Editorial

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Foreword: toward diagnostic excellence

Among the last studies I authorized as president of the Institute of Medicine (IOM, now the National Academy of Medicine) was the one that produced the 2015 report on *Improving Diagnosis in Health Care.* This report asserted that most people experience at least one diagnostic error in their lifetime and declared that improvement in diagnosis is "a moral, professional, and public health imperative." This was the culminating product in the "Quality Chasm" series, a set of 12 IOM reports springing from *To Err is Human* (2000) and *Crossing the Quality Chasm: A New Health System for the 21st Century* (2001).

Like other reports in the Quality Chasm series, *Improving Diagnosis* drew upon a substantial, prior body of evidence. The report showed that the incidence and severity of consequences from diagnostic errors warranted concerted attention from the medical community. Now, 10 years after the report appeared, is an appropriate time to take stock of what has been accomplished. As documented in the series of papers in this special issue, there followed an intensified effort to reduce diagnostic errors. This has been expressed in an increased number of studies, development of improved quality measures for diagnosis, institutional attention to reducing diagnostic errors, professional organization and training in the field, and focused funding from the public and philanthropic sectors.

The next 10 years of progress toward diagnostic excellence will be shaped by a combination of technological, systemic, and cultural forces that are fundamentally changing how healthcare is understood and delivered. These changes will likely lead to more personalized, proactive, and accessible care, while also presenting new challenges. I suggest here five key forces that will shape the next 10 years of progress toward diagnostic excellence:

(1) **Understanding the expansive meaning of diagnostic excellence.** Diagnostic excellence means more than reducing diagnostic errors. The Crossing the Quality Chasm study identified six dimensions of health care quality: health care should be safe, effective, patient-centered, timely, efficient, and equitable. Every one of these dimensions applies to achieving diagnostic excellence. A correct diagnosis delayed is not timely. A correct diagnosis after redundant diagnostic testing is not efficient. Reducing errors is crucial, but incomplete. If our goal is to achieve uniform excellence in diagnosis, each of the six dimensions matters.

(2) **The pervasive rise of artificial intelligence (AI).** AI is the single most transformative force in diagnostics, and its influence will grow exponentially.

a. **Enhanced accuracy and speed:** AI will become a standard tool for analyzing medical imaging (X-rays, MRIs, CT scans) and pathology slides, even today outperforming many radiologists and pathologists in detecting subtle anomalies like tumors or lesions. An open question is whether AI will serve as an adjunct to human diagnosticians, as an equal partner, or as a leading force.

b. **Predictive diagnostics:** By analyzing vast datasets from electronic health records, genomic profiles, and real-time monitoring devices, AI models will be able to predict disease progression and identify individuals at high risk of developing certain conditions years before symptoms appear. This shift from reactive to proactive care will be a cornerstone of future medicine. This will make each patient over time their own standard for detecting change associated with disease and predicting prognosis.

c. **Streamlined workflows:** AI can potentially reduce the burden on healthcare professionals by automating administrative tasks, triaging patients, and prioritizing urgent cases. This can free up clinicians to focus on complex cases, make subtle diagnoses, and improve efficiency.

d. **Clinical decision support:** AI-powered tools will assist clinicians in making more informed decisions by providing real-time, evidence-based recommendations, and suggest personalized treatment plans based on a patient's unique biological and behavioral profile. AI may be one technology that connects clinicians and patients and brings them into alignment.

(3) **The expansion of patient-centered care and data ownership.** The future of diagnostics will be less about

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the doctor alone and more about the patient as an active partner in their own health.

a. **Wearable and remote monitoring:** A new generation of sophisticated wearables and biosensors will continuously monitor a wide range of health metrics, from heart rate, blood pressure, and blood oxygen to stress levels and glucose. This real-time data will provide a longitudinal view of a patient's health, enabling earlier intervention and personalized care.

b. **Direct-to-consumer diagnostics:** Patients will have more direct access to their own test results and health data through secure online portals. This transparency, along with user-friendly explanations and educational resources, will empower patients to better understand their health and participate in decision-making about their own care. The challenge will be to avoid misleading and erroneous web-based information.

c. **Telehealth and decentralized care:** Telemedicine platforms will evolve to include AI-enabled diagnostics and remote patient monitoring, making care more accessible and convenient, especially for those in rural or underserved areas. Point-of-care testing will also become more common, allowing for rapid diagnostics outside of traditional hospital settings.

d. **Holistic health integration:** Diagnostic data will be integrated with other aspects of a patient's life, including lifestyle habits and environmental factors, to provide a more comprehensive view of their health.

e. **Adaptive, patient-centered decision making**: The future of diagnosis should rely on clinicians whose style of decision making adapts to the needs of the individual patient rather than reflect the personality and proclivities of the clinician. Many patients will benefit from having more authority over their care, others will want the clinician to take control of decisions, and yet others will prefer balanced partnership with their clinicians.

(4) **The revolution in precision medicine.** Diagnostics will move away from a one-size-fits-all approach and toward highly individualized care.

a. **Genomics and pharmacogenomics:** Advances in genomic analysis will allow clinicians to tailor treatment plans and drug dosages based on an individual's genetic makeup. This is already relevant in cancer care, where precision medicine can target specific mutations, and in psychiatry, where it can inform the choice of antidepressants.

b. **Liquid biopsies and nano-biosensors:** Relatively non-invasive technologies, which can detect disease markers in a simple blood sample, will become more advanced. They hold the potential to transform early disease detection and management for conditions like cancer, reducing the need for more invasive procedures.

c. **Digital biomarkers:** A new class of biomarkers will likely emerge from a patient's digital footprint, including their voice patterns, typing speed, or even their social media activity. These markers could provide early indicators of conditions like neurodegenerative diseases.

(5) **The drive toward health equity.** Some technologic advances, such as telemedicine, can facilitate wider access to high-quality diagnosis and treatment. Other technologic advances will be more expensive and intrinsically exclusive. Explicit attention to equity, the sixth dimension of quality in health care, will be needed to assure diagnostic excellence.

a. **Correcting algorithmic bias:** One specific problem already evident will be to prevent and correct biases in AI algorithms. Many existing models are trained on datasets that do not adequately represent diverse populations, for example, and this can lead to misdiagnoses and disparities. Future development should prioritize representative data sets and rigorous validation across different racial, ethnic, and socioeconomic groups.

b. **Improving access for rural and underserved populations:** Innovations like mobile medical units, telehealth, and point-of-care testing can help overcome geographic barriers to care. More general progress, such as universal broadband access, can support more equitable models of care.

c. **Culturally sensitive care:** A growing attention to health literacy, cultural competence, and inclusive practices can help ensure that all patients receive safe and effective care.

By documenting progress over the last decade, the papers in this issue lay the groundwork for ever-increasing diagnostic excellence in the future.