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From Precision to Prediction: Decentralising, Digitising, and Democratising Diagnostics

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Diagnostics is evolving from disease detection to predictive, preventive, and continuous health intelligence. AI, digital health, point-of-care testing, and home diagnostics are decentralising and democratising access to care. However, ensuring accuracy, quality, affordability, digital inclusion, and integration with clinical care pathways will be essential to deliver equitable and effective healthcare outcomes.



Diagnostics is moving beyond a single test result in the patient journey to becoming an ongoing intelligence layer across the care continuum. The goal is no longer only to diagnose disease more precisely after it appears, but to detect risk earlier, recognise disease before symptoms emerge, monitor progression in real time, and enable intervention before conditions become more severe, costly, or difficult to treat. This shift makes decentralisation and democratisation essential. If diagnosis is the gateway to care, then access to disease diagnostics determines who gets through that gateway and who does not.

This is exactly why the future of diagnostics cannot be only about precision. It must be timely and accessible. Democratisation makes diagnostic tools easier to access and more affordable across care settings. Decentralisation is the operating model that makes this possible. Point-of-care testing, home-based diagnostics, remote monitoring, digital biomarkers, portable molecular platforms, and connected devices are moving testing closer to the patients.

Precision may improve the quality of diagnosis, but democratisation and decentralisation determine whether that diagnosis reaches the populations that need it most.

Innovations enabling predictive and preventive diagnostics

With richer health data and technologies such as IoT, advanced analytics, machine learning (ML), and artificial intelligence (AI), healthcare is moving from detecting disease after symptoms appear to identifying risk much earlier.

AI analyses large datasets to identify microscopic patterns and early structural anomalies before traditional symptoms emerge. AI imaging detects micro-abnormalities years ahead of tumour formation. For example, Qure.ai (Mumbai, India; NY, US) has developed lung cancer algorithms built from Large Language Models (LLMs) and Agentic AI, which not only improve clinical workflows but also enable early detection. Through its partnership with AstraZeneca and the EDISON Alliance, Qure.ai has reached a five-million-scan milestone across 20 countries, applying AI to routine chest X-rays to create opportunities for earlier detection.

AI and ML algorithms can process ultra-high-dimensional, heterogeneous multi-omics datasets to detect latent molecular patterns and predictive biomarkers. MedGenome (Bengaluru) uses next-generation sequencing (NGS) with proprietary bioinformatics and AI (such as their VarMiner tool) to diagnose rare diseases and cancers. It also provides Polygenic Risk Score (PRS) tests that quantify an individual's genetic predisposition to common, complex conditions.

AI and ML can be used to create a digital twin, which is a dynamic, virtual replica of an individual patient, organ, or biological system. It integrates real-time data from devices, data from labs and clinical records, and advanced analytics to simulate disease progression, personalise treatment, and predict future risk. Twin Health (Chennai, India; California, US) has developed a Digital Twin technology to track and predict metabolic health through data from smart devices, meal logs, and lab

work. It also offers real-time guidance on nutrition, activity, sleep, and stress.

Innovations enabling decentralisation and democratisation of diagnosis

Point-of-care and portable testing are strong enablers of decentralised diagnostics. Molbio Diagnostics (Goa) offers a point-of-care real-time PCR platform with lab-grade accuracy for multiple infectious diseases. Huwel Lifesciences (Hyderabad) has developed Quantiplus, a rapid and affordable open RT-PCR assay for the detection of adult pulmonary tuberculosis (TB). Genes2Me (Gurugram) provides portable RT-PCR systems and kits for infectious diseases such as human papillomavirus (HPV), TB, dengue, malaria, COVID-19, and others.

Home diagnostics are another powerful route to democratisation. They give people the ability to test more conveniently, privately, and repeatedly. HealthCubed India (Bengaluru) has developed a patented, medical-grade, portable, multiparametric diagnostic system that provides instant results for more than 55 parameters, including blood glucose, haemoglobin, blood pressure, infectious disease markers, and an electrocardiogram (ECG).

For quick home diagnostics, smartphones are also becoming a powerful diagnostic interface. They can read paper-based tests, analyse medical images, guide self-testing, and connect patients to clinicians. For example, Spark Diagnostics (Gujarat, India; Texas, US) uses smartphone-based tools to interpret lateral flow assays. Remidio (Bengaluru) has developed the Remidio Medios DR AI smartphone app, which is connected to Remidio's handheld retinal camera for diabetic retinopathy screening. AI-enabled apps are also expanding access to symptom assessment and guided screening. For example, Pinky Promise (Mumbai) uses an AI-enabled, doctor-in-the-loop model to provide reproductive healthcare support to more than 400,000 Indian women. These innovations bring care closer to the patients.

Finally, connected remote monitoring devices are shifting care from overburdened hospitals and clinics into patients' homes. This is especially important for chronic disease management, where patients need continuous insight rather than occasional testing. Sensio's (Bengaluru) Orbyt smart ring enables ECG and impedance cardiography monitoring. Zydus Lifesciences (Ahmedabad) has developed AI-powered continuous glucose monitoring systems, Diasens and GlucoLive, for patients with diabetes, CKD, and post-transplant needs.

Challenges and the Way Ahead

One of the biggest concerns regarding the point-of-care and home-based diagnostic tests is the potentially lower precision and the accuracy of the test compared with the analytical quality of centralised laboratory testing. When tests are performed by patients, community workers, or non-laboratory personnel, errors can occur in sample collection, device handling, alignment, storage, or result interpretation.

The way forward is not to slow decentralisation, but to make it safe and accurate. Point-of-care and home-based tests need rigorous validation, continuous quality monitoring, and clear performance standards before they scale. Central laboratory oversight will remain important, even in decentralised models. For high-risk conditions such as cancer, TB, HIV, hepatitis, and genetic disorders, decentralised tests should not operate as standalone products. They must be embedded into managed care pathways with confirmatory testing, referral protocols, physician review, and patient counseling.

AI-based diagnostics bring another layer of complexity. These models depend heavily on the quality and diversity of the datasets they are trained on. In decentralised settings, real-world data can be noisy, incomplete, irregular, and highly variable across populations. This makes bias testing, demographic validation, and ongoing performance monitoring essential. Human oversight should be built into AI-enabled diagnostics, especially for clinical decision-making, to reduce the risk of biased recommendations, unsafe outputs, or over-reliance on automated interpretation.

AI tools must also be designed for the realities of decentralised care. A model that performs well in controlled environments may not work as effectively in noisy community settings. For example, Wadhvani AI's (Mumbai) Cough Against TB uses cough sounds and self-reported symptoms to screen for presumptive pulmonary TB. The advanced ML for acoustic biomarker screening can filter out background interference and evaluate respiratory health.

The implementation challenge is equally important. Community screening programmes require standardised training and certification models for frontline workers and decentralised test operators. Digital tools can help by embedding guided workflows, video instructions, automated quality checks, error alerts, result interpretation support, and remote supervision. The goal should be to make the test not only portable, but usable, reliable, and safe in real-world settings.

Cost is another barrier. Point-of-care testing can have a higher cost per test than centralised laboratory testing, especially when device costs, consumables, maintenance, quality assurance, and connectivity are included. Value-based payment models, bundled screening programmes, and outcome-linked reimbursement can help scale decentralised tests that

demonstrate clinical and economic value by reducing delays, preventing complications, or lowering downstream treatment costs.

Though the innovations are focused on early diagnosis, decentralisation, and democratisation, one of the biggest risks is poorly designed diagnostics, especially digital diagnostics, which still exclude the most vulnerable and widen the inequalities.

Patients without smartphones, broadband access, digital literacy, insurance coverage, or follow-up care still remain outside the system.

Diagnostic results must be designed for action (treatment, monitoring, follow-up), not just information. Public and private healthcare systems should work toward closing the care loop by integrating these diagnostics into broader care programmes and connecting patients to physicians, counselors, and follow-up services.

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