



PART 2

Read the text below and answer questions 14–26.

PRECISION MEDICINE: A TAILORED APPROACH TO HEALTHCARE

A

Precision medicine refers to a broad movement in healthcare away from “one-size-fits-all” protocols and towards prevention and treatment that reflect individual variability. Instead of assuming that patients who share a diagnostic label will respond similarly, clinicians increasingly attempt to stratify risk and guide therapy using a mix of genetic information, molecular biomarkers, lifestyle patterns, and environmental exposures. In practice, this may mean identifying which patients are likely to benefit from a particular drug, which should receive enhanced screening, or which might avoid an intervention altogether. Although clinicians have always adjusted care according to age, weight, pregnancy status, or comorbidities, the novelty lies in the scale and precision of modern molecular diagnostics and data-driven stratification, which promise a more systematic way to match the right approach to the right patient at the right time.

B

A major driver of this shift has been the rapid decline in the cost and time required for genomic sequencing, alongside the growth of large biobanks that link genetic variants to clinical outcomes. These resources support studies that associate particular variants with disease risk or drug response, and they have encouraged the development of polygenic risk scores, which aggregate the small effects of many genetic loci into a single estimate of susceptibility. However, for most common diseases—such as type 2 diabetes, coronary artery disease, or many psychiatric conditions—risk is polygenic and heavily shaped by behaviour, social context, and environment. Consequently, genetic signals rarely provide deterministic answers when considered alone. A high risk score may warrant targeted prevention or earlier screening, but it does not guarantee illness, just as a low score does not eliminate risk. For this reason, contemporary precision medicine increasingly combines genomic information with longitudinal clinical history and real-world data rather than treating DNA as destiny.

C

The most visible successes of precision medicine have appeared in oncology, where tumours can be profiled for molecular alterations that drive growth and survival. By identifying so-called driver mutations, clinicians may select targeted therapies designed to block specific signalling pathways, inhibit abnormal proteins, or exploit tumour-specific vulnerabilities. Some approaches, for example, aim to interrupt pathways that promote



uncontrolled proliferation, while others leverage immune mechanisms by directing immune cells toward tumour antigens. Yet precision oncology also highlights fundamental limits. Tumours are heterogeneous, meaning that distinct subclones can coexist within the same cancer, and treatment pressure can select for resistant cells that later dominate. This evolutionary dynamic helps explain why initial responses may be dramatic but short-lived, as resistance emerges through new mutations, pathway bypassing, or phenotypic change. In addition, many patients do not have actionable mutations linked to an effective, accessible drug. The promise of tailoring therefore depends not only on laboratory capacity, but also on equitable access to targeted agents and timely re-testing as the tumour evolves.

D

Outside cancer, pharmacogenomics aims to anticipate how individuals metabolise medications by examining genetic variants in enzymes and transporters that influence pharmacokinetics and pharmacodynamics. Variants affecting metabolic enzymes can alter the speed at which a drug is activated or cleared, meaning a standard dose may be ineffective in one patient yet toxic in another. In principle, testing could guide drug selection, dosing, and monitoring for therapies with narrow safety margins or well-established gene–drug interactions. In practice, implementation is uneven. Busy clinicians may be uncertain about which tests are clinically indicated, how to interpret results, or how to act on them within existing workflows. For routine use, health systems often require clear prescribing guidelines, robust evidence of benefit, and electronic decision support that translates laboratory findings into actionable recommendations at the point of care. Without these supports, testing may be ordered inconsistently, results may arrive too late to influence prescribing, or findings may be overlooked entirely.

E

Data integration remains a central obstacle. Precision medicine depends on combining laboratory outputs with electronic health records, imaging archives, pharmacy data, and sometimes patient-generated information such as wearable data. Yet healthcare data are frequently fragmented across institutions and vendors, stored in incompatible formats, or governed by divergent standards for coding and access. Even when data can be linked, quality varies: missing values, inconsistent documentation, and shifting clinical definitions can degrade model performance. Moreover, algorithmic predictions may reproduce or amplify existing inequalities if training datasets under-represent minority groups or reflect historical patterns of unequal care. A model may appear accurate overall while performing poorly for specific populations, leading to misclassification, delayed diagnosis, or inappropriate treatment recommendations. Building trustworthy systems therefore requires not only advanced analytics, but also transparent evaluation, continual



monitoring, and explicit attention to bias across the full lifecycle of model development and deployment.

F

Ethical and social concerns shape public acceptance of precision initiatives. Genetic information can reveal sensitive details beyond the individual, including familial relationships and potential future disease risk, which raises questions about consent, data sharing, and long-term privacy. Consent models are especially contested when data are used for secondary research or shared across borders and institutions: broad consent can enable discovery but may feel insufficiently specific, while narrowly defined consent can limit scientific value and complicate governance. There are also fears of discrimination if employers or insurers gain access to genetic risk indicators, even in jurisdictions that restrict such practices. Equally important is distributive justice. If precision tools—sequencing, specialised diagnostics, targeted therapies—remain costly, they may widen health inequalities, benefiting those in well-resourced settings while leaving others with standard, less tailored care. Ethical implementation therefore requires protections, accountability, and deliberate efforts to expand access rather than assuming that benefits will diffuse automatically.

G

A further sticking point is evidence. Some precision interventions show clear clinical value, while others are plausible but unproven or context-dependent. Randomised controlled trials can be difficult to conduct when patients are subdivided into small molecular subgroups, as recruitment becomes slow and statistical power is harder to achieve. Adaptive designs and basket trials may help, but they introduce methodological complexity and may still struggle to address long-term outcomes. Meanwhile, real-world evidence drawn from routine care can be confounded by differences in baseline risk, provider behaviour, and access to follow-up treatment. These challenges fuel debate among regulators and payers about what counts as sufficient proof for approval or coverage, and how decisions should be updated as new data emerge. In short, precision medicine often advances faster than the evidence frameworks designed to evaluate it.

H

Despite these constraints, precision medicine continues to expand through national sequencing programs, biobank investments, and clinical decision tools that attempt to translate molecular findings into routine practice. The most successful implementations tend to be targeted and pragmatic: they focus on conditions where biomarkers strongly predict response, where testing is paired with a clear treatment pathway, and where the benefits justify cost and complexity. Over time, proponents argue that the goal is not



merely to treat disease more precisely, but to predict risk earlier and prevent illness through tailored screening, risk reduction, and behavioural interventions. Achieving that ambition will require interoperable data systems, careful governance, and sustained public trust. If these elements align, precision medicine may shift healthcare from reactive management of symptoms toward a more anticipatory model that acknowledges biological diversity while striving for fairness.

Questions 14–19

Choose the correct heading for each paragraph.

List of Headings

- i Ethical concerns and the risk of widening gaps in access
- ii Using multiple kinds of personal information to guide prevention and treatment
- iii Why pharmacogenomics is promising but unevenly implemented
- iv The difficulties of combining health data and avoiding biased prediction
- v How cheaper sequencing helped—but genes rarely give certain answers for common disease
- vi Precision oncology as a leading example, and its limitations
- vii The problem of proving benefit and deciding what counts as evidence
- viii Conditions required for precision medicine to expand successfully
- ix Genetic testing as a guide to standard medication doses

14 Paragraph A

15 Paragraph B

16 Paragraph C

17 Paragraph D

18 Paragraph E

19 Paragraph F

Questions 20–23

Choose **TRUE** if the statement agrees with the information given in the text, choose **FALSE** if the statement contradicts the information, or choose **NOT GIVEN** if there is no information on this.

20 The passage gives a specific monetary figure for the decline in genomic sequencing costs.



21 For most common diseases, genetic information alone rarely determines who will develop the condition.

22 Tumours can evolve in ways that allow resistance to targeted therapies to emerge over time.

23 Routine pharmacogenomic testing is more likely to be used when clear prescribing guidelines and electronic decision support are available.

Questions 24–26

Complete the notes below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

Precision medicine: key considerations

- Precision medicine uses genetics, biomarkers, lifestyle, and environment to guide decisions, while data integration may also include patient-generated information such as **24**
- Trustworthy predictions require representative datasets, transparent **25** and continual monitoring.
- Public acceptance is influenced by privacy concerns and the risk that precision tools could widen health **26**

Answer Key

14. ii

15. v

16. vi

17. iii

18. iv

19. i

20. NOT GIVEN

21. TRUE

22. TRUE

23. TRUE



24. wearable data

25. evaluation

26. inequalities