THE FUTURE IS NOW:
How to Drive Precision Oncology Adoption
Effectively applied, precision oncology should drastically enhance the way cancer is treated, the way drugs are developed and (most importantly) the health outcomes that patients can realistically hope for. Precision oncology describes a diverse set of strategies in cancer medicine tailored to the unique biology of a patient’s disease. Strategies range from the use of targeted therapies to the use of data from next-generation sequencing to select treatments independent of cancer type, and hence go beyond traditional organ-based oncology. Patients, healthcare systems, and economies all stand to benefit.
Governments have invested billions of dollars into personalized medicine (PM), the parent field of precision oncology, as a matter of public and national interest. Personalized medicines have made up 20 percent of US Food and Drug Administration (FDA) approvals between 2013 and 2018—a number that jumped to 40 percent in 2018. The FDA and European Medicines Agency (EMA) have both seen the need for regulatory flexibility and new guidelines, as reflected in the EMA’s Regulatory Science to 2025: Strategic Reflection report. The agency defined “supporting developments in personalized medicine, biomarkers, and ‘omics’ as its foremost strategic goal”. For years, patients diagnosed with a disease often received the same treatment. For some people, that treatment worked. For others, it did not—or only worked marginally or with serious side effects. In cancer, standard therapies are ineffective in an average of three-quarters of patients—one of the highest therapy failure rates for all diseases.

While the exact impact of precision oncology is still being debated among researchers, the most recent literature suggests that up to 50 percent of patients could benefit—a significant step forward from one-size-fits-all therapies.

Highly personalized cancer treatments mean patients and physicians can look forward to significantly better therapy selection and treatment success rates. That also means lower exposure to ineffective drugs and their negative side-effects. For healthcare systems and payers, precision oncology holds the promise of improved efficiency, better care, and the reduction of ineffective treatments and costs.

Aside from physicians, health systems and payers, pharmaceutical firms and technology innovators will have opportunities with the advent of precision oncology.

Health systems and payers: Apart from data platforms and tumor boards, health systems must find ways to fund not only infrastructure, but also new diagnostic and therapeutic options. Outcomes-based pricing and other risk-sharing payment models will be the rule, rather than the exception. This will only be possible if well standardized longitudinal data (including outcome data as well as “omic data” e.g. from reimbursed comprehensive genomic sequencing, liquid biopsies) is available.
Given all this promise, the questions arise: how widely is precision oncology currently used, what is it used for, and how fast is it likely to grow? To test the status quo, identify barriers to adoption, and help unlock precision oncology’s full value, we surveyed 130 oncologists from the United States and Europe as part of the Accenture Study on Precision Oncology in Practice.7

Our research reveals there is strong consensus that precision oncology will be an important part of the clinical environment within five years, yet despite its promise, adoption is slow

According to our research, despite 70 percent of oncologists agreeing that precision oncology is emerging and is applied in their practices to some degree, 29 percent still acknowledge that it is not yet widely applied in their daily work.

In particular, we found that 14 percent of oncologists routinely participate in molecular tumor boards, 18 percent regularly use clinical decision support (CDS) tools, and 41 percent of oncologists frequently match targeted therapies to genomic alteration (see Fig. 1). Overall, these percentages seem very low as all three points are critical for the wide adoption of precision oncology in clinical practice.

More than 80 percent of oncologists believe that precision oncology will be an important part of the clinical environment within five years and see great growth potential; however, it seems many oncologists are waiting for some essential ingredients before they begin implementing.
The precision oncology pipeline is full, governments are investing and oncologists see it as an important part of their future practices—so what is holding precision oncology back?

Important work remains to prepare oncology to leverage the full potential of the precision oncology paradigm shift. In an increasingly complex field, oncologists must integrate the explosion of precision oncology information into daily practice. When we asked our survey respondents what factors would best stimulate the future use of precision oncology:

- **Oncologists emphasized the importance of large clinico-genomics databases to search for comparable patient cases and decision support tools to match treatments to genomic alteration.**

- **Oncologists highlighted the use of platforms to efficiently learn from one another’s experiences.**

In this context, we’ve identified three key enabling factors to put precision oncology into practice.
Three keys to speed oncologists’ adoption of precision oncology

The widespread use of precision oncology hinges on its adoption by oncologists themselves. In terms of making precision oncology work at the clinical practice level, the oncologists we surveyed need:

01 DATA: ARMING ONCOLOGISTS WITH EVIDENCE.
A data foundation to support adoption and use of precision oncology in clinical practice.

02 CLINICAL DECISION SUPPORT: MITIGATING UNCERTAINTY.
Tools and guidelines to support clinical decision making.

03 EVOLVED EDUCATION: UNDERSTANDING THE FUNDAMENTALS.
Education designed to provide comprehensive foundational understanding of precision oncology and facilitate effective implementation.
DATA: ARMING ONCOLOGISTS WITH EVIDENCE

Doctors treating cancer patients need excellent data to be comfortable with the decisions they make and bring to patients based on precision oncology adoption. Data is the foundation on which precision oncology will be built. Soon, the sheer number of possible product combinations will not allow for phase three trials on every single treatment so oncologists will be faced with the complex task of choosing different combinations of helpful products without the benefit of a clinical trial. For this reason, oncologists want more real-world data.

Why should I share my data?

Real-world datasets are only as reliable as the quality of the underlying data, which makes sharing large, high quality patient databases an absolute prerequisite for establishing and applying precision oncology.* The more good data, the more robust the decisions they support.

This shared data will create transparency into the patient benefits that can realistically be expected—and when and how to apply precision oncology. Secondly, shared data will help oncologists review longitudinal studies of comparable cases to support decisions that are in patients’ best interests.

It is unsurprising, then, that based on our research, the most important perceived benefits of data sharing were access to patient cohort data (88 percent), establishing data quality standards across institutions (75 percent), and improving quality of individual patient care (71 percent). Simultaneously, 82 percent of those in our study said a lack of supporting real-world evidence was a key hurdle to precision oncology becoming a mainstream treatment modality. It should be noted that in contrast to big pharma’s priorities, increasing the speed of drug discovery and approval was not perceived as being critical and only ranked as important among two percent and three percent of oncologists, respectively. This misalignment of priorities may present some challenges in terms of establishing common data sharing approaches between stakeholders.

What data should I share?

According to our research, outcomes/longitudinal data was ranked as the most critical data source to share (by 85 percent of respondents), suggesting that the healthcare industry should invest more into longitudinal studies and real-world evidence data. Of course, the 85 percent response carries with it the explicit assumption of maintaining data privacy standards. Although the use of genomic sequencing data is still limited, this data source ranked as the second most important (71 percent), closely followed by data about clinical history and current treatment (70 percent), and then by laboratory (62 percent) and imaging data (58 percent). In contrast to all this, only four percent of oncologists rank clinical trial data as important to be shared (see Fig. 2).

*Data sharing is one of the key forms of making data accessible. Other forms include edge learning, data collaborates, and federated systems, among others.
Requirements for data sharing

We identified four needs that must be met for data to be shared effectively. Data needs to be made accessible, standardized, broadly shared, and secure. The latter is vital to ensure data privacy, data protection, and data ownership are addressed.

Artificial intelligence (AI) will be used to process data currently stuck in silos, and in disparate formats, to make it more accessible to physicians. Structuring mass amounts of data is currently painstakingly done by humans analyzing existing data and creating code to integrate with other data.

The second step, standardization, goes beyond standard formatting and must include data quality which is a very labor-intensive process. Algorithm-based data standardization and curation will be imperative to make data usable. A further aspect to standardization, possibly the most challenging, is for oncologists to achieve global consensus on longitudinal data parameters (including outcomes) to make them comparable during treatment decisions and useful for research.

\[\text{Fig. 2: Data that needs to be broadly shared across medical centers / institutions to facilitate optimal precision oncology effectiveness.}\]
Over 90 percent of oncologists say data should be shared across borders.

In terms of broad data sharing, polled oncologists are convinced that different institutions should share data nationally or even globally. More than 90 percent of the oncologists we polled believe that data should be shared across borders — reinforcing that cancer treatment is not a national but an international endeavor.

To ensure trust in shared data and enable data sharing at scale, the healthcare ecosystem (medical centers, pharmaceutical companies, and technology companies) needs to invest in the process of establishing data accreditation standards. To get clinical value from the data and encourage cross-organizational adoption, common approaches to data collection, data quality, and accreditation are vital. Standards would also increase both patients’ and oncologists’ trust by ensuring that the statistical probabilities of different health outcomes are benchmarked and can be conveyed to them accurately.

An open-source approach to oncological data will unlock the real value—which is not bound up in the data itself but rather in the insights generated from large combined datasets.

All three aspects—accessibility, standardization, and sharing—must be subject to data privacy, protection, and ownership caveats. Viewing data as a source of value may prevent some from wanting to share it freely, but an open-source approach to oncological data is key to unlock real value. That value is not bound up in the data itself but rather in the insights generated from large, combined datasets which help to predict patient outcomes and reduce the burden that cancer places on societies and health systems.
CLINICAL DECISION SUPPORT: MITIGATING UNCERTAINTY

Clinical decision support (CDS) tools provide doctors with intelligently filtered information at important moments along the care pathway to enhance clinical decisions and improve health outcomes.

Clinicians will want to know what’s in CDS for them. Our research among oncologists indicates they expect CDS tools to:

- **83%** Minimize the risk of error.
- **82%** Facilitate the process of staying up to date.
- **66%** Increase clinicians available time for direct patient care.

When developing CDS tools to adopt into clinical practice, it is vital to create trusted algorithms which nevertheless remain subject to autonomous decision making by oncologists. Interestingly, the transparency and validation of the algorithms ranked as the least important factor in terms of adoption. Oncologists want to know that the algorithms are reliable, but they don’t need to know the minutiae of exactly how they work. Instead, integration of CDS tools into clinical guidelines, regulatory approval, and hospital workflows ranked as the next highest requirements after trust. (See Fig. 3)

**Fig. 3: Frequency of key factors ranked in the top 3 (out of 7), listed in decreasing order in terms of CDS adoption into clinical practice.**
Setting CDS standards

The practice of precision oncology will become enormously complex, given the number of possible treatment choices or combinations that will be on the market in the next few years. Most physicians will have to depend on smart CDS tools to help in everyday decision making. Integration with oncologists’ workflow is vital if oncologists are to adopt precision oncology/CDS technology.

Technology firms and startups will need profound insight into oncologists’ practices to make sure they plug into oncologists’ thinking and provide functionality that leverages all available patient data. Integrating solutions into clinical workflows is not easy, and a lack of standardization among underlying systems means CDS solutions will have to leverage advanced analytics to be effective.

Enhanced decision making by oncologists will be critical and built on some foundational elements. First, as described above, they will need CDS tools integrated into everyday workflow (45 percent). Second, oncologists will want interpersonal contact with colleagues through forums designed for experience exchange and insights sharing among peers and experts (65 percent) using digital technologies (64 percent)—such as virtual molecular tumor boards that go deep into the genomic space (64 percent). (See Fig. 4)

Fig. 4: Requirements to new solutions supporting oncologists.

Needs to allow to connect with other physicians to discuss “tricky” cases

Needs to evolve to include also the emergence of new “digital” technologies

Needs to go much deeper into the genomic space

Needs to be integrated into the busy work schedule (online, app, …)

Frequency [%]
Forums to share experiences with peers and experts (e.g., virtual tumor boards) need to become more common

In order to foster confidence in their decisions and smooth the transition to precision oncology, oncologists will need the comfort of a peer network. This applies especially to rare cases where new precision oncology treatments will be applicable, but oncologists lack the experience to use them. If oncologists can conveniently ask questions to more experienced specialists like geneticists, it will help ease anxiety around appropriate therapeutic precision oncology options, the way current hospital-based molecular tumor boards do. Virtual molecular tumor boards across institutions need to become more common. Our data shows that this type of interaction is still fairly rare with more than 80 percent of oncologists not routinely participating in any molecular tumor boards.

EVOLVED PRECISION ONCOLOGY EDUCATION: UNDERSTANDING THE FUNDAMENTALS

Ongoing education of oncologists is vital to precision oncology adoption as fast-evolving treatment options and emerging technologies multiply and will soon be too numerous and complex to keep up with.

We found a broad consensus among oncologists (66 percent) that clinical practice is changing rapidly and will require them to master new skillsets. First, they will need a detailed understanding of molecular mechanisms, pathways, and the importance and interpretation of genomic alterations, and how to act on these insights. Second, they need a much deeper understanding of how to work with less structured longitudinal clinical data, often not reviewed by statisticians—and therefore the need for a deeper understanding of advanced analytics tools and algorithms as well as core statistical principles. Lastly, they will need an understanding of the technological dimension, also covering algorithms related to machine learning and artificial intelligence, as well as new technologies emerging in the actual therapy of cancer (e.g. CAR-T and CRISPR).
Four essential steps for widespread adoption of precision oncology

Soon, precision oncology will no longer be limited to a subset of cancer patients and instead will be used more widely. Cancer patients will be treated based on their individual biology, and oncology’s success rate will improve greatly as a result.

It’s clear that precision oncology’s importance will grow significantly in the next few years, but to achieve the desired goals, a clear course must be plotted. We believe the oncology ecosystem requires four key focus areas to capture the full potential of precision oncology:

**BUILD THE BASICS:**

As our research shows, the basics are only partially in place, so precision oncology adoption has been limited. Virtual molecular tumor boards and CDS tools need to become more abundant, because precision oncology brings a lot of complexity. To cope with this complexity, physicians need support through seamless exchange with peers and experts, and support from CDS tools using advanced analytics to interpret patient data. Furthermore, we need real-world evidence to guide individual patient treatment—clinical trial data is not optimal for matching data with individual patients because it only guides a subset of therapy decisions oncologists need to take. We also need data that drills down to an individual patient level, not just cohort data, because only patient-level data would enable oncologists to find a comparable case that helps their treatment decisions. Data access must be seamless, while ensuring good data governance.

**THINK BEYOND BORDERS:**

Most precision oncology initiatives (tumor boards, etc.) still operate at a national or institutional level. Our research reveals that global data sharing is vital to physicians, but our experience is that in most cases, hospitals are not yet incentivized to think this way. Global precision oncology projects should include data sharing among medical centers and frequent daily, international interaction between oncologist peers. We must expand the oncology data ecosystem across borders and drive interoperability: technical, structural, semantic, and organizational. Each individual case is effectively unique, so we need large datasets in order to draw individually relevant value out of the data. This is only possible if we start to share data and insights beyond borders by creating a collaborative ecosystem.
REIMAGINE MEDICAL EDUCATION:

The knowledge and capabilities needed to manage cancer in the age of precision oncology are developing rapidly. Our research indicates that this knowledge should evolve to include digital technology and place greater emphasis on genomics. For the moment, education remains inside a traditional paradigm and does not place enough emphasis on either interpreting the molecular foundations of each individual cancer, or fluency in technology-enabled solutions—as a result, many practicing oncologists are struggling to master these new skills. To help them do so, the university curriculum needs updating as soon as possible, and continuing medical education needs to become freely available and integrated into oncologists’ work schedules using digital solutions like online or mobile app training.

MAKE HEALTHCARE PROFESSIONALS’ LIVES EASIER:

Precision oncology will add complexity to everyday clinical practice in multiple ways: more products to use and combine, the need to treat patients with limited data, more exchange between healthcare professionals, and new diagnostic tools and insights to master. Without alignment to clinical workflow and integration into local technology and data landscape (e.g. electronic medical records) precision oncology tools may eat up time, causing doctors to be disincentivized to adopt it. New technology that is well integrated into physicians’ daily workflows will improve their lives, save time and effort—and stimulate adoption.

There is much work to be done to prepare the field of oncology to leverage the full potential of precision oncology. We will have to collaborate across borders and beyond existing ecosystems and create win-win situations for all the stakeholders in the ecosystem. The time is now, the future of oncology patients depends on it.
REFERENCES

1 Recent national investments into personalized medicine have multiplied and include: the Obama Administration’s Precision Medicine Initiative (PMI) ($1.4bn); the U.S. Cancer Moonshot ($1.8bn); The EU’s Integrated Framework Programmes (EUR 3.2bn) and the Innovative Medicines Initiative (EUR 5.3bn).


7 See About the Research for more details.


ABOUT THE RESEARCH

We conducted the Accenture Study on Precision Oncology in Practice in February and March of 2019. We surveyed 130 oncologists from the USA (23 percent of our sample group) and Europe (UK (15 percent), Germany (12 percent), France (12 percent), Netherlands (8 percent), Switzerland (8 percent), Norway (8 percent), Sweden (8 percent), and other (8 percent)). Most of the oncologists we polled work at universities (88 percent), and specialize in breast, thoracic/pulmonary, gastrointestinal, and hematological cancers, and see 25-50 patients per month.

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