



Cover illustration
Nik Spencer

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Sponsorship
Stephen Brown
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Production
Ian Pope

Marketing
Hannah Phipps

Editorial Assistant
Rebecca White

The Macmillan Building
4 Crinan Street
London N1 9XW, UK
Tel: +44 (0) 20 7833 4000
e: nature@nature.com



nature publishing group

From wearable activity trackers to metagenomic sequencing and direct-to-consumer genetic testing, we are able to monitor our personal environment and health more than ever before. Rapid improvements in technology have also driven genetic discovery in human disease. Although the interpretation and definition of clinically relevant genetic variation remains a challenge, established examples are being used to stratify subgroups of patients to identify optimal treatments. Precision medicine is emerging as a natural extension that integrates research disciplines and clinical practice to build a knowledge base that can better guide individualized patient care.

At a crucial time when efforts such as the UK 100,000 Genomes Project and the US Precision Medicine Initiative seek to scale up population-based genome sequencing and integrate it with clinical data, we present this collection of reviews that assess progress towards the implementation of precision medicine. A new framework is required to bring together researchers, clinical laboratories, clinicians and patients in what Samuel Aronson and Heidi Rehm term a “precision-medicine ecosystem”.

Tailoring treatment to the patient is central: for this, Mary Relling and William Evans examine progress in pharmacogenomics and Luigi Naldini describes developments in gene therapy. Drug-development pipelines are benefiting from genomics in target-validation approaches that promise improved success rates and reduced costs, whereas clinical trials need to be redesigned to match the right trial to the right patient, as proposed by Andrew Biankin and colleagues.

For the next steps, the need to share data is greater than ever. The Global Alliance for Genomics and Health offers innovative solutions that facilitate research and clinical diagnoses while maintaining the privacy of sensitive data. Also essential will be a continually updated knowledge base to aid the interpretation of genetic tests. Although the challenges might seem formidable, we are encouraged by the early examples discussed here and are optimistic for the realization of precision medicine.

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Orli Bahcall
Senior Editor

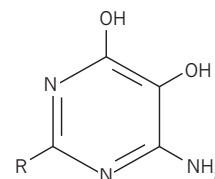
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