

Advances in camera and sensor technologies have led to increased use of **contactless patient monitoring** in healthcare settings. When paired with AI and digital health, it allows for continuous, non-invasive and remote monitoring of a patient's vital signs or other parameters, and can also be used to track motions for fall prevention. It mitigates traditional routine physical measurement in confined medical settings, which requires significant manpower and resources and may potentially spread contagious disease as well as cause disruption or discomfort to patients. Contactless patient monitoring may free up manpower for high-value tasks, helping to address growing overhead costs in healthcare.

Revolutionising Standards in Patient Monitoring

Contactless patient monitoring has been used in infection control, in challenging settings and when long-term monitoring is required such as newborn monitoring, intensive care unit (ICU) care, elderly care, mental health, home monitoring and rehabilitation training.[31] Most commonly monitored vital signs include heart rate, temperature, respiratory rate and oxygen saturation. Although promising, the evidence for use is still emerging. Across two systematic reviews, contactless vital sign monitors were found to be accurate in measuring heart rate. However, more research is required to assess the accuracy of contactless blood pressure and respiratory rate measurements, especially in clinical settings where abnormal vital signs are present.[32, 33]

Current research primarily focuses on developing contactless measurement algorithms for a single parameter or two closely correlated parameters. The development of a large-scale AI model capable of multiple tasks, that can simultaneously measure multiple physiological signals, holds significant potential for clinical application and represents a promising direction for future research.

Implementation Challenges and Future Growth

Before widespread implementation, some technology barriers such as motion, poor lighting and manual face tracking will need further development to improve measurement accuracy. Consumer-grade contactless monitors over specialised devices may also encourage patients and their families to take greater ownership of their personal healthcare while lowering the cost of care. Other implementation considerations include integrating collected data with existing hospital and IT systems, addressing privacy and data security concerns, and ensuring scalability. Setting-specific considerations such as the target care setting or infrastructure can be important considerations when deciding adoption. For example, shared wards may not support contactless monitoring.

The global market size for contactless patient monitoring devices is projected to grow from USD $50.4 billion in 2024 to USD 203.7 billion by 2032 at a CAGR of 19.1% over the forecast period.[37] In Singapore, the local contactless patient monitoring software and services market is projected to grow from USD $103.3 million in 2023 to USD $725.2 million by 2030 at a CAGR of 32.1% over the projected period.[34]

Examples of Contactless Patient Monitoring technologies include:

- **Oxevision**, a vision-based patient monitoring management system designed for mental health care. Using an infrared camera, it serves as an adjunct to usual care by enabling remote and periodic non-contact monitoring of patients' movements, vital signs, and sleep activity in a single occupancy ward environment. The software comprises a suite of modules that can monitor a patient's pulse and breathing rate, provide activity and location-based alerts and sleep activity. ACE's assessment showed that Oxevision resulted in a significant reduction in self-harm incidents and in night-time falls, with potential cost savings for the healthcare system. However, its use may be limited by the requirement for single-occupancy wards.

- **Gili Pro Biosensor**, a system that uses optical sensors and infrared light to remotely capture micro-movements on the skin. Software algorithms analyse the changes, which correlate with a person's pulse rate, heart rate, respiratory rate and breathing rate.

Benefits:

- Continuous, non-invasive and remote monitoring of vital signs while reducing infection risk, staff burden, and healthcare cost.

Limitations:

- Lacks robust clinical validation for multiple vital signs beyond heart rate, with accuracy concerns for abnormal measurements and limited capability for simultaneous multi-parameter monitoring.

Implementation challenges:

- Technical challenges (motion artifacts, lighting conditions, and face tracking limitations), system-integration needs, privacy concerns and setting-specific constraints.

TOP 9 TRENDS

Digital Therapeutics

Digital Therapeutics (DTx) are evidence-based therapeutic interventions delivered via software to prevent, manage, or treat a medical condition.[35] DTx leverage digital platforms to enable remote and scalable delivery of personalised, data-driven care, thereby encouraging patient engagement and treatment adherence. Although part of the digital health domain, DTx differ from diagnostics, telehealth, and other digital health products. They often target conditions managed poorly by the healthcare system, such as diabetes, and mental and neurological disorders, mainly via driving and supporting behavioural modifications to optimise patient care.[36] DTx either complement and add value to the traditional healthcare delivery system, or have the potential to significantly replace the existing system.[37]

Extending Healthcare Through Digital Technologies

One of the key applications of DTx is the delivery of cognitive behavioural therapy (CBT) through mobile applications to manage symptoms. CBT delivered as DTx has shown promising results over alternative therapies for treating patients with anxiety or depressive disorders.[37, 38] Another area of interest is the ability of DTx to drive large-scale behavioural change. Studies show that DTx-based behavioural-change interventions targeting education, diet and exercise, through personalised coaching and peer-group support, have the potential to reduce the risk of developing type 2 diabetes.[37] This has led to the development of similar DTx-based lifestyle-change and diabetes-prevention programs, which are approved and recognised by the US Centres for Disease Control and Prevention.[37]

Improving Treatment Adherence and Care Delivery

Additionally, DTx can integrate continuous physiological monitoring, symptom tracking, and medication management to optimise treatments. Evidence showed that DTx improved medication adherence, enhancing the effectiveness and outcomes of conventional pharmaceutical therapies.[37, 39] With advancements in remote monitoring and the capability to make real-time adjustments, DTx can enable physicians to deliver individualised, efficient care remotely while reducing the need for frequent in-person consultations.[36] It may also enhance the efficiency of care in primary care settings, where physicians can leverage DTx to bridge treatment gaps by offering accessible and affordable interventions, thereby encouraging patients to work with them to achieve better health outcomes.

Benefits:

- Deliver evidence-based, personalised interventions, enabling scalable treatment solutions for poorly managed conditions while enhancing patient engagement and care outcomes.

Limitations:

- Lack of robust evidence and regulatory harmonisation impede adoption rates.

Implementation challenges:

- Absence of reimbursement framework, technical barriers in IT integration, data privacy and cybersecurity risks, digital literacy gaps, and the need for comprehensive clinical governance frameworks to ensure appropriate use.

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Implementation Challenges and Future Growth

DTx represent an emerging category of treatment approaches, but their widespread adoption is hindered by the absence of defined regulatory and reimbursement frameworks in many countries to ensure usability, accessibility and sustained implementation.[40] Limited robust evidence and lack of regulatory harmonisation across jurisdictions contribute to continued scepticism for adoption among healthcare professionals, low health literacy and low confidence among patients. [35, 40]

Successful implementation of DTx would require addressing IT system interoperability (e.g. standardising data formats, integrating with existing healthcare infrastructure), data privacy and cybersecurity risks (e.g. compliance with regulatory standards, establishing data governance policies), and bridging digital literacy gaps (e.g. ensuring accessibility for older patients). Additionally, clinical governance frameworks will need to be established to ensure safe and appropriate use of DTx in alignment with their intended purpose.

The global DTx market size is expected to grow from USD $7.9 billion in 2024 to USD $56.8 billion by 2034, representing a CAGR of 21.8%.[41] In Singapore, the local DTx market size is expected to grow from USD $893 million in 2025 to USD $1.3 billion by 2029, representing a CAGR of 9.3%. [42]

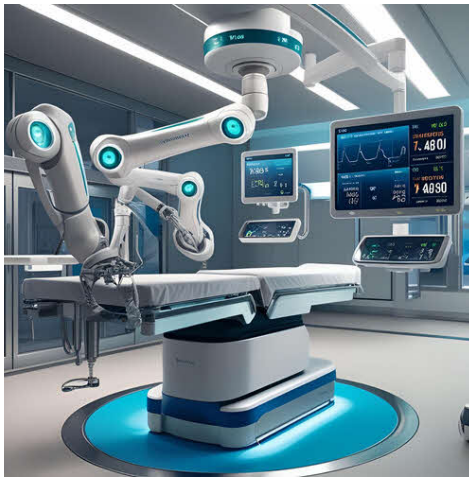
Examples of DTx technologies include:

- **AspyreRx**, a prescription digital behavioural therapeutic device, provides CBT in addition to standard of care, to people with type 2 diabetes. CBT is delivered weekly through a mobile application, in a step-by-step process to help patients improve glycaemic control.

- **Nerivio**, a drug-free digital therapeutic wearable that delivers remote electrical neuromodulation for the acute and preventive treatment of migraine, with or without aura. ACE has previously assessed Nerivio and showed that it appears to be a safe, effective (e.g. pain relief and reduction in migraine days per month) and well-tolerated non-pharmacological modality for acute and preventive treatment for migraine in both adults and adolescents.

TOP 9 TRENDS

Minimally Invasive Interventions



Open surgeries are complex procedures carrying inherent risks that may negatively impact patient experience and recovery. Some individuals with multiple comorbidities may also be inoperable or at high risk for mortality when undergoing open surgery. **Minimally Invasive Interventions** are technologies that provide a less-invasive alternative to traditional open surgical procedures. Primarily performed via laparoscopic or robotic systems, they can enhance surgeon precision and agility during procedures. These MIS have transformed surgical approaches, including for oncological, spinal, neonatology and paediatric surgery.[43, 44]

Benefits:

- Advancing surgical approaches, minimally invasive interventions demonstrated short-term advantages including reduced hospital stay, fewer conversions to open surgery, and quicker return to daily activities.

Limitations:

- Uncertain long-term outcome and cost-effectiveness.

Implementation challenges:

- Require physical adaptation to new technology, substantial workflow reorganisation, specialised training, significant capital expenses, and behavourial changes among healthcare personnel to integrate systems into standard care pathways.

Reduced Complications and Shorter Recovery Time

By shortening recovery times and lowering complication rates, minimally invasive interventions have the potential to improve clinical outcomes and reduce healthcare costs.[45] A systematic review of oncological procedures showed that, despite longer procedure times, robotic-assisted surgery (RAS) had short-term benefits such as shorter hospital stays, lower blood transfusion rates and fewer conversions to open surgery.[43] Additionally, readmission and mortality rates at 30 days were lower for RAS versus both laparoscopic and open surgeries, while reoperation rates were lower for RAS compared to open surgery. These minimally invasive interventions have the potential to offer short-term benefits including enhancement of overall patient experience by enabling faster recoveries, less post-operative pain, and quicker return to daily activities.[45]

Increased Procedure Precision

Robotic surgical systems for orthopaedics are classified as open or closed. These classifications influence surgical specificity and precision, and the brands and models of implants compatible with the system.[46] Evidence showed that robotic technology can improve procedural precision and accuracy, particularly for hip and knee arthroplasty and spinal surgery, through precision component placement and alignment with 3D planning.[47, 48] For certain complex procedures, robotic technology allows surgeons to acquire key skills more quickly with a more friendly learning curve compared to traditional laparoscopic surgery.[45] However, the longer-term patient outcomes of robotic surgery, such as survival, remain to be validated.

Implementation Challenges and Future Growth

Despite the benefits of minimally invasive interventions, their cost-effectiveness remains uncertain when compared to standard of care, especially for RAS. This is primarily due to the prohibitive capital investment and maintenance costs associated with these systems.[49] For successful implementation of minimally invasive interventions, it is necessary to carefully consider the financial investment, physical adaptation to the new technology, and a shift in organisational workflow, human processes and behaviours to operate with the latest systems. Specialised training and education are essential to ensure its safe and effective use.[44] Training is often model- or brand-specific and requires significant capital investment. Healthcare organisations would also need to adjust workflow and upgrade infrastructure to integrate these systems into standard care pathways, requiring additional resources and organisational changes. While MIS may involve high upfront and ongoing expenses, advancements in the field with multiple competitive technologies may eventually improve efficiency, and over time potentially reduce the overall costs.

The global MIS market size is expected to grow from USD $47.5 billion in 2024 to USD $89.9 billion by 2032, with a CAGR of 8.3%.[50] In Singapore, the local MIS market size is expected to grow from USD $1.4 billion in 2022 to USD $2.1 billion by 2031, with a CAGR of 4.4%.[51]

Examples of Minimally Invasive Interventions include:

- **Symani Surgical System**, a flexible platform consisting of two robotic arms that can be easily positioned to facilitate surgical procedures across any anatomical region, even in the smallest vessels. Symani Surgical system is indicated for soft tissue manipulation and has broad applications that span multiple specialties, including reconstructive, lymphatic and vascular surgery. The innovative design with small wristed instruments, combined with tremor-reducing and motion-scaling technologies, is optimised for ease of use and set-up for both the surgeon and surgical team.

- **Vertebral body tethering (VBT) system** is a non-fusion, dynamic treatment for paediatric scoliosis. It uses an external magnet controller that enable non-surgical adjustments of spinal curvature over time via a flexible cord (a tether) connected to metal anchors placed to the vertebrae on the side of the spine that curves outward. This approach offers adolescents a flexible alternative to spinal fusion surgery, preserving natural spinal motion.

TOP 9 TRENDS

Point-of-care Testing

Point-of-care Testing (POCT) generally refers to tests taken at a site of care outside of the conventional laboratory setting, allowing results to be acted upon immediately at the time of consultation.[52] This technology has the potential to ease demand on conventional laboratories and provide timely guidance in clinical decision-making. Many point-of-care tests are simple to use and can be performed without specialised training and in a variety of care settings, including primary and emergency care, non-clinical settings, or even for self-testing by non-medical personnel. This flexibility provides greater convenience for the end-user and potential cost-savings for health systems as POCT tends to be less expensive compared to laboratory testing.

Accelerating Care Decisions

POCT is undergoing rapid advancement in the emergency department (ED) where time is especially critical. A systematic review examined POCT use in the ED which included various panels such as cardiac parameters, echocardiography, polymerase chain reaction, and ultrasound. The review found that all POCT use was associated with a quicker decision-making process, although reduced time to appropriate interventions was not consistently reported. This highlights the need for treatment confirmation, which is a factor that is limiting the application of POCT, especially in newer tests.[53] However, when used effectively and in the appropriate context, POCT has the potential to expedite treatment initiation, improve outcomes, increase timely patient discharge rates and decrease total length of stay.[54] Continual advances in POCT for complete blood count, pregnancy testing, infectious diseases, and cancer screening may also improve the quality of pre-hospital and hospital emergency care.[54]

Transforming Clinical Practice Across Care Settings

POCT can transform care across tertiary to primary care settings. Point-of-care ultrasound (POCUS) in internal medicine is gaining interest as an alternative to more invasive options. One example is left ventricular ejection fraction (LVEF) assessment using echocardiography which is traditionally performed by experienced cardiologists or sonographers. A systematic review found that cardiac POCUS, when performed by clinicians without specialised expertise in cardiac ultrasound, was an accurate complementary tool for assessing LVEF.[53] Another systematic review also reported that use of POCUS appeared to have positive effects on the clinical decision-making process, with higher diagnostic accuracy of clinical evaluation, more appropriate patient management and possible reduction in further imaging investigations and hospital length of stay.[55] Higher patient satisfaction due to greater convenience was reported with POCTs than conventional laboratory testing, with immediate feedback of the test results contributing to both improved disease management and strengthened relationship with their general practitioners. [56]

Implementation Challenges and Future Growth

The use of POCT can be influenced by various healthcare professional- and patient- related factors, particularly in complex primary care settings. Despite its relative simplicity and convenience, POCT may be more prone to error and may be less accurate than standard laboratory testing. Improper use of POCT, such as lack of proper quality control and training of healthcare professionals on the use and interpretation of POCT results, may produce false results, potentially leading to adverse health consequences.[57] Studies also highlighted concerns on the use of POCT, such as uncertainty of its added value, potential inappropriate use of POCT, the impact on existing workflows, misalignment of POCT results with clinical assessments, together with patient concerns on the motivation and cost of POCT. Successful implementation of POCT would benefit most from a multi-faceted approach that addresses these various concerns. Developing context-specific guidelines for appropriate use, reorganising care workflows, training healthcare professionals, and establishing reimbursement and incentive schemes would help to ensure the optimal integration of POCT into standard clinical practice.[56, 57]

The global POCT market size accounted for USD $44.3 billion in 2023 and is estimated to increase to USD $80.8 billion by 2033, with a CAGR of 6.2%.[58]

Examples of POCTs technologies include:

- **CorVista System**, a POCT that couples machine learning with a patient's cardiac and hemodynamic signals to evaluate both coronary artery disease and pulmonary hypertension in a single visit.

- **DermaSensor**, a small, hand-held non-invasive device that takes instant spectroscopic recordings of cellular structures beneath the skin's surface. Combined with AI, it promptly analyses the spectral data to assess if suspicious skin lesions are benign or malignant.

- **FloBio's Bleeding Risk Diagnostic Test**, a device that combines haemodynamic flow and discrete clot activation to mimic physiological blood clotting and rapidly produce a comprehensive direct oral anticoagulants (DOACs) drug assessment at the patient's bedside to determine blood clotting status and whether a patient is on DOACs. The information could be helpful in the ED, where informed treatment decisions need to be made on drug reversal to reduce serious bleeding.

Benefits:

- Accelerates clinical decision-making, potential for expedited treatment initiation, expands diagnostic capability for non-specialists across care setting, and improves patient satisfaction.

Limitations:

- May be more prone to error than standard laboratory testing, with uncertainty regarding its added clinical value particularly with newer tests requiring confirmatory testing.

Implementation challenges:

- Requirement of quality control protocols, staff training on use and interpretation of test result, and workflow reorganisation.

TOP 9 TRENDS

Virtual and Augmented Reality

Virtual and Augmented Reality (VR/AR) encompasses two key technologies. Virtual reality (VR) involves the use of a specialised headset to fully immerse the user in a simulated environment. This creates the perceptual experience of being physically situated in a synthetic 3-dimensional (3D) virtual space.[59] Augmented reality (AR) connects to VR and displays a real-world environment, in the form of a live video, where the user can interact with the help of haptic (touch) feedback and audio and visual stimuli.[59] VR/AR are rapidly gaining traction in healthcare, offering transformative opportunities for medical education, patient care, and therapeutic interventions. With the simulation of real-world environments, VR/AR offers a safe, highly realistic and interactive learning environment for healthcare professionals and patients alike to practice tasks that would otherwise not be feasible in real-world settings.

Education and Training

VR-based education and training can facilitate effective learning by creating a highly realistic and interactive learning environment via intuitive 3D visualisations of anatomical structures. Studies report improvements in technical performance, procedural speed, user skills and self-confidence.[59] The ability of VR to provide visual, auditory, or haptic feedback also allows patients to make adjustments in response to positive or negative feedback during task performance. Positive feedback linked to successful task performance can further motivate and encourage treatment adherence.[63] VR/AR is used to enhance, rather than replace, the human elements in healthcare. Promoting independence and self-directed use of VR at home can enable patients to access on-demand VR/AR interventions. This approach empowers patients to take an active role in managing their symptoms.[68]

Applications in Mental Health and Physical Rehabilitation

Mental health and cognitive rehabilitation are key areas where VR/AR has demonstrated some benefits.[60-62] VR has been utilised to treat physical and cognitive impairments. Systematic reviews have shown a positive impact for VR comparable to standard therapies for some psychiatric disorders, with more mature evidence observed for posttraumatic stress disorder and anxiety disorders.[63-65] However, VR therapeutic interventions in other areas of psychopathology, such as obsessive-compulsive disorders or depression, remain less mature.[64] Similarly, VR-based diagnostic tools are still in the proof-of-concept stage but show promise, particularly for cognitive assessment. Studies validating VR-based cognitive evaluations suggest these tools could become the future standard for neuropsychological testing, offering a more interactive alternative to traditional assessment methods.[66] VR therapies have also demonstrated improved outcomes for enhancing balance, gait, and mobility in older adults compared to minimal intervention or usual care.[63] VR may also help patients with neuro-cognitive disorders, when used as cognitive rehabilitation to improve memory, dual tasking and visual attention. VR/AR has also been shown to be effective in alleviating stress, anxiety and length of hospitalisation in preoperative, ICU and rehabilitation settings by enhancing patient comfort and engagement.[59, 65, 67]

Driving Better Decision-Making in Healthcare

Implementation Challenges and Future Growth

A potential strength of VR is its scalability and accessibility. With minimum additional equipment (e.g. VR headsets), modern smartphones can be transformed into VR devices, potentially with minimal additional costs, enabling widespread distribution.[64] VR can also facilitate remote care, such as in telemedicine, reducing the demand for in-person clinical visits.

VR/AR research is in its early stages. Validity of observed results are currently limited due to heterogeneity in intervention protocols, inconsistent evaluation tools, and lack of standardisation in hardware/software. Other challenges such as data privacy, incompatibility with electronic health records and poor cost-effectiveness are hindering its clinical adoption. Addressing these limitations is essential to enable the routine clinical implementation of these technologies.

The global VR/AR market size accounted for USD $2.85 billion in 2023 and is estimated to increase to USD $16.14 billion by 2033, with a CAGR of 18.89%.[69] In Singapore, the local VR/AR market size accounted for USD $174.9 million in 2025 and is estimated to increase to USD $237.6 million by 2029, with a CAGR of 7.96%.[70]

Examples of VR/AR Technologies include:

- **RelieVRx**, a three-dimensional VR therapy delivered as part of an eight-week treatment program. It incorporates principles of behavioural therapy and mindfulness strategies to treat patients diagnosed with chronic pain. Based on early evidence, ACE assessed RelieVRx as promising in relieving pain and pain-related outcomes with improvements sustained up to 24 months post-treatment, despite potential adverse effects such as dizziness, vertigo and nausea. However, current evidence is confounded by a lack of comparison with standard care including background medications used. Additional evidence addressing its impact on healthcare utilisation and cost is anticipated within the next one to two years.

- **GammaSense**, a non-invasive sensory stimulation system that treats Alzheimer disease by stimulating gamma oscillations in the brain with a headset, improving cognitive functions, and slowing cognitive decline.

- **Altoida's Alzheimer's-predicting smartphone app**, a program that measures and analyses cognitive and functional aspects of brain health through a 10-minute series of AR and motor activities that simulate complex activities of daily living.

Benefits:

- Offers potential for medical education, patient care, and therapeutic interventions especially in areas of mental health and physical rehabilitation.

Limitations:

- Despite early promise, VR/AR lack standardised protocols with limited evidence for emerging applications.

Implementation challenges:

- Data privacy concerns, barriers to electronic health records integration, uncertain cost-effectiveness, and the need for hardware/software standardisation.

Driving Better Decision-Making in Healthcare

TOP 9 TRENDS

Wearable and Sensors

Wearables and sensors are devices worn on or close to the body that can continuously monitor health parameters and deliver real-time data to patients and healthcare providers. The devices provide monitoring in a remote, often non-invasive, and for some, wireless manner. Rapid advancements in this space, coupled with AI technology that can recognise patterns and generate meaningful findings from the enormous volume of information collected, have led to the integration of wearable devices in everyday life. A wide range of wearables are being researched or applied in clinical practice, such as commercial devices (e.g. continuous glucose monitors, smartwatches), customised wearable electronics (e.g. thermal or mechanical sensors) and customised flexible electronics (e.g. smart contact lenses, wearable bioelectrodes such as ECG). Wearables can provide health status updates to a patient, caregiver or healthcare provider in real-time, which can facilitate more timely interventions. The continuous and detailed data collection offers a comprehensive and precise view of patients' health, enhancing treatment planning and decision-making. Data from wearables can also be used to oversee and monitor patient outcomes for chronic disease management or to facilitate disease prevention such as weight management or physical activity monitoring.

Application in Cardiovascular and Chronic Disease Management

Wearable devices have shown some benefits for cardiovascular disease management through continuous monitoring of vital signs. This can enhance patient engagement and facilitate timely interventions, with various studies indicating potential benefits such as improvements in daily walking activity, physical capacities, atrial fibrillation detection, and management of heart failure and diabetes.[71, 72] However, some of the findings are currently mixed, potentially related to study heterogeneity in terms of design and intervention/control protocols, and are limited to short-term data.[72] Other clinical areas where wearables and sensors may offer potential benefits include diabetes (e.g. continuous glucose monitors), epilepsy (e.g. detection of seizures), depressive disorders (e.g. monitor changes in behaviour or symptoms), Parkinson disease (e.g. early diagnosis and long-term monitoring) and upper musculoskeletal conditions (e.g. quantification of movement), although there remains a need for further research and larger trials.[73-76]

Shifting Care Models from Clinical Settings to Home Monitoring

With the continuous proliferation of wearables in healthcare, management may increasingly shift outside traditional clinic settings to the home. This shift may improve healthcare resource allocation, with fewer staff needed for routine monitoring as well as reduced in-person visits. The integration of wearable-collected data may enable better coordination among multi-disciplinary teams, allowing a holistic approach to patient care. The shift towards proactive and preventive healthcare may also transform care models, leading to the development of new care pathways that incorporate wearable and sensor data.

Implementation Challenges and Future Growth

Despite the rapid and large-scale emergence of wearables, clinical evidence supporting their performance, safety and cost-effectiveness is limited. This reflects the lack of robust clinical evidence, methodological constraints, and variability across healthcare settings.[77] Future directions include the development of multifunctional and integrated platforms. There are also efforts to construct reliable closed-loop systems for both diagnosis and treatment. Data privacy and cybersecurity are critical considerations that must be addressed before widespread clinical adoption.

The global wearable sensors industry is projected to grow from USD 1.57 billion in 2024 to USD 3.96 billion by 2032, with a CAGR of 12.28% during the projected period (2024 - 2032).[78]

Benefits:

- Real-time health monitoring with wearables and sensors improves healthcare delivery through early disease detection and management, timely interventions, data-driven treatment planning and shifting care to home settings.

Limitations:

- Evidence limited by short-term data, methodological constraints and variability across various healthcare settings.

Implementation challenges:

- Data privacy and cybersecurity concerns, need for healthcare system integration, and requirement for reliable closed-loop systems before widespread clinical adoption.

Examples of Wearables and Sensors technologies include:

- **Zio XT**, a patch that can be adhered to a patient's left chest to monitor the electrical impulses of the heart for 14 days. It is wireless and waterproof, allowing ECG to be continuously monitored during exercise, showering and while sleeping. Based on ACE's previous assessment of Zio XT for patients with suspected cardiac arrythmia, it was found to be generally safe and accurate as an alternative to Holter devices for ambulatory ECG monitoring. However, a limitation of the evidence is the lack of studies evaluating patient outcomes for using the Zio XT device.

- **CardioTag**, a non-invasive multi-sensor for use in heart failure. The device is placed on a patient's chest to assess pulmonary capillary wedge pressure (PCWP) and noninvasively estimate hemodynamic parameters. Results from the SEISMIC-HF I study were presented as late-breaking science at the American Heart Association's (AHA) 2024 Scientific Sessions, providing data for further development of machine learning AI algorithms for patients with heart failure.

- **One sensor biowearable**, claimed as a first-of-its-kind biowearable sensor that continuously monitors glucose and ketone levels to help prevent diabetic ketoacidosis. It is expected to be able to integrate with Abbott's digital ecosystem and insulin pump technology for seamless, real-time diabetes management.

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APPENDIX - METHODS

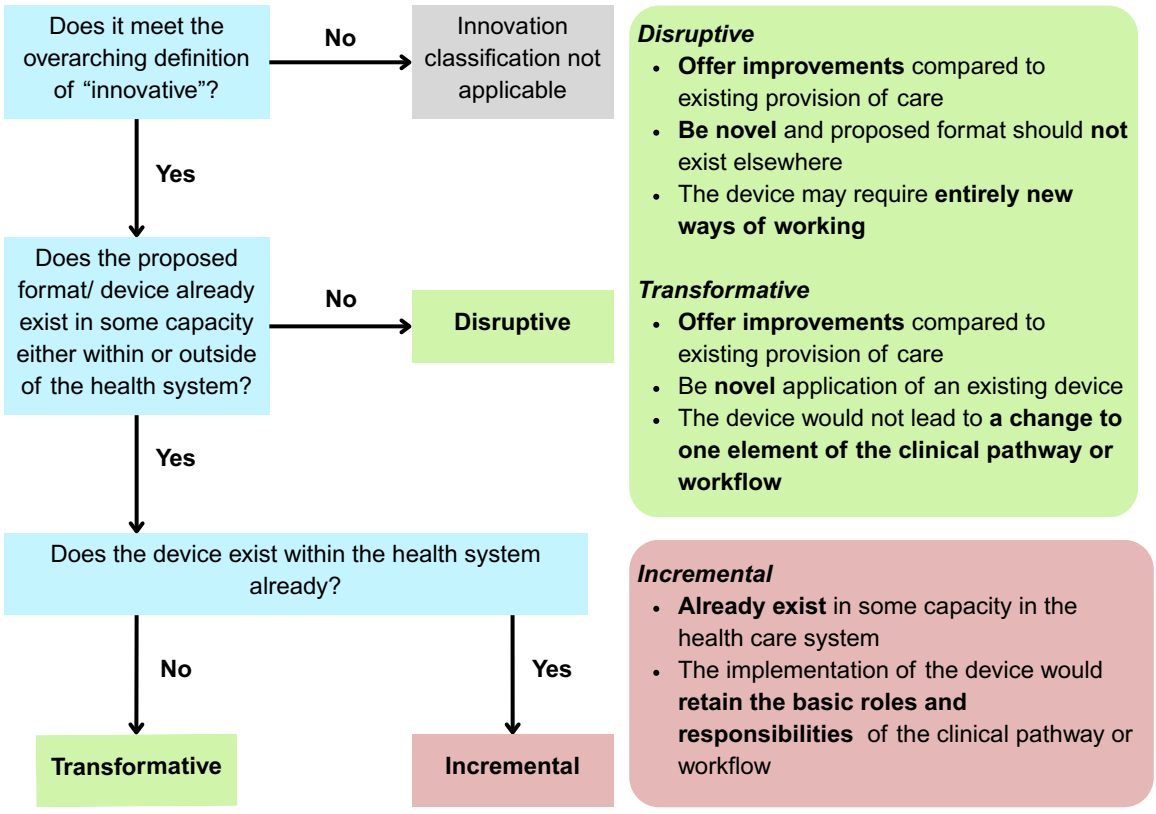
Identification

Using ACE's HS methodology, emerging MedTechs addressing top local disease priorities were identified from various sources such as news media channels, US Food and Drug Administration (FDA) databases and the websites of reference agencies (see Supplementary Table 1). A total of 1,870 innovative technologies were filtered based on various proxies of innovation, including technologies granted FDA breakthrough device designation or cleared through the FDA de novo pathway.

Type of information source	Source
Primary	Trial registries
	Commercial developer websites
Secondary	Regulatory authorities (FDA, EMA)
	Medical technology or pharmeceutical news media
	Scientific journals
	Conference proceedings
Tertiary	Reports from reference horizon scanning agencies
Others	Industry notification
	Nominations from local clinicians, policy makers, consumers

Supplementary Table 1. Proactive identification of emerging MedTech from various sources

Filtration



Supplementary Figure 1. UK Department of Health and Social Care Medical Technology Innovation Classification Framework

Filtration

The level of innovativeness of these filtered technologies was determined using the UK Department of Health and Social Care Medical Technology Innovation Classification Framework (see Supplementary Figure 1). The technology aspects (i.e. novelty) was assessed to detemine the novelty of MedTechs. As a pragmatic approach, filtered MedTechs were classified by three independent evaluators into one of three categories of innovation (i.e. disruptive, transformative or incremental) based on their technology aspect. For this report, MedTechs assessed to be disruptive or transformative were deemed as innovative. Two hundred and twenty eight (228) innovative MedTechs addressing Singapore's top causes of disease burden were filtered.

Creating a clinician workgroup

A clinician Workgroup comprising six clinical experts (henceforth referred to as the 'Workgroup') was closely involved in the whole process. The experts represented the five disease areas with top disease burdens in Singapore and one national innovation centre. At the first Workgroup meeting, held virtually on 8 October 2024, attendees were informed of the project purpose and discussed the scope and methodology for the development of the Innovation Trends Report (ITR). The Workgroup provided further inputs on the innovative MedTechs and also nominated additional MedTechs, if relevant.

ACE grouped similar MedTechs into broad trends by considering their mechanism of action, intended purpose and clinical application. As a result, 22 trends were identified, along with 6 individual technologies that were not able to be grouped into the trends.

Short-listing

The Workgroup was consulted to ensure the relevance and accuracy of the trends. Through an online survey, the Workgroup was asked to shortlist trends and technologies for further consideration for the final listing of the top emerging trends. The survey included questions that allowed the Workgroup to vote for their top trends or standalone technologies most likely to disrupt local practice in the next five years.

Survey responses and votes were collated, resulting in a list of 14 trends. A second Workgroup meeting was conducted on 13 November 2024, to reach consensus for the 14 trends identified.

Evidence scan

Domain	Considerations	Rank*
Local clinical need	Is the trend likely to address a local unmet need (e.g. patients have no or limited treatment options)?	
	Is the trend likely to address a large target population? *Targeted population size: Modest (10k), Moderate (10-50k), High (50-100k), Very high (>100k)	
Patient outcomes/ experience	Is the trend likely to improve patient outcomes?	
	Is the trend likely to improve patient experience related to care delivery (e.g. care setting, journey of care, recovery)?	
Care delivery	Is the trend likely to shift healthcare delivery (e.g. tertiary to primary or home care)?	
	Is the trend likely to lead to significant improvements in workflow (e.g. need for less staffing, organisation of care)?	
Organisation	Is the trend likely to have little resource implication, or save resources, if implemented (e.g. facility or equipment requirements, learning curve, IT system and data storage)?	
Time to market entry	Is the trend likely to penetrate the local market in the next 2-5 years?	
* 1 - Very Unlikely, 2 - Unlikely, 3 - Neutral, 4 - Likely, 5 - Very likely		

Supplementary Table 2. A set of criteria developed to guide stakeholders in the voting process

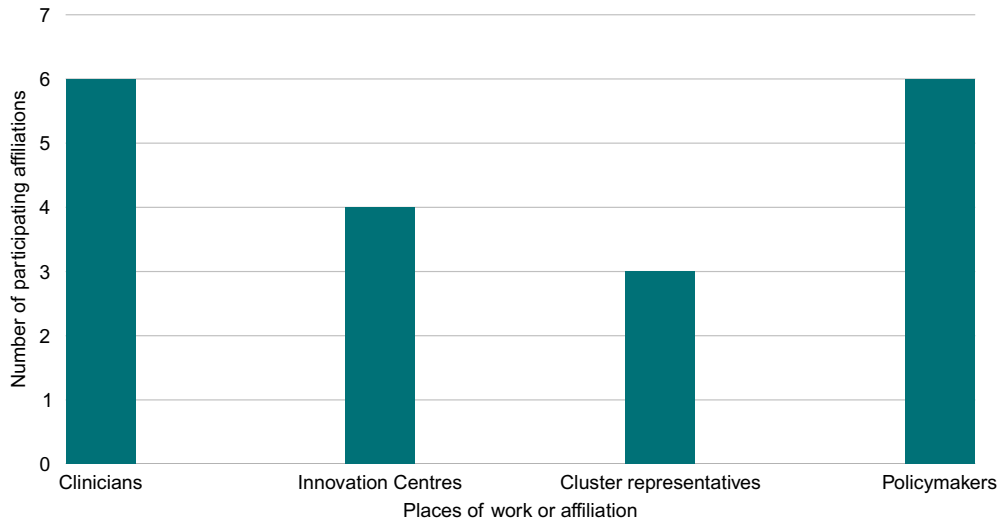
Evidence scan

A literature scan on PubMed and Google was performed, focusing on reviews (including systematic reviews and/or meta-analyses) within the last five years. Additional global research and development activity reports for the 14 identified trends were also reviewed.

A set of criteria were developed to guide stakeholders in the final voting process (see Supplementary Table 2). The criteria included a set of questions and high-level evidence for each shortlisted trend such as local unmet need, benefits, organisational implications and number of ongoing trials. In addition to the guiding criteria, the stakeholders were expected to rely on their own knowledge, experience, and expertise to support the final voting.

Stakeholder consultation

To determine the top trends anticipated to disrupt local healthcare practices and improve the robustness of the ranking process, a wider stakeholder group were invited for participation in shortlisting the final top trends (see Supplementary Table 3). In addition to the Workgroup, stakeholders such as policymakers from MOH divisions and representatives from regulatory bodies and national innovation centres, participated in a voting process through an ITR workshop.



Supplementary Table 3. Stakeholders primary place of work or occupation affiliation (n=19)

Final-listing

Summarising responses

Of the stakeholders invited, 73.7% responded. They reviewed and scored the 14 shortlisted trends based on the guiding criteria developed by ACE. The total scores for each trend were tabulated and inter-rater agreement was assessed. An agreement rate was defined as an individual rate score within one standard deviation (SD) of the group mean (mean ± SD), and group consensus was considered reached if the agreement rate was ≥75%.

Consensus workshop for final listing

Once voting results were analysed, ACE ranked the 14 trends (see Supplementary Table 4). During the stakeholder workgroup conducted on 16 January 2025, deliberation among the participants was used to reach a group consensus on the final list of top 10 MedTech trends. Any additional comments from the participants were also discussed. Following the meeting, further refinement and adjustments were made to the trends, and a consensus was reached via email to combine two related trends (“AI in medical imaging and testing” and “Algorithm-based decision support tools without AI”).

Final-listing

Trend	Range*	Median*	Mean*	SD	Inter-rater agreement
AI in medical imaging and testing	18-33	28.5	28.3	3.5	78.6
Algorithm-based decision support tools without AI	24-33	27.0	27.5	2.4	53.8
Wearable and sensors	16-34	29.5	28.1	5.4	78.6
Biodegradable implants	10-31	26.5	25.2	5.5	83.3
Contactless patient monitoring	22-37	28.0	28.2	3.7	69.2
Digital twin and computer simulation	16-31	24.0	23.2	4.1	76.9
Point-of-care test	24-36	32.0	30.5	3.1	76.9
Regenerative medicine	11-28	22.0	21.5	4.2	76.9
Bioelectronic therapies	8-30	25.0	22.8	6.2	75.0
Blood-based biomarkers for Alzheimer disease	22-33	27.0	27.3	4.1	50.0
Digital therapeutics	16-31	27.0	25.8	4.4	69.2
Minimally invasive interventions	25-34	29.0	29.2	2.9	61.5
Smart implants	18-32	25.0	24.7	4.0	58.3
Virtual reality	22-31	25.0	26.0	2.7	66.7

Supplementary Table 4. Overall rating results from stakeholder workgroup

APPENDIX - BEYOND THE SHORTLISTED NEW AND EMERGING TRENDS

These items represent additional trends identified beyond the top 9 priorities, listed without specific ranking or order of importance.

BIOELECTRONIC MEDICINE

uses small implantable devices or non-invasive means to deliver targeted stimulation through modalities such as electrical pulses, heat, laser, ultrasound and magnetic fields. These modalities act along existing physiologic pathways to trigger the body's own biological responses. This creates a targeted disease-fighting effect based on specific molecular mechanisms.

SMART IMPLANTS

are implantable devices equipped with sensors and connectivity capabilities to provide real-time objective and quantitative data on patient health or implant function. Information gathered can be used to tailor treatments, trigger transitions in care and detect adverse events before they cause symptoms.

DIGITAL TWIN AND COMPUTER SIMULATION

are virtual representation of a physical entity that generates dynamic simulations using multi-scale modelling of multi-modal data such as clinical, genetic, molecular, environmental, and social factors. These simulations can identify potential treatment strategies, monitor and predict health trajectories, and explore the impacts of early intervention and prevention.

REGENERATIVE MEDICINE

involves restoring or establishing normal function by replacing, repairing, or regenerating body organs, tissues or cells that have been damaged by disease, trauma, or congenital issues. The three main strategies used in regenerative medicine are cell-based therapy, the use of biologic or synthetic material to lead repair processes and cell growth, and the implantation of scaffolds seeded with cells.

The Agency for Care Effectiveness was established by the Ministry of Health Singapore to drive better decision-making in healthcare through health technology assessment, clinical guidance, and education.

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