

Genomics and the Future of Healthcare

From reactive care to precision health

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Why genomics matters: the human story



1. A child has unexplained symptoms.



2. The family sees specialist after specialist.



3. Tests come back inconclusive.



4. Months become years.



5. Then one genomic test provides an answer.



**Not always a cure — but a diagnosis,
a care pathway, and a way forward.**

The right information, at the right time, can change the course of care.



The moment for genomics is now

Healthcare is being asked to do more — with fewer people, tighter budgets, and more complex disease.

Aging population

higher demand

Workforce shortages

limited capacity

Rising costs

sustainability

Diagnostic complexity

more tests, more data

Patient expectations

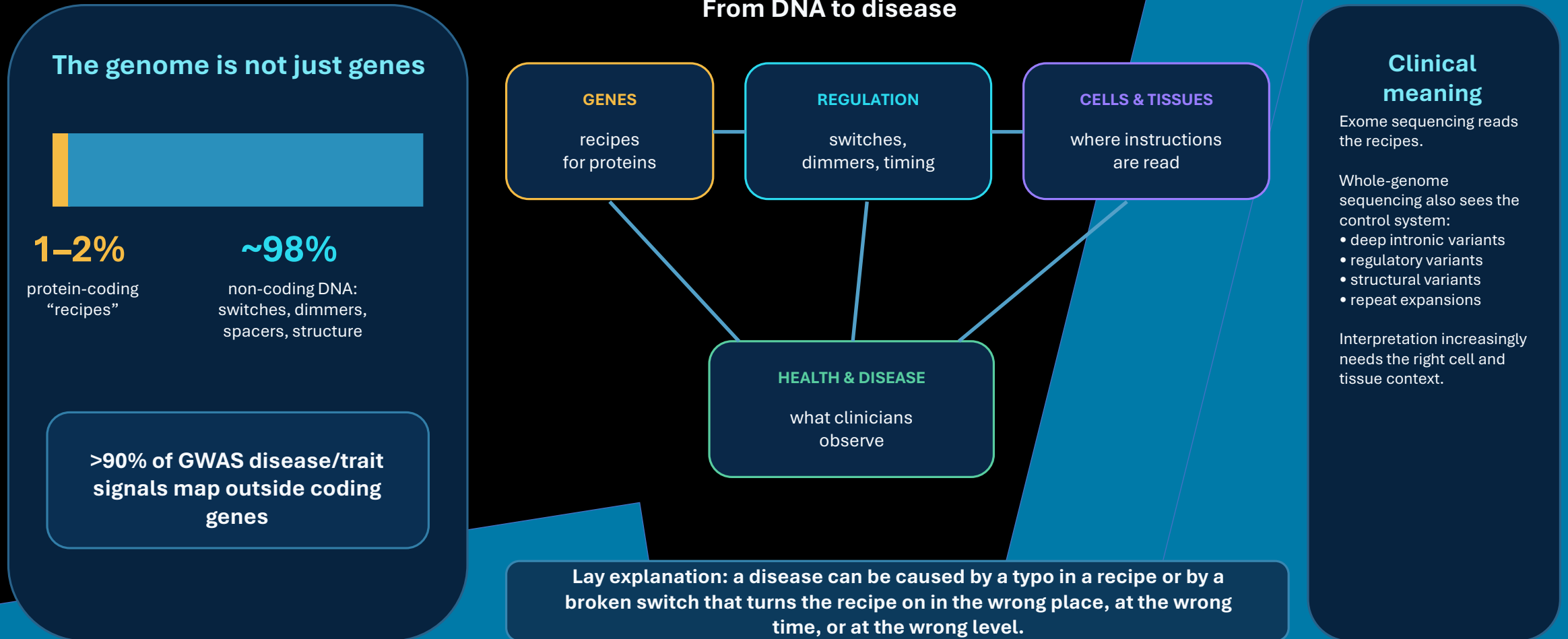
answers faster

We cannot solve tomorrow's healthcare challenges using yesterday's diagnostic model.

Why whole-genome thinking matters

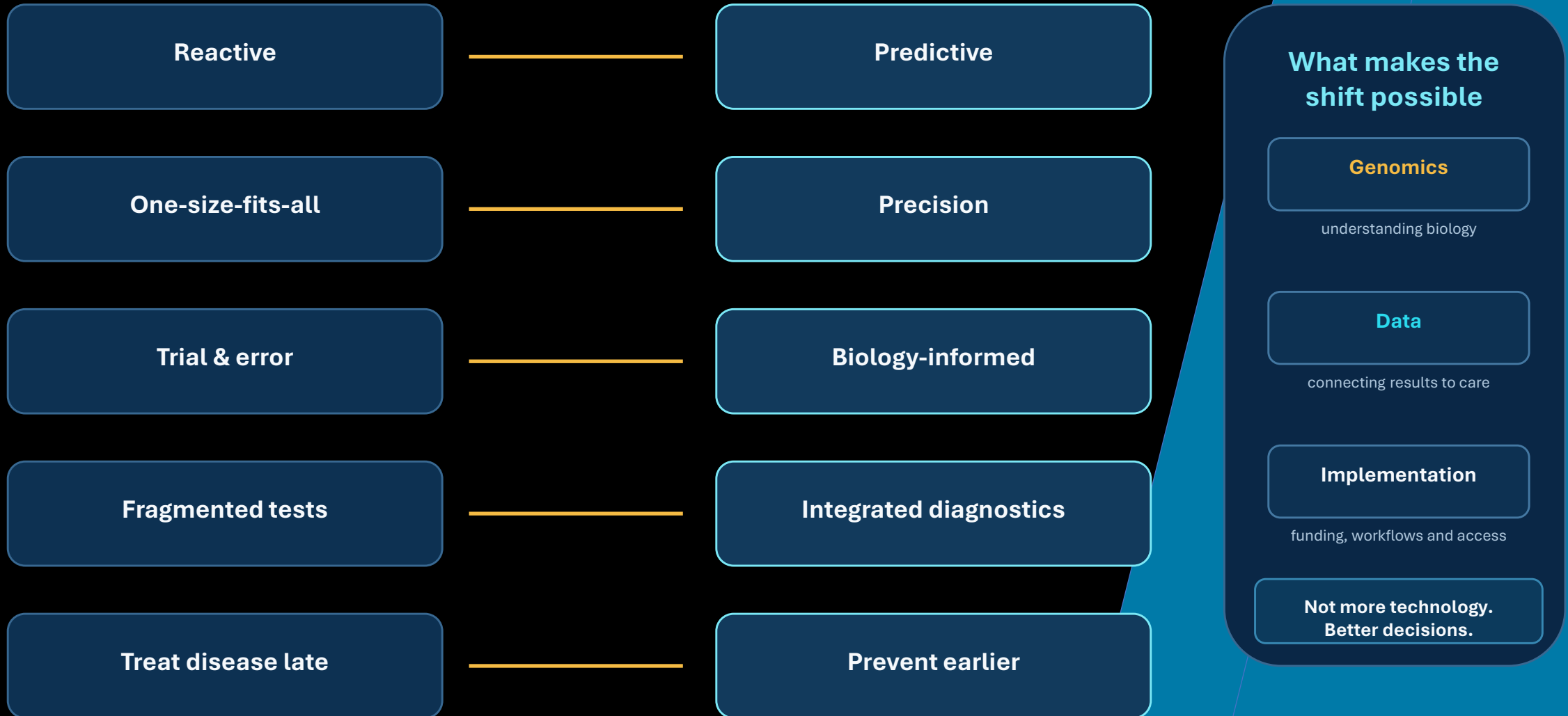
Disease biology is not only in the gene “recipes” — it is also in the switches, timing, and cell/tissue context.

From DNA to disease



The health-system shift

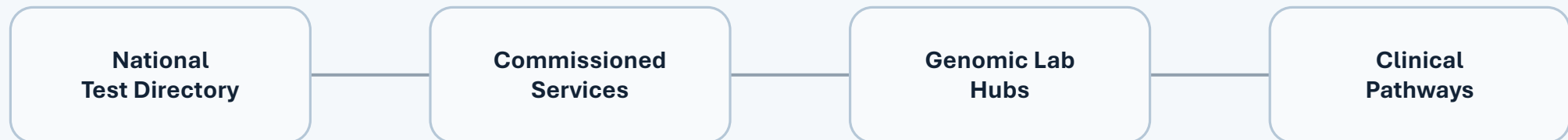
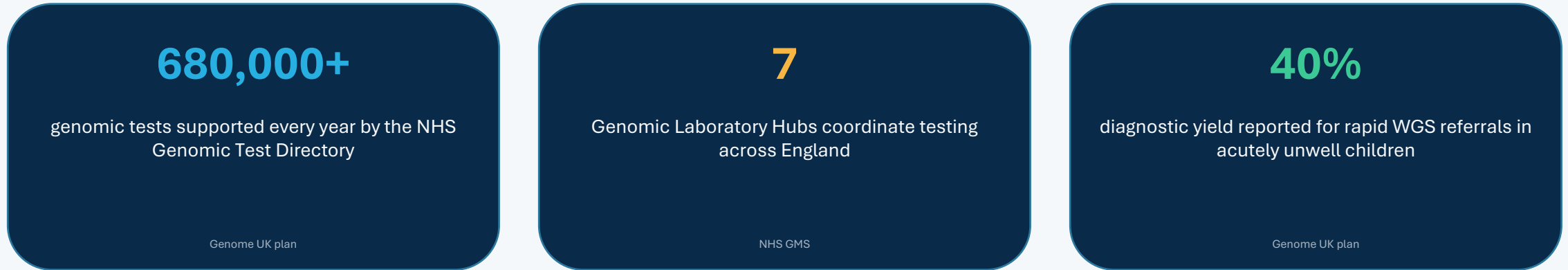
Genomics is one of the foundations of precision health



This is not about more technology. It is about better clinical decisions and smarter use of system capacity.

Proof that genomics can scale

The UK has moved genomics from “project” to national health service infrastructure.

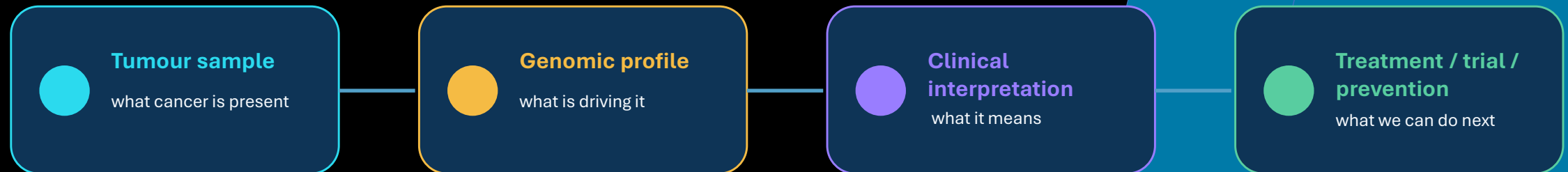


A test directory is more than a list. It is a policy tool: who is eligible, what test is done, where, when, and how results return to care.

Cancer care is becoming increasingly genomic

Cancer is not only defined by where it starts. Increasingly, care depends on what is driving the tumour biologically.

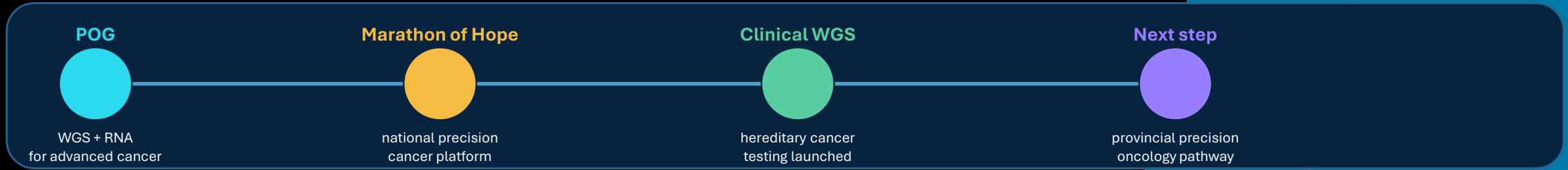
Genomics turns a tumour sample into information that can guide treatment, trial options, and prevention.



Precision oncology is the move from “one-size-fits-all” to “right treatment, right patient, right time.”

BC is moving cancer genomics from research leadership into clinical care

The story is not only innovation — it is translation into provincial precision medicine.



1. POG pioneered the model

BC Cancer, the Genome Sciences Centre and UBC built one of Canada's leading precision oncology programs using whole-genome and transcriptome analysis to inform treatment options.

2. BC contributes to national scale

The Marathon of Hope Cancer Centres Network builds on this expertise to link genomic data, clinical data and precision oncology across Canada.

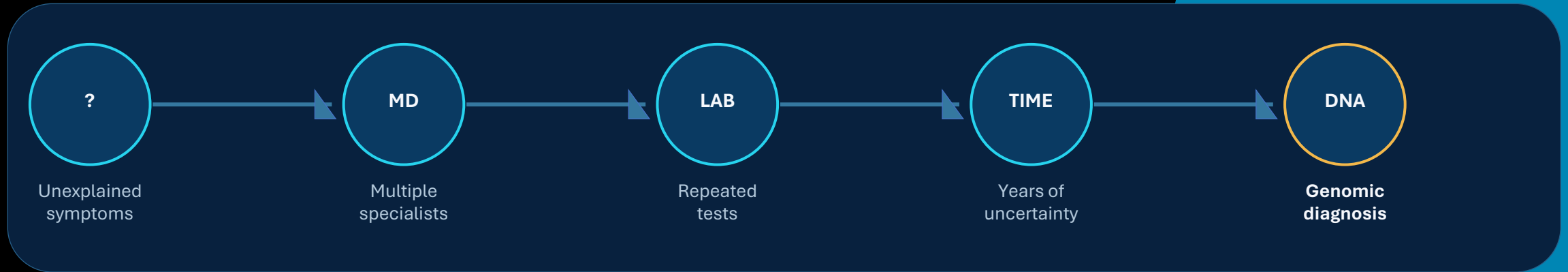
3. Clinical WGS is now live in BC

In 2025, GSC introduced clinical whole-genome sequencing for hereditary cancer testing with BC Cancer's Hereditary Cancer Program and the Cancer Genetics and Genomics Laboratory within PLMS.

This matters because BC is no longer just demonstrating the science — it is beginning to build the clinical infrastructure for genomic cancer care.

Rare disease: ending the diagnostic odyssey

Genomics can turn years of uncertainty into a clinically useful answer.



For families

An answer can mean validation, a care pathway, reproductive information, and eligibility for therapies or trials.

For clinicians

A molecular diagnosis can focus care, reduce uncertainty, and support more precise management.

For the system

Earlier answers can reduce fragmented testing and help move innovation into routine care.

The value of genomics is not only the test — it is the right answer, at the right time, for the right patient.

Prevention: newborn genomics is entering policy debate

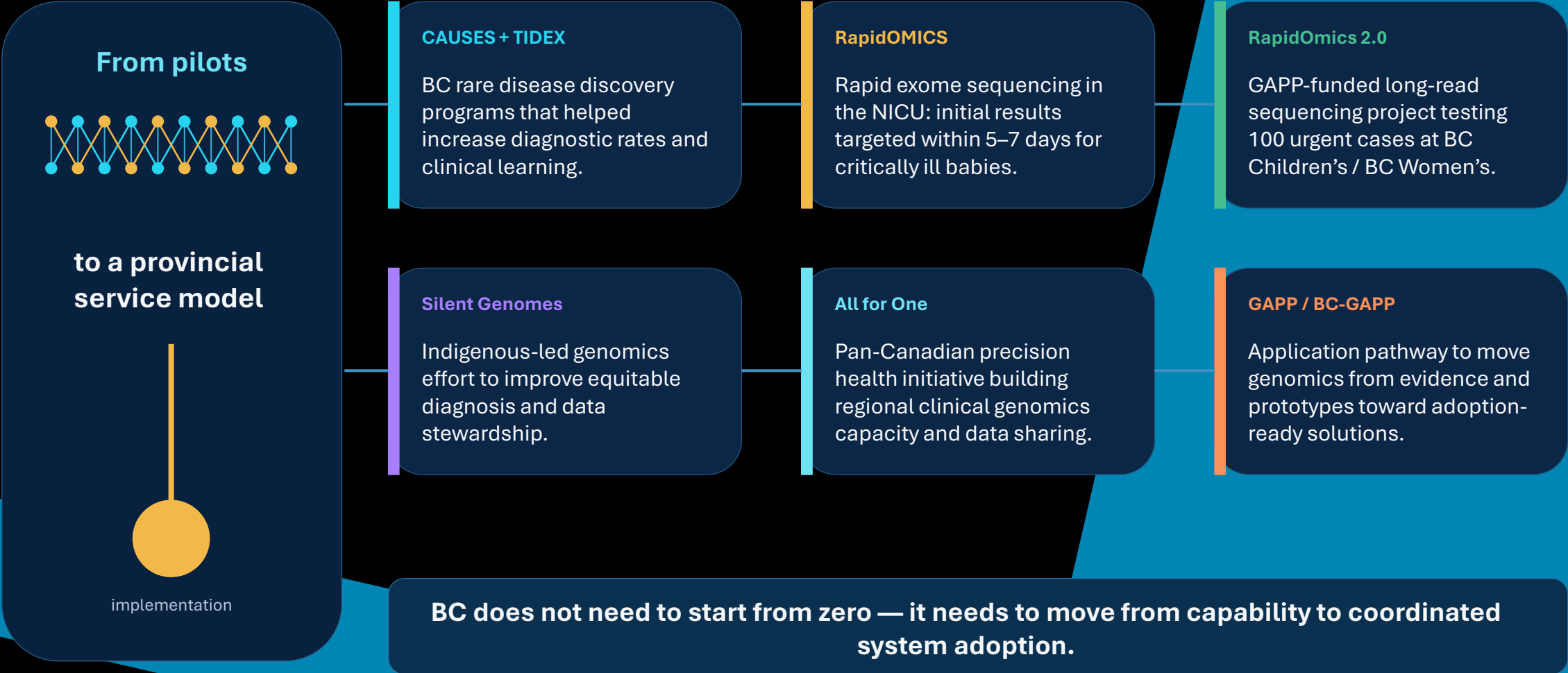
The UK Generation Study is testing whether whole-genome sequencing can identify treatable rare conditions earlier in babies.



Keynote line: the future is not “sequence everyone tomorrow.” The future is evidence-based, ethically governed, clinically useful genomics.

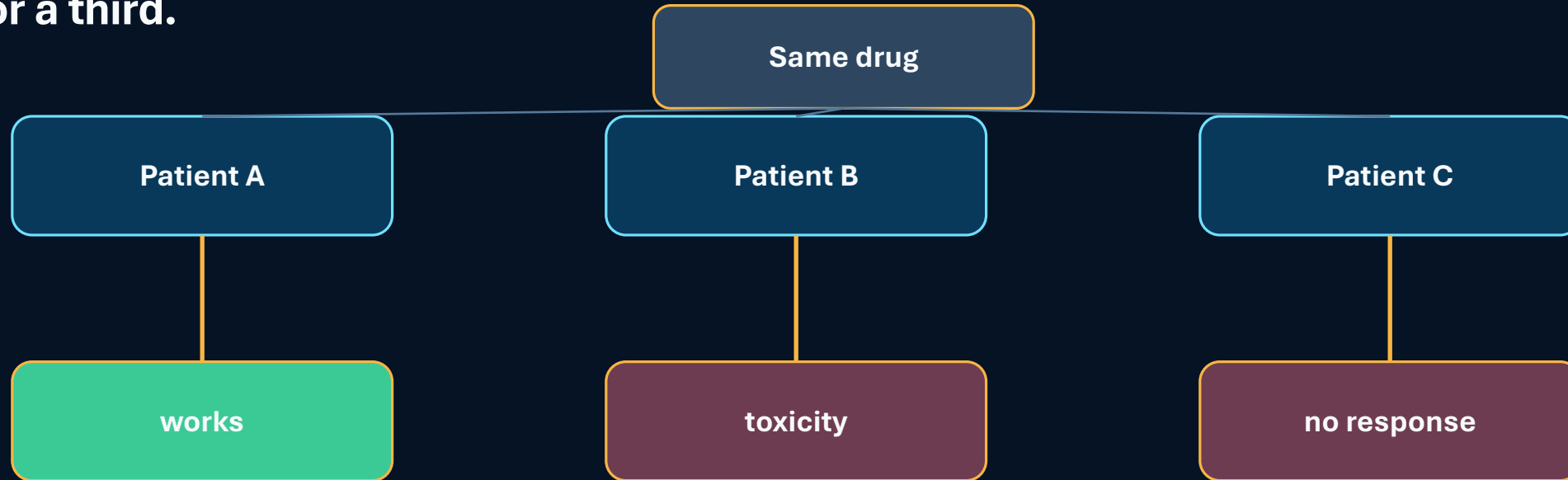
BC has already built a rare disease genomics foundation

The next step is to connect funded innovation to routine, equitable provincial implementation.



Pharmacogenomics: moving beyond trial-and-error medicine

The same medication can help one patient, harm another, and do nothing for a third.



High-value use cases: oncology drugs · mental health prescribing · anticoagulation · pain medicines · adverse drug reaction prevention

Strategic value = better prescribing + fewer avoidable adverse events + less waste

Pharmacogenomics for depression: a BC example ready for implementation

From trial-and-error prescribing to genetics-informed medication choice for major depressive disorder.

The current problem

Major depression is common, but medication selection often still relies on trial and error.



For more than half of people with MDD, the first medication prescribed is not effective.

The human cost is delayed recovery; the system cost is avoidable use, escalation and chronicity.

BC evidence base → implementation design

\$956M

predicted BC health-system savings for patients with refractory depression over 20 years

37%

~2 yrs

estimated time to offset test costs

Implementation Pathways

Austin + Bryan team is testing how PGx for depression should be introduced in BC including who delivers it, how patients/public value PGx data use, and what implementation model is most efficient.

This is exactly the shift: evidence → implementation strategy → routine care.

What implementation requires

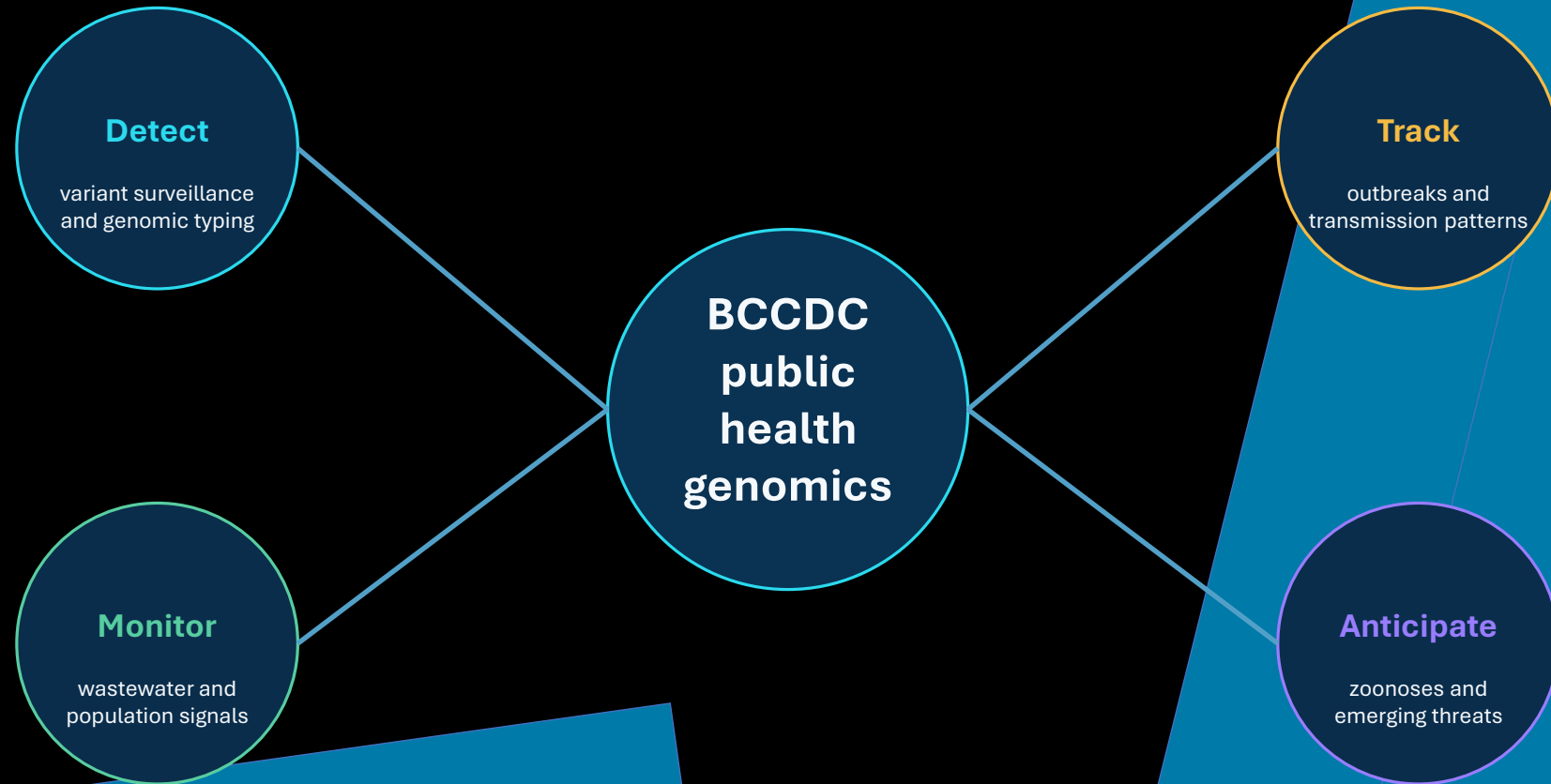
- Test** validated PGx panel
- Guide** clinician decision support
- Embed** primary care + psychiatry workflows
- Protect** equity, Indigenous perspectives & data governance

Ready for a provincial adoption conversation

Message for the keynote: pharmacogenomics is not a futuristic promise, BC has local evidence, local leaders and an implementation pathway.

Genomics is also public health infrastructure

In public health, genomics is not about one patient at a time — it helps us detect, track and respond at population scale.



Simple message: genomics helps public health move from seeing disease after it spreads to seeing signals earlier and responding faster.

BC examples: from COVID-19 response to future preparedness

These examples show how BC has already used genomic and surveillance capability — and why it matters for what comes next.

COVID-19 in BC: BCCDC as the provincial surveillance hub

During COVID-19, BCCDC linked laboratory testing, sequencing, surveillance and evidence-based guidance. Variant monitoring used sequencing of positive PCR samples, and the BCCDC Public Health Laboratory added wastewater surveillance to track population trends.

Zoonotic surveillance: SARS-CoV-2 in mink farms

BC's mink-farm events showed why One Health matters. Surveillance and environmental sampling helped assess animal-to-human risk and informed a stronger provincial response to zoonotic spillover.

Hantavirus reminder

Hantavirus is uncommon but serious. BCCDC notes that zero to four cases are reported each year among BC residents. It is a reminder that local zoonotic threats still require vigilance.

Public health lesson

The capability we build for one threat becomes infrastructure for the next: lab readiness, genomic analysis, dashboards, outbreak investigation, and integrated situational awareness.

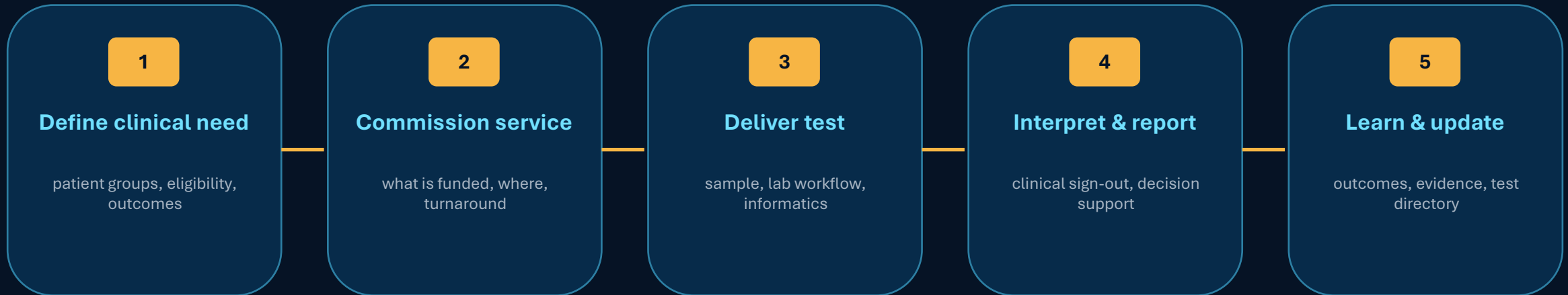
Looking ahead: FIFA 2026

Major events such as FIFA 2026 increase the need for respiratory and syndromic surveillance, outbreak readiness, lab surge capacity and real-time situational awareness across the health system.

In BC, public health genomics is no longer just a research capability — it is part of preparedness, response and resilience.

Implementation: how genomics becomes healthcare

The translation problem is not sequencing. It is adoption, governance and integration.



Chief Health Genomics Officer mandate: connect genomics, laboratory medicine, public health, research and data so innovation reaches patients.

BC has the ingredients — now it needs integration



The updated rating reframes the problem: not a lack of genomics excellence, but a gap in the operating model that turns excellence into routine care.

Readiness rating

C

2023

2025/26

C

C

Interpretation: the opportunity is not to create capability from scratch — it is to connect capability into a governed, funded, equitable service model.

What the updated rating points to

Capability

2025 signal

Implication for keynote

Scientific / sequencing capacity

Strong

BC already has world-class assets

Clinical demand

High

Cancer, rare disease, pharmacogenomics and public health are immediate use cases

Data + interoperability

Developing

Genomic results need to flow into care and learning systems

Commissioning / adoption pathway

Emerging

Move from pilots to funded, evaluated, routine services

Equitable provincial access

Needs focus

Design for rural, remote and Indigenous communities from the start

Key line: a “C” is not a failure — it is a call to integrate.

Why British Columbia? Why now?

BC already has many of the ingredients.

- Provincial health system
- BC Cancer & clinical programs
- BCCDC public health expertise
- Genome Sciences Centre
- UBC & research institutes
- Laboratory medicine & data assets

The opportunity now is integration — a coherent provincial model for genomic medicine, diagnostics, data and implementation.



BC is unusually well positioned to lead.

The question is not whether BC has capacity.
The question is how quickly we can connect it.

What leadership should ask for

Clinical value

— Which patients benefit? What outcome changes?

System value

— What legacy testing or cost is avoided?

Equity

— Who gets access, where, and how reliably?

Data governance

— How are consent, privacy and reuse handled?

Sustainability

— What is funded as routine care, not pilot work?

Genomics must be governed as a service model, not purchased as a technology.

The future of healthcare

from reactive care → **to predictive health**

from averages → **to precision**

from fragmentation → **to integration**

**Genomics is no longer simply the future of healthcare.
It is becoming part of the infrastructure of healthcare.**

BC has an opportunity to lead.

Acknowledgements

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People and teams

Cancer genomics

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Rare disease genomics

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Pharmacogenomics

Jehannine Austin · Stirling Bryan · collaborators

Public health genomics

Linda Hoang , BCCDC Public Health Laboratory

Across all programs

Patients, families, clinicians, laboratory teams, data teams, policy partners and Indigenous partners

Institutions and funders



Why whole-genome thinking matters

If we look only at the “blue” coding space, we miss part of the biology.



**~1–2%
coding
genes**

**regulatory genome
controls when, where and how
genes act**

**WGS can detect classes of
variation that targeted or coding-
only tests may miss.**

Enhancers / promoters non-coding variants affecting gene expression

Structural variation deletions, duplications, inversions

Repeat expansions diseases missed by many panels

**Mitochondrial / complex
regions** broader genome context