Precision medicine and public health interventions: tuberculosis as a model?

Tuberculosis provides an excellent model for how precision medicine can enhance public health through adoption of new technology and facilitation of rapid expansion at the population level. Drug-resistance is an emerging crisis for which appropriate diagnostic tools are either unavailable or inadequate. Conventional phenotypic drug-susceptibility testing can identify only low numbers of resistance mutations with a long delay from the time of tuberculosis diagnosis. Consequently, only a fraction of patients with drug-resistant tuberculosis are detected and placed on adequate treatment; ineffective or delayed treatment renders patients infectious longer and propagates the crisis.[1] There is a clear need for better and more rapid diagnostics. Whole-genome sequencing of *Mycobacterium tuberculosis* provides comprehensive data on resistance mutations. In studies published in the past 2 years, scientists have been able to sequence genomic targets directly from sputum, overcoming a previous major limitation of sequencing-based diagnostics—the requirement for culture before DNA processing. The integration of targeted next-generation sequencing into routine workflow at a similar or cheaper price than current diagnostic workflows, and the concomitant progress in data interpretation and standardisation mean that sequencing could replace conventional drug-susceptibility testing.[2,3] In resource-limited countries where conventional drug-susceptibility testing remains unavailable, this implementation would allow progress through advanced and yet implementable technology. For optimal use, sequencing data need to be interpretable to clinicians within a clinically actionable timeframe. This interpretability is best achieved through clinical decision support systems (CDSS), computer systems designed to assist decision making on individual patients at the point of care. Clinical, laboratory, and other patient-specific information is interpreted through structured protocols that conform to practice standards and consensus guidelines, then intelligently filtered and presented to the clinician at appropriate times for optimal health-care delivery. CDSS have been effective in reducing inappropriate prescribing and adverse drug events across health-care settings.[4] In one study, CDSS identified potentially infectious patients that clinicians missed, increased latent tuberculosis infection screening of high-risk patients in primary care clinics, enhanced the diagnosis of smear-negative pulmonary tuberculosis, and predicted unsuccessful tuberculosis treatment outcomes.[5] Another advantage of using CDSS is that they can also automatically interact with national drug resistance surveillance and drug supply and procurement systems, thus improving accuracy and efficiency (appendix). Technology connecting patients, care providers and public health systems will also allow the roll-out of active pharmacovigilance, which is necessary where potentially toxic drugs are used. Thus, precision in care becomes precision in public health, ensuring a convergence between individualised and standardised health interventions, and between individual care and population-based prevention.

See **Online** for appendix

We declare no competing interests.

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