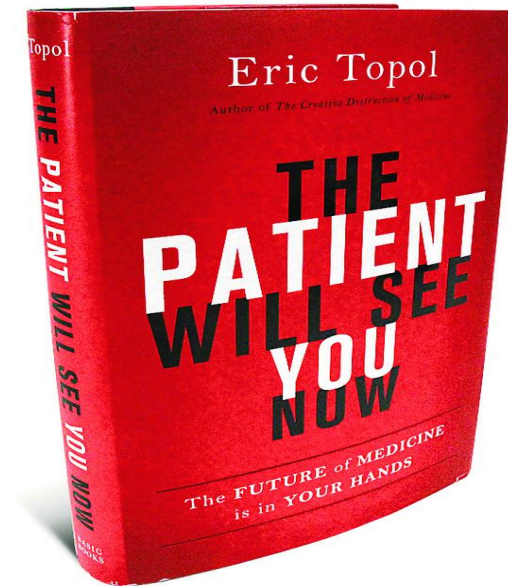
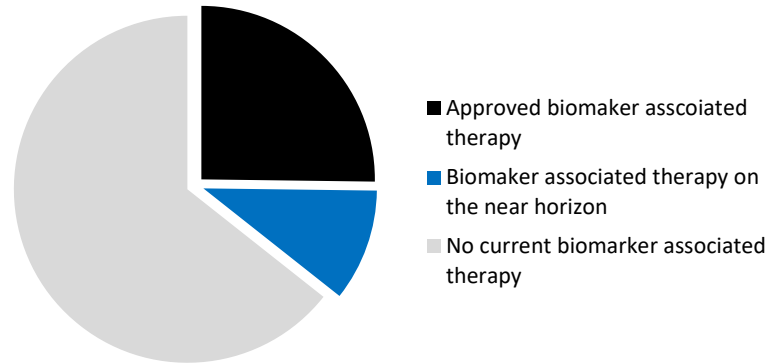


Making Biomarkers relevant for patients and health systems: Primed for Prime Time



Mark Lawler

Professor of Digital Health, Chair in Translational Cancer Genomics, Queen's University Belfast; Board Member Cancer Drug Development Forum; Board Member European Cancer Organisation (E.C.O.); Co-Chair E.C.O.'s Community 365 Initiative on Genomic Tumour Testing

Precision Genomic Testing: the key to unlocking the potential of Precision Oncology

- *The Primacy of Precision Genomic Testing in Precision Oncology*
- **Empower** the selection of which patients will respond to a more **personalised treatment** while sparing non-responders the therapy-related toxicity
- Precision Genomic Testing must be **embedded into the real world of oncology delivery**
- Testing must be **implemented across Europe**, with the intended aim of narrowing, not widening the inequity gap for patients.
- **Cancer patients** must be placed unambiguously at the **centre of a cancer biomarker informed precision oncology care agenda**

Normanno N, Apostolides K, de Lorenzo F, Beer PA, Henderson R, Sullivan R, Biankin AV, Horgan D, Lawler M. [Cancer Biomarkers in the era of precision oncology: Addressing the needs of patients and health systems.](#) *Semin Cancer Biol.* 2021 10:S1044-579X(21)00214-5.

Moving forward: Embedding precision diagnostic testing within European health systems

- Development and implementation of **precision oncology** and its potential contribution to the **enhancement of personalised health** is being made possible thanks to the **appropriate deployment of cancer biomarkers and precision genomic testing** in routine clinical care
- Predictive biomarkers are essential tools for defining the optimal therapeutic strategy for each cancer patient, **maximizing the therapeutic response while minimizing any treatment-related toxicity**.

Poster Children for the Precision Oncology Revolution

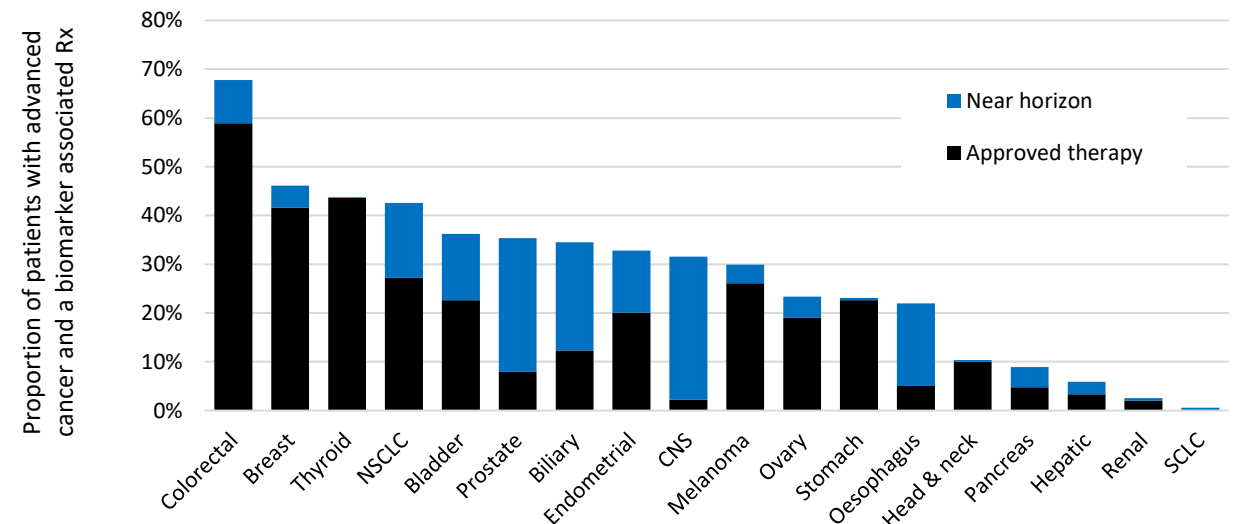
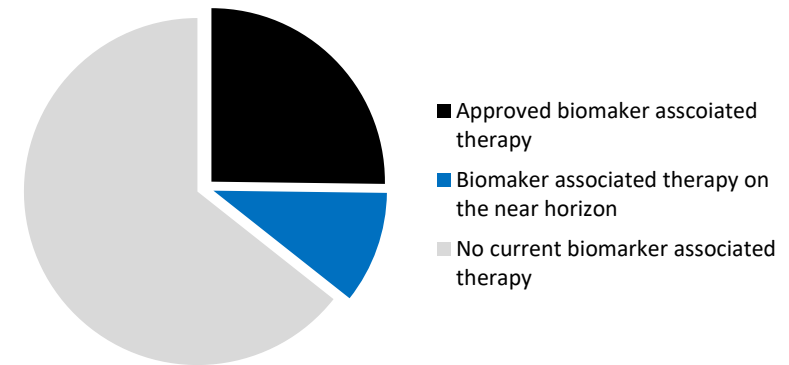


Poster Children for the Precision Oncology Generation

- In many ways, anti-ERBB2 antibodies and TKIs targeting the leukaemia specific BCR-ABL1 protein can be considered the “**poster children**” for the precision oncology generation.
- However, their efficacy can only be realized through the **prior use of a test for a cancer biomarker/Precision Genomic Test** that recommends their deployment in the treatment of the individual patient.
- This **drug-biomarker combination** has thus become an **essential component in the delivery of modern precision oncology**.

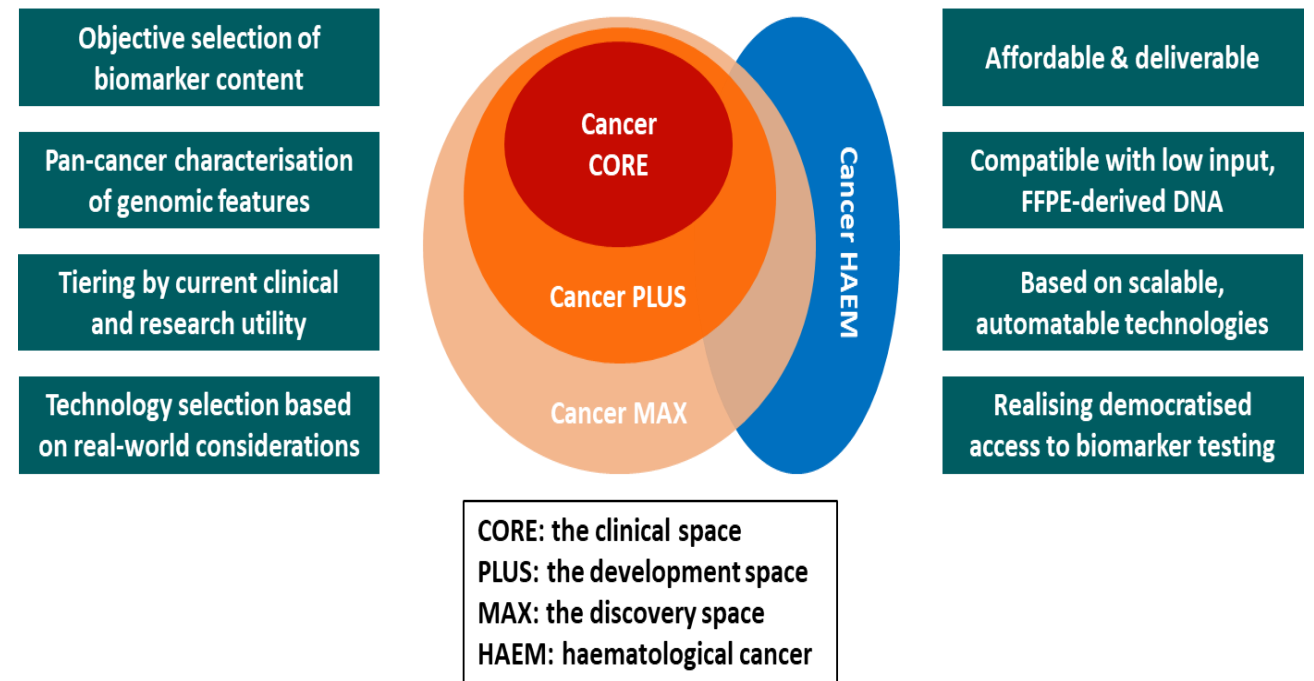
Cancer Biomarkers and Precision Genomic Testing go mainstream

- At the end of 2019, there were **70 approved cancer drugs which required or recommended predictive biomarker tests**, with this number increasing at a rate of 5-10 new approvals per year.
- At present, nearly a **third of patients** with advanced cancer will have a specific malignant subtype that is **eligible for a biomarker-informed systemic therapy**



Precision Genomic Testing in the Real World

- A **comprehensive approach** providing information on the many gene-level and genomic-level alterations in a **suite of pragmatic diagnostic assays**,
- **Truly embed** cancer biomarkers and precision oncology **within our daily clinical practice**.
- **Glasgow Cancer Assays**: Suite of **fit-for-purpose** diagnostic genomic assays that are affordable, specifically designed to be **deployed as part of routine healthcare**



Putting the patient at the Centre of Personalised Medicine

Personalised Medicine: A Guide for Patients



AN INITIATIVE OF THE EUROPEAN CANCER PATIENT COALITION



Keeping the Patient at the Centre of Personalised Medicine

- **Personalised Medicine – A Guide for Patients**
 - An Initiative of the European Cancer Patient Coalition
- A **Resource** that **specifically addresses** the **needs of patients**
- Important that the cancer patient is **well informed** as to the **opportunities and challenges** that personalised medicine and immunotherapies present
- **Empower** patients to make the **best and most informed decisions** about their personal care

<https://ecpc.org/wp-content/uploads/2020/12/ECPC-personalised-medicine-booklet-V.pdf>



European Cancer
Patient Coalition

A Resource to inform and assist the cancer patient

- The **Booklet** and accompanying **Leaflet** is **co-created by patients and health professionals**
- Seeks to **provide relevant information** on personalised medicine for cancer patients
- **Address questions** that the cancer patient may have about **personalised medicines, including immunotherapy**

<https://ecpc.org/wp-content/uploads/2020/12/ECPC-personalised-medicine-booklet-V.pdf>

<https://ecpc.org/wp-content/uploads/2020/11/ECPC-personalised-medicine-leaflet-II.pdf>



European Cancer
Patient Coalition

Empowering the Patient

- **Understanding personalised medicine/precision oncology** and how it might help specifically in the care of the patient **can be challenging.**
- **Patients may have** a number of **uncertainties** but find them difficult to articulate to their doctor or to ask the right questions.
- As part of the Patient Booklet and Leaflet, we have created **a series of 10 questions** that the patient may choose to ask their doctor
- **Help ensure** that the **patient is more informed** so that they can **make the decision that is right for them.**

Regulatory Challenges

- **Regulatory issues** may also limit Europe-wide implementation of PGT
- In the EU, cancer biomarkers and PGT were regulated under the **In Vitro Diagnostics Directive (IVDD)**.
- However, this is being superseded by the **In Vitro Diagnostics Regulation (IVDR)**, which may have significant implications for cancer biomarkers, particularly in their validation.
- A potentially contentious issue is the position of **Laboratory Designed Tests (LDTs)** which complement the commercially manufactured **Diagnostic Test kits, (CDx)**.
- Under IVDD, LDTs were approved, but their status is less clear under the new regulation.
- **Could lead to significant shortages of cancer biomarkers** that comply with the regulation,
- Unintended consequences of **inhibiting diagnostic innovation** and adversely impacting on the care of the cancer patient.
- IVDR will come into full effect **shortly**, so there is a **need to act quickly and decisively**.

Cancer Biomarkers and Precision Genomic Testing: Cost and Value¹

- Cost effectiveness of **Precision Genomic Testing**
- **Comprehensive health economic analysis** undertaken in colorectal and lung cancer
- **Colorectal:** Health economic assessment **supported use of PGT** in certain scenarios ²
- **Lung:** PDT guided therapy versus “Therapy-for-All” approach – **PGT was cost effective in 100% of scenarios³**
- Both studies emphasised the **need for more robust health economic evaluation** approaches, **underpinning value-based care** and enhanced outcomes for cancer patients.

¹Lawler M, French D, Henderson R, Aggarwal A, Sullivan R. [Shooting for the Moon or Flying Too Near the Sun? Crossing the Value Rubicon in Precision Cancer Care](#). *Public Health Genomics*. 2016;

²Henderson R, French D, Sullivan R, Maughan T, Clarke M, Lawler M. [Molecular biomarkers and precision medicine in colorectal cancer: a systematic review of health economic analyses](#). *Oncotarget*. 2019

³Henderson R, Keeling P, French D, Smart D, Sullivan R, Lawler M. [Cost-effectiveness of precision diagnostic testing for precision medicine approaches against non-small-cell lung cancer: A systematic review](#). *Mol Oncol*. 2021

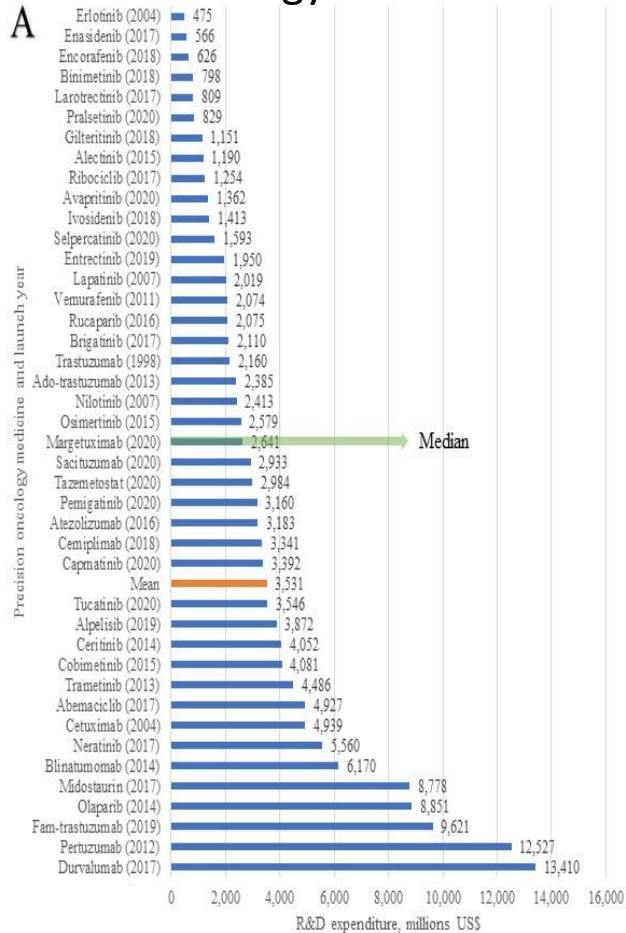
Cancer Biomarkers and Precision Genomic Testing: Cost and Value

- When considering biomarkers and genomic testing in Europe, there is an absolute need to **ensure that PGT is available and is reimbursed appropriately**, and not just in the elite countries of western Europe, but to all of Europe.
- A systematic review and meta-analyses found that there are **socio-economic inequalities** in predictive biomarker tests and biological and precision therapy utilization.
- Issues such as the **cost** (personal, clinical, financial) of “**not testing**” are of paramount importance, but are currently not well defined or understood.

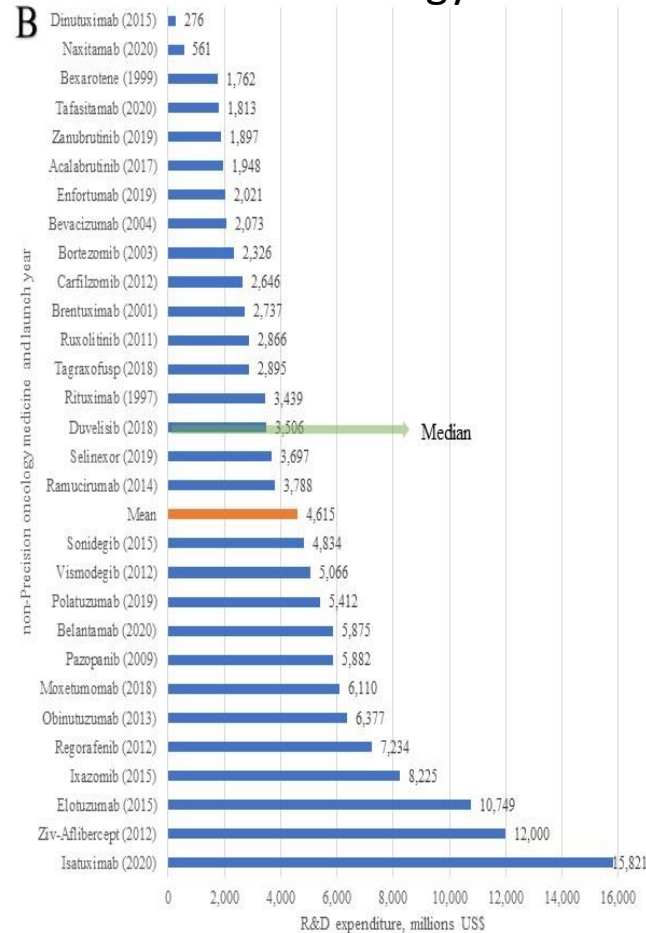
Norris RP, Dew R, Sharp L, Greystoke A, Rice S, Johnell K, Todd A [Are there socio-economic inequalities in utilization of predictive biomarker tests and biological and precision therapies for cancer? A systematic review and meta-analysis.](#) *BMC Med.* 2020 18:282.

Deploying data to deliver the precision oncology paradigm

Precision Oncology Medicines



Non Precision Oncology Medicines



- R&D spend for **42 precision oncology medicines**, (\$475M to \$13,410M) v **29 non-precision oncology medicines** (\$276M to \$15,821M).
- Probability of Success (POS)** for precision v non-precision oncology medicines: **\$1,486.6M** v **\$2,077.9M**, a difference of **\$591.3M**.
- Increased POS** associated with a **CDx** in clinical trials - employment of a **CDx approach increases POS** v non CDx approach **by a factor of 2.5**

Henderson RH, French D, Stewart E, Smart D, Idica A, Redmond S, Eckstein M, Clark J, Sullivan R, Keeling P, Lawler M. [Delivering the precision oncology paradigm: reduced R&D costs and greater return on investment through a companion diagnostic informed precision oncology medicines approach.](#)

J Pharm Policy Pract. 2023

Landmark study demonstrates economic benefit of precision medicine in treating cancer

Approach

- **Most comprehensive study** of precision oncology medicines in the marketplace
- Examined **economic impact of precision oncology medicines** compared to traditional oncology medicines.

Key results

- **Over \$1 billion less in R&D** spend to develop a medicine guided through clinical trials in a precision oncology approach, compared to a “one size fits all” approach
- **CDx -guided approach** can deliver **health benefits at a potentially affordable cost, lowering expensive clinical trial attrition rates** and **sparing patients from ineffective treatments** with significant side effects.
- Treating patients based on their **genomic make-up** is the **direction of travel that we should be pursuing**, this study highlights how it can be achieved in an efficient and cost-effective way.

Take Home Messages

- **Precision medicine** can be a **cheaper, more efficient way** to treat cancer
- **If we don't deploy a CDx-guided approach** we are **missing a huge opportunity** to deliver the best, most affordable care to our patients.



European Cancer Organisation Community 365 Round Table on Genomic Tumour Testing

- Convened by the **European Cancer Organisation (E.C.O.)**
- Chaired by Prof Matti Aapro (Immediate Past President E.C.O) and Prof Mark Lawler (Board Member E.C.O.)
- Convened interested and experienced **patient, research, clinical, policy, political and industry stakeholders** to address the **key opportunities and barriers for genomic tumour testing in Europe**
- Series of Meetings and a High Level Workshop (2nd December 2021), culminating in an Action Report
- ***Put to the Test: Empowering Genomics to Improve Cancer Care and Patients lives***

Lawler M, Aapro M, Schirmacher P, Möslin G (2022). Put to the Test: Empowering Genomics to Improve Cancer Care and Patient Lives. European Cancer Organisation; Brussels



Put to the Test: Empowering Genomics to Improve Cancer Care and Patients lives

- Key Overarching Message:

““Put to the Test” aims to provide helpful guidance and information to interested stakeholders and policy-makers in order to embed genomic tumour testing as standard of care for European cancer patients.”



Put to the Test: Key Asks

- ***“Put to the Test”*** set out key asks for European attention to achieve the potential of genomic tumour testing **to guide better therapy for cancer patients, improve their survival and enhance their quality of life.**
- **Improve collaboration** between cancer centres as an important means to pool resources and improve patient access to genomic tumour testing
- **Enhance consistency in national approaches** for **reimbursement** of, and **access** to, genomic tumour testing across Europe
- **Improve collection and use of data**, including for cost-benefit considerations
- **Ensure connected infrastructure** and address **workforce** needs, **through investment, education and training**
- **Align activity** to relevant and existing **European policies**

<https://www.europeancancer.org/resources/244:put-to-the-test-empowering-genomics-to-improve-cancer-care-and-patient-lives.html>



Conclusion

- Need to move to a situation where **Precision Genomic Testing is embedded** within health systems and **really delivers for our patients**
- Upgrading infrastructure and ongoing expenditures need to be carefully assessed against rigorous benchmarks to **deliver affordable care**.
- The **IVDR issue** must be addressed
- The **Economic Argument** must be articulated more **clearly** and **robustly**
- **Education** is required, for patients, for health care professionals and for policy makers/health care providers,
- We must **avoid a multi-speed Europe** that leaves many patients behind
- An **equality agenda** must be pursued to ensure that **Precision Genomic Testing narrows rather than widens cancer disparities** across Europe
- We have a huge opportunity within our grasp. **LET'S TAKE IT!**

Thank you for Your Attention

