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HLC205

How MD Anderson and Philips power precision medicine with genomics on AWS

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Agenda

- Introduction – AWS for Health
- The value of multimodal analysis in cancer care
- Challenges in oncology care
- Leveraging cloud technology to reduce barriers for personalized health
- Real-world exploration: MD Anderson
- Technical deep dive
- Looking into the future

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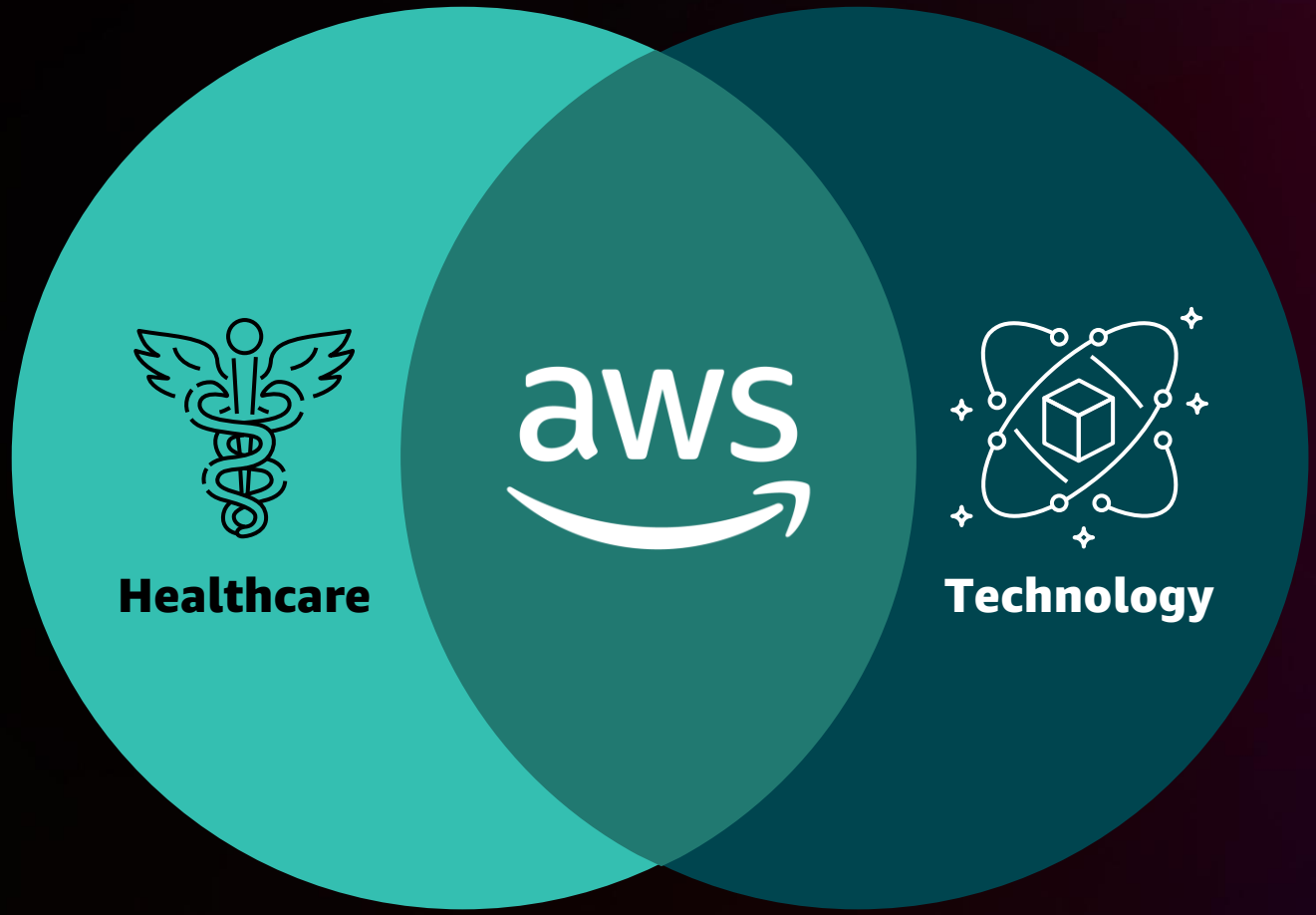
Reproducible research and democratized care **is my why**

Lisa McFerrin
Head of Genomics Solutions
Amazon Web Services



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Supporting customers at the intersection of science and technology



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AWS for Health



Omics



Healthcare



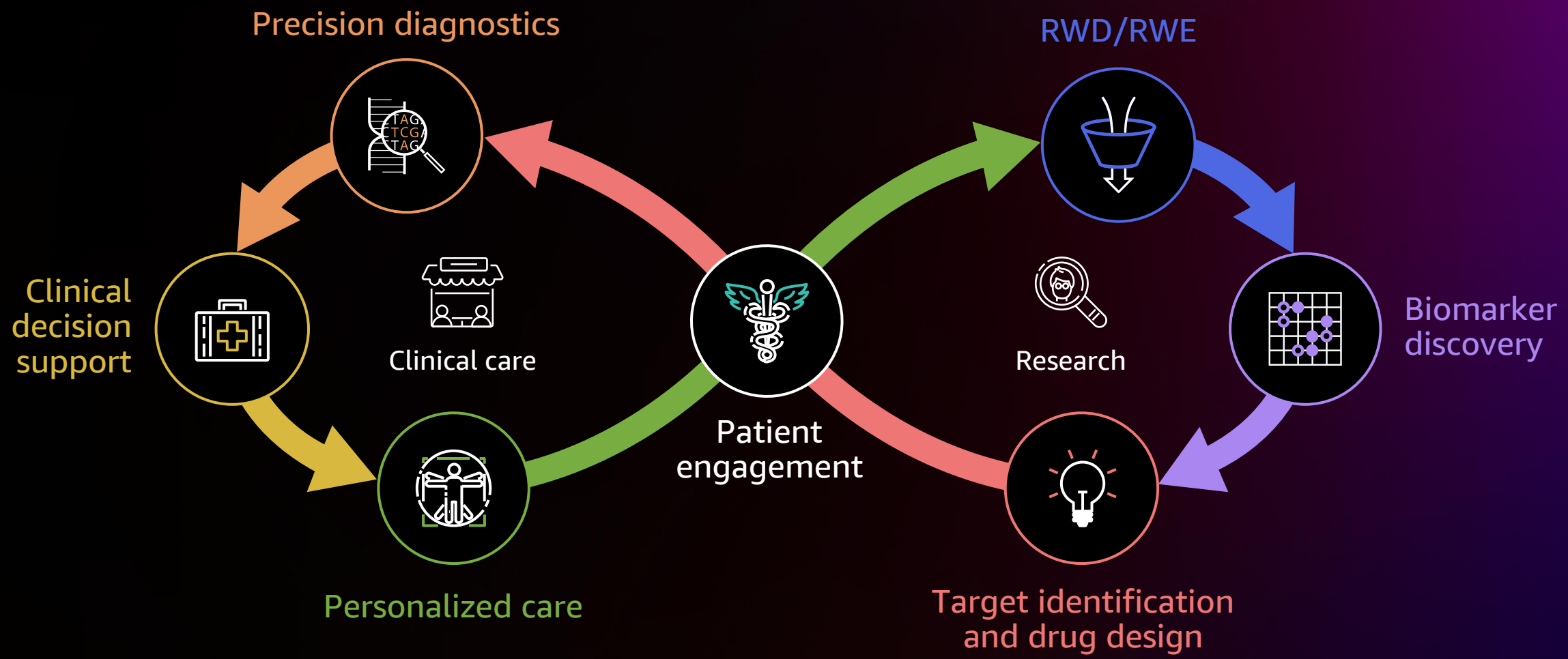
Life sciences

Accelerating innovations from benchtop to bedside

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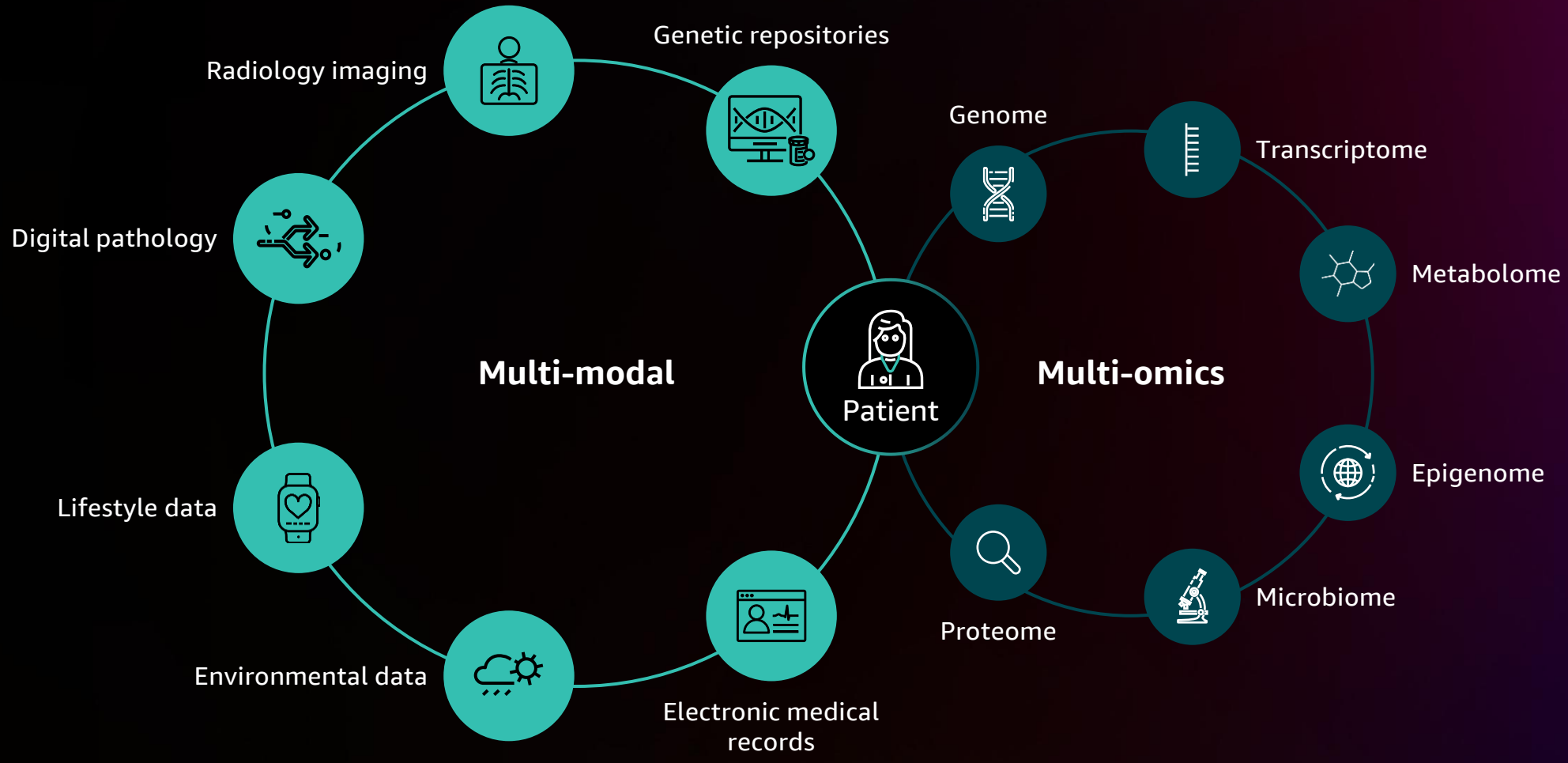
Data flywheel across health continuum

PROPER FLOW OF DATA ACROSS HEALTH CONTINUUM TO IMPROVE PATIENT OUTCOMES



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Importance and value of multi-modal data in cancer care



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Challenges in achieving precision oncology

"Our team needs to seamlessly integrate and analyze genomic data with other forms of medical and biological data."

"My background isn't genomics – how do I know if a variant is relevant in the context for my patient."

Difficult to interpret

"Hard to keep up with the science and options for number of therapies and open clinical trials."

Function and clinical data change over time

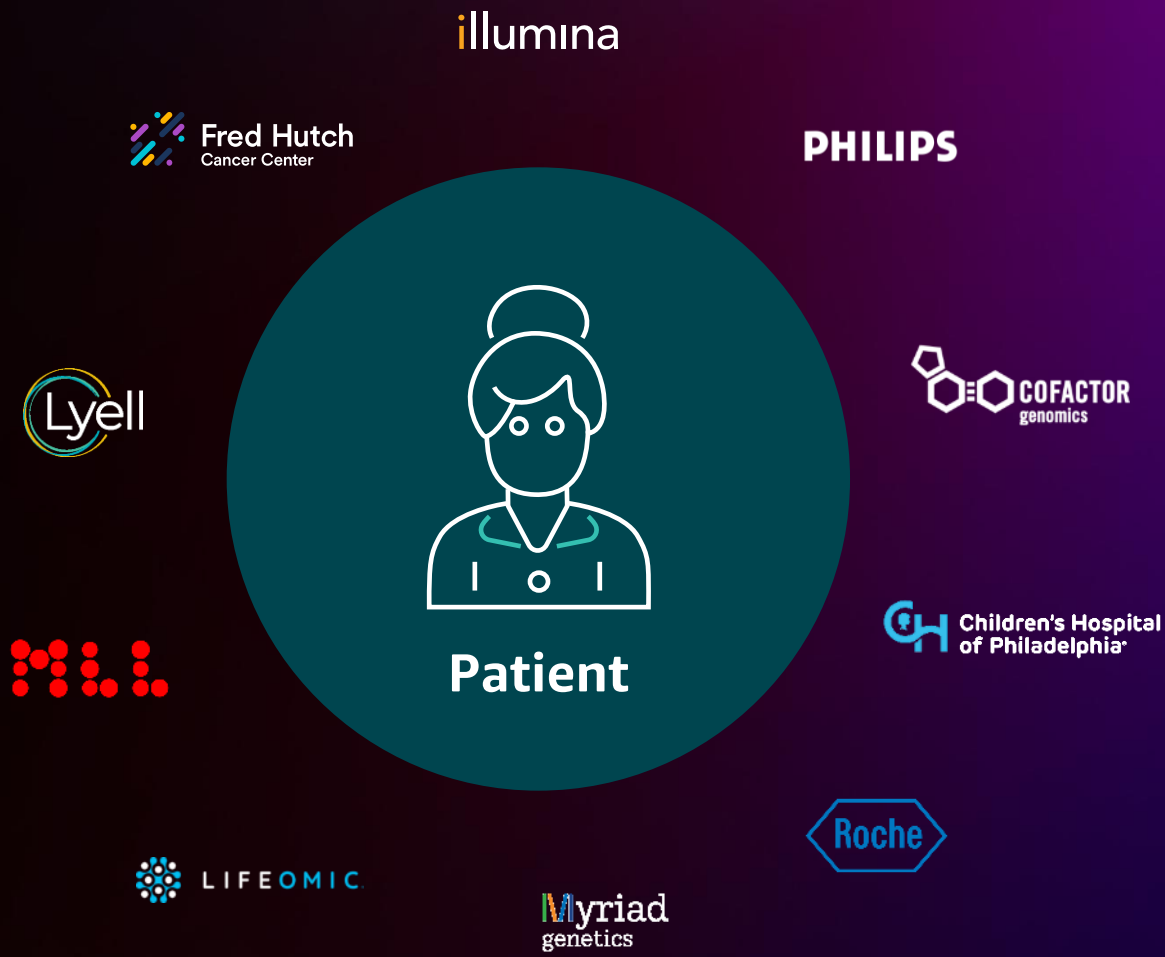
"Unify data silos but maintain regulation."

More than access to data – need actionable insights

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Supporting oncology use cases across the healthcare ecosystem



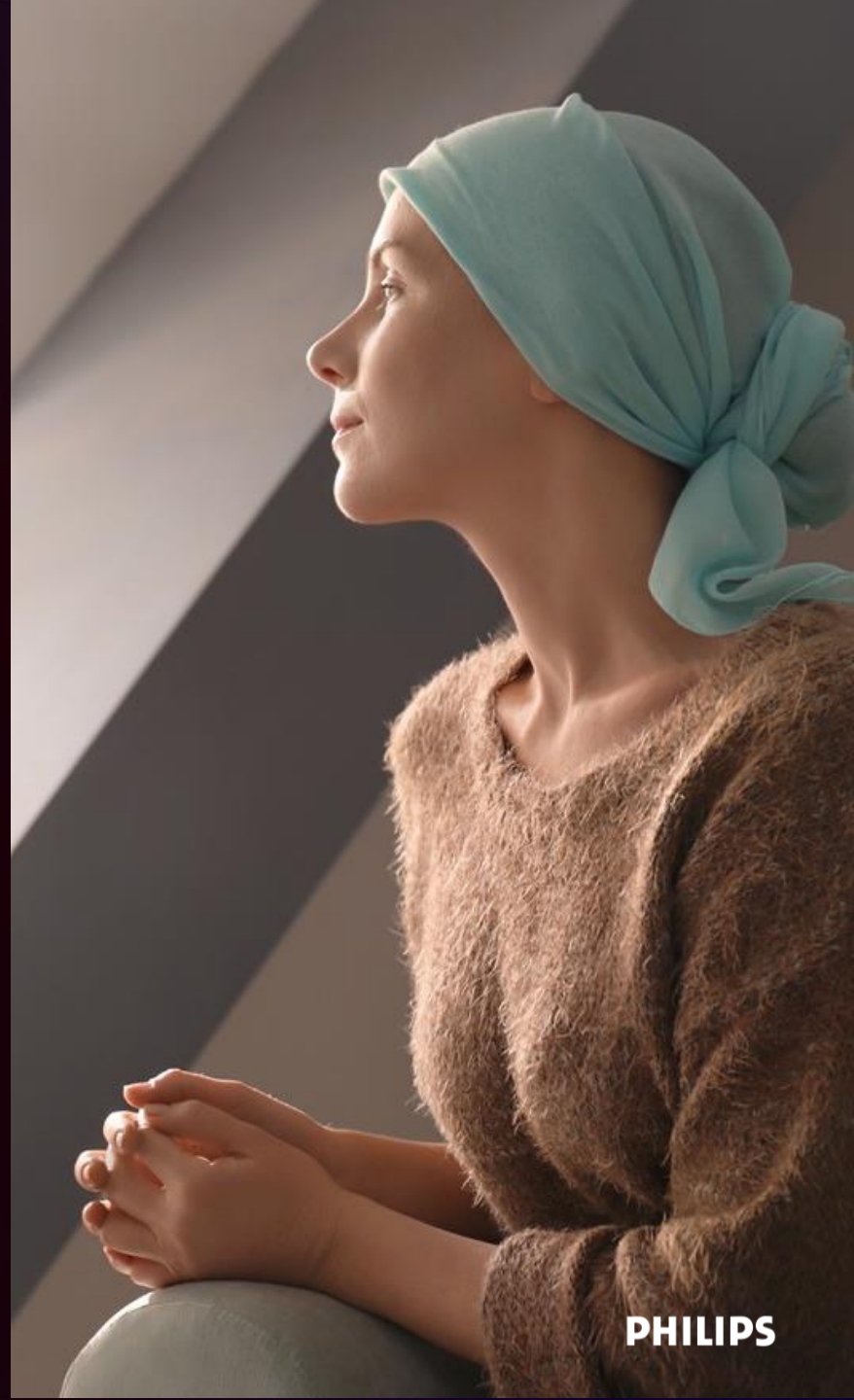
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Philips

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Fighting cancer with data is my why

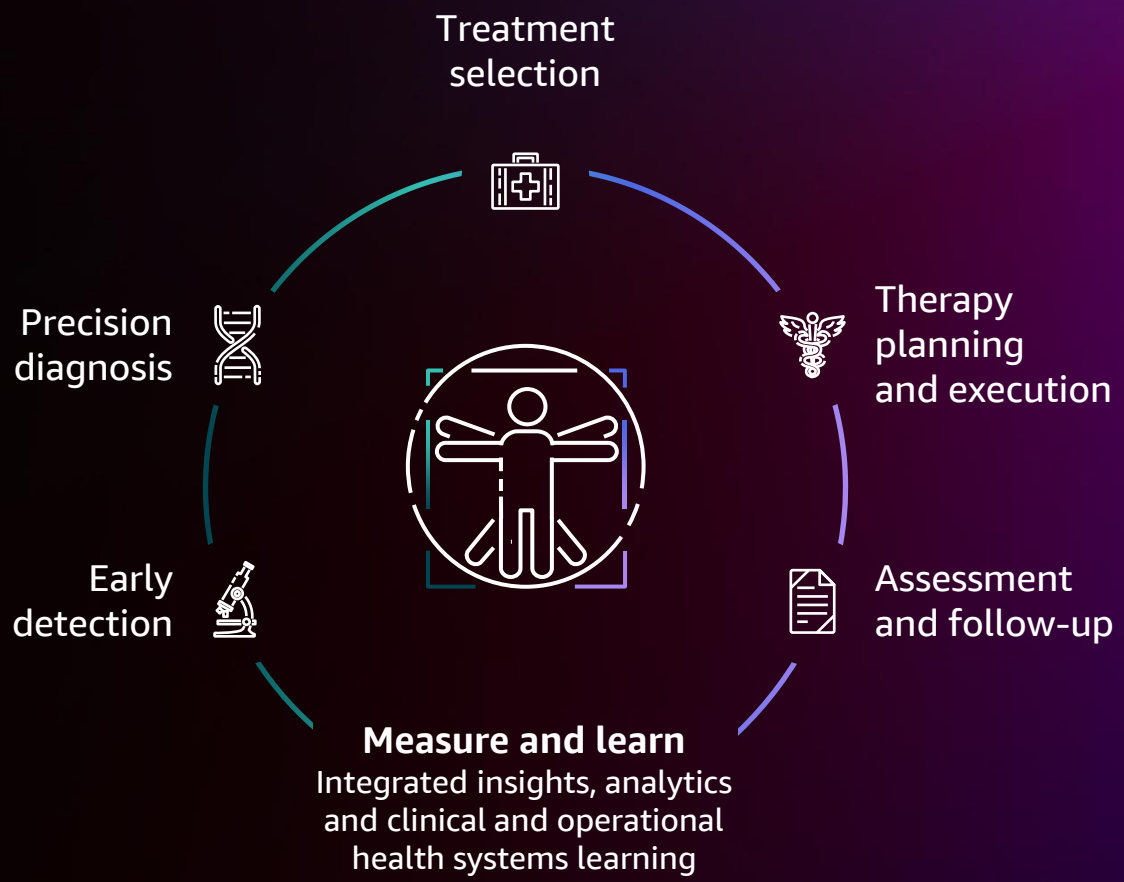
Louis Culot
Innovation Strategy Leader, Precision Diagnosis
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Advancing precision oncology

CHALLENGE OF MULTI-MODAL INFORMATION AND DECISION-MAKING



Improved patient experience

Improved staff satisfaction

Better health outcomes

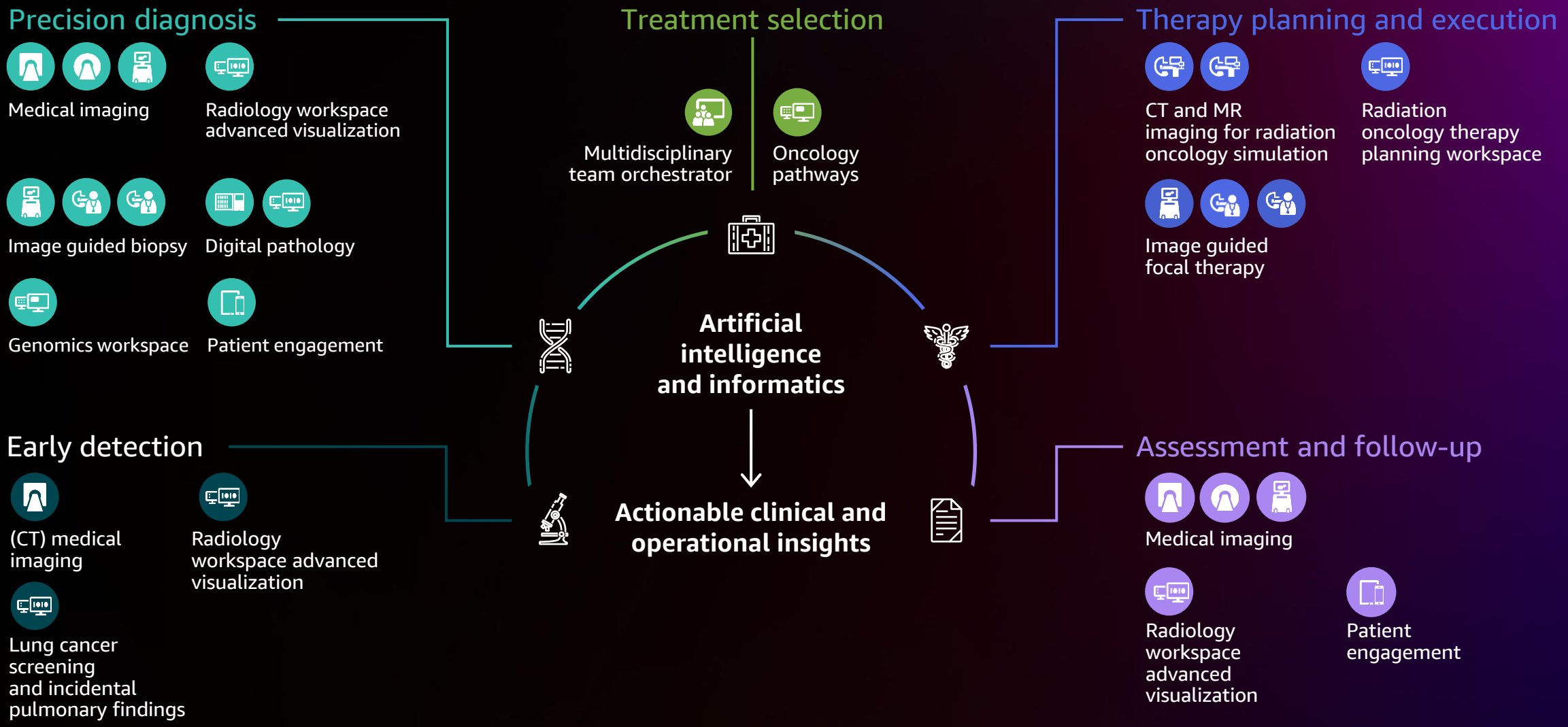
Lower cost of care

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Extracting actionable data



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Precision medicine and paradigm shift

COMPLEXITY OF DISEASE BIOLOGY



1 Molecular profiling

2 Prognostic markers

Markers predictive of drug sensitivity/resistance

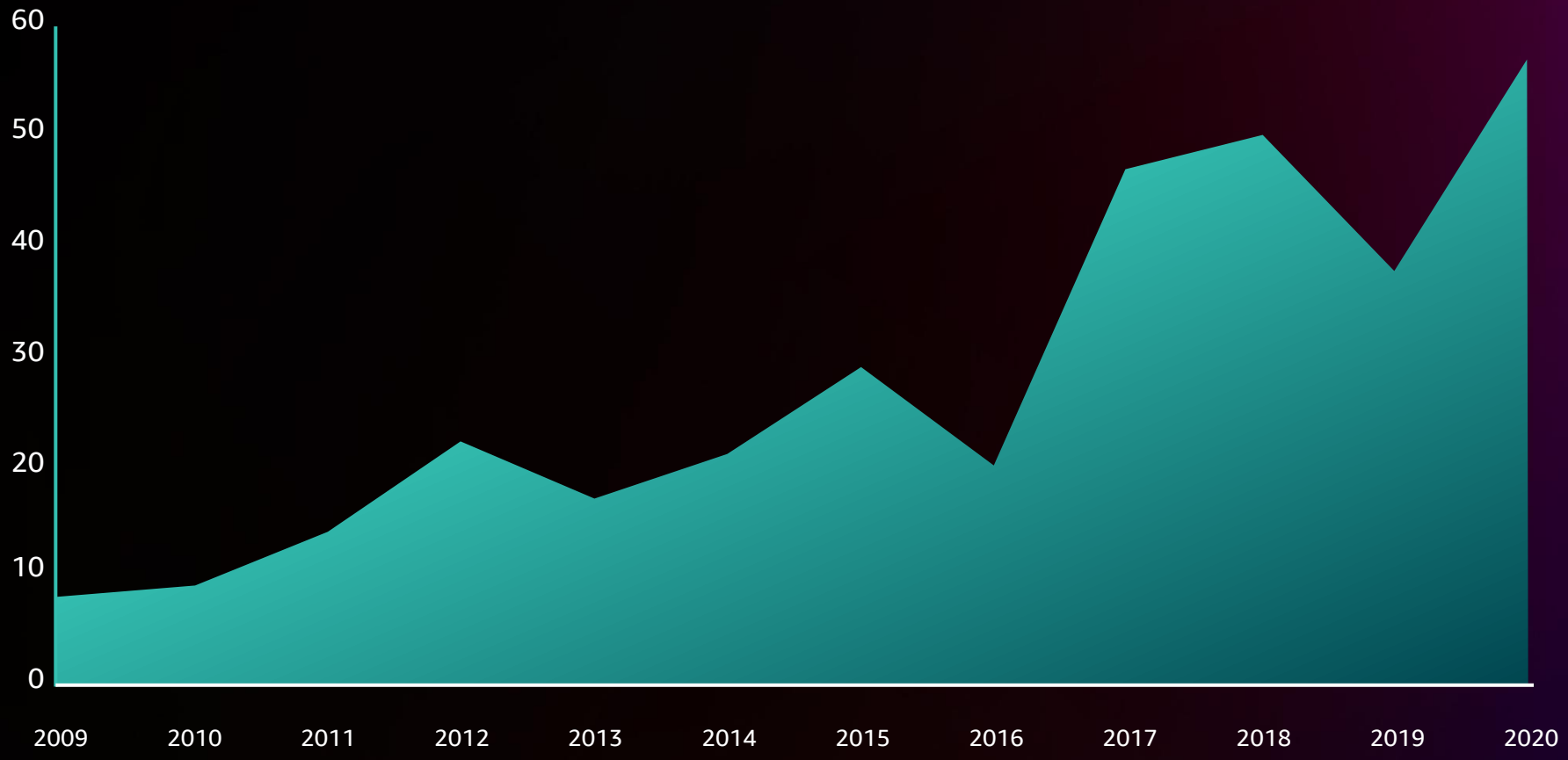
Markers predictive of adverse events

Population based → Individual “genotype-phenotype” based

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Number of cancer therapies approved each year

GROWING VOLUME OF TREATMENT OPTIONS FOR CLINICIANS TO EXPLORE



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Barriers to clinical adoption of NGS

SOPHISTICATED TECHNOLOGIES REQUIRE EXPERTISE IN THE FIELD

"More than **half reported** that NGS test results were **difficult to interpret** either often or sometimes. One-quarter said they referred patients to other providers for NGS testing, possibly suggesting a **lack of expertise** or **comfort** for ordering and interpreting NGS tests."

From the American Society for Clinical Pathology report, "Most Oncologists Report They Actually Do Use Sequencing-Based Panels in Practice"

https://www.ascp.org/content/news-archive/news-detail/2019/02/04/most-oncologists-report-they-actually-do-use-sequencing-based-panels-in-practice

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Elements of actionability

Alterations

- Retrieve literature, aggregate data (including unpublished internal data)
- Manually annotate the functional significance of the alterations
- Test variants of unknown significance in vitro to identify potential function

Drugs

- Annotate drug targets, development status (FDA approved or clinical development), and therapeutic implications (if any)

Clinical trials

- Manually annotate the trials' genotype/biomarker-specific selection criteria
- Annotate for other inclusion criteria, including tumor type, bring in NLP

Patient responses

- Integration with HER to identify patients treated with 'matched' agent to annotate clinical response
- Allows for N-of-1 annotation for next patient with identical mutation

The University of Texas
MD Anderson

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Solving with technology

THE VALUE AND IMPORTANCE OF SAAS SOLUTIONS



Sheer volume

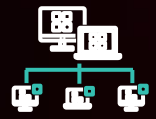


Complexity requires multi-inputs



Compute and storage

- Large genomics files/processing time for pipelines/elastic demand on resources



Multi-tenant use cases

- Hybrid multi-tenant:
  - Connects experts across centers
  - Use of real-time updates in biological interpretation
- Interoperability across facilities and institutions



Analytics and data sharing

- Combining de-identified data to “learn” from cohorts of patients
- Big data problem – small N!

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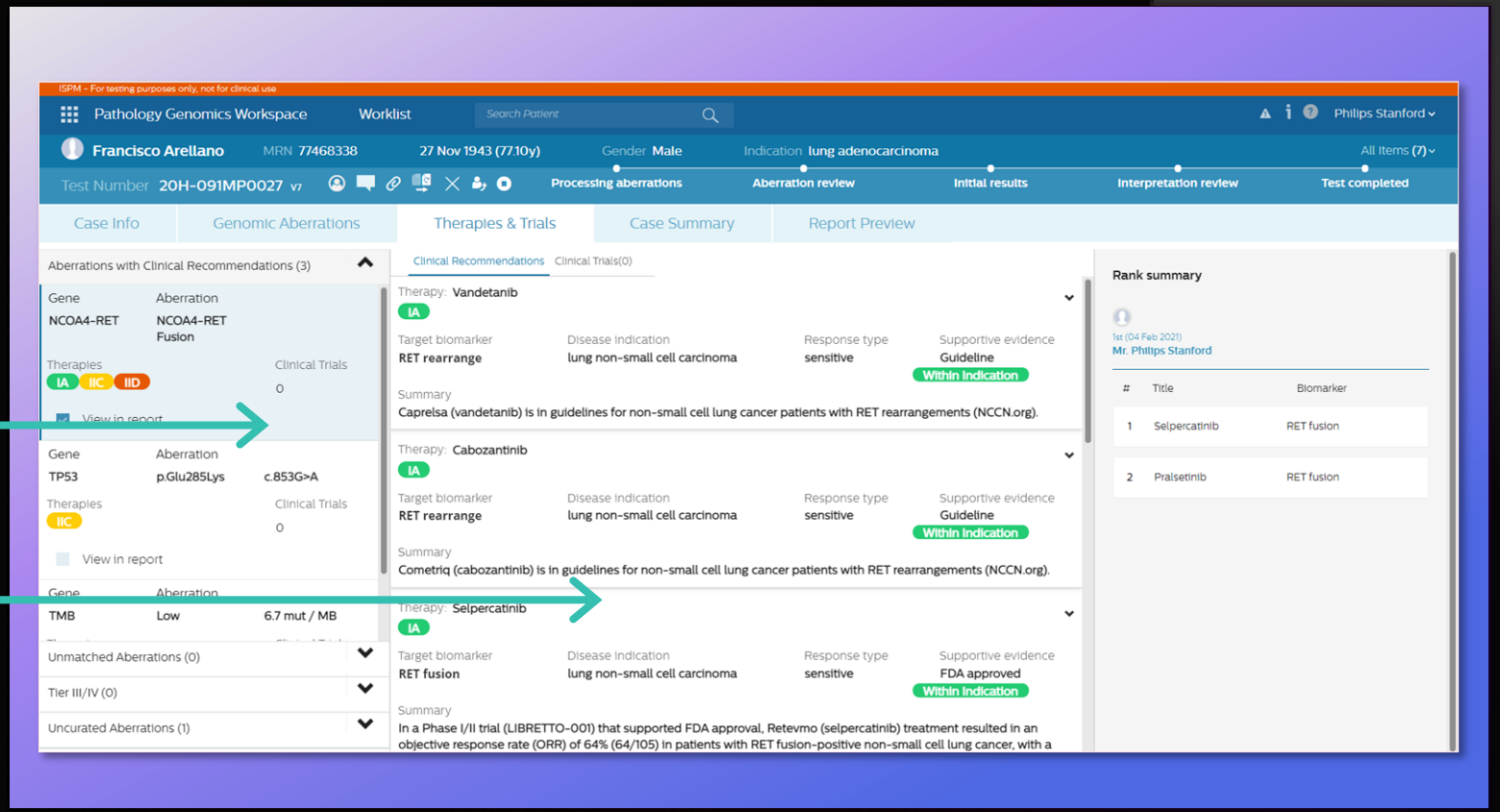
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Philips genomics workspace and MD Anderson PODS

Variant level actionability shown to drive trial enrollment

Genotype- and tumor type–matched clinical trials included



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Translational impact

IMPROVED CLARITY

"The right drugs at the right time for the right patient: the MD Anderson precision oncology decision support platform"
Drug Discovery Today
December 2015

10.1016/j.drudis.2015.05.013

"'Personalized Cancer Therapy': A Publicly Available Precision Oncology Resource"
Focus On Computer Resources
Cancer Research
October 31, 2017

https://doi.org/10.1158/0008-5472.CAN-17-0341

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The University of Texas
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Data-informed care

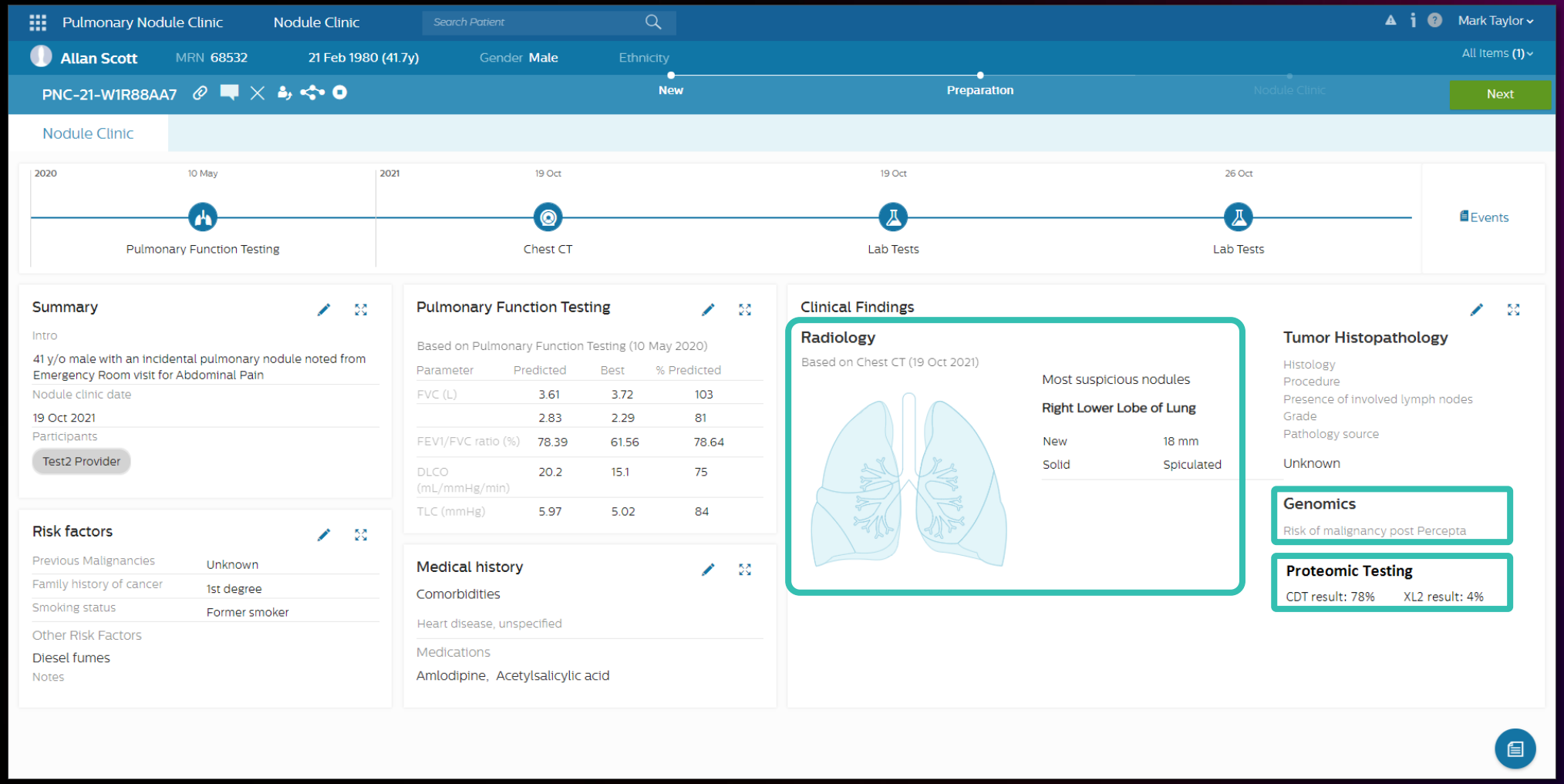
Precision Oncology Decision Support system (PODS)* was created and designed to provide our clinicians with information in real time on mutations, whether they are actionable, and available clinical trials for those that are actionable

*PODS is a third-party service integrated to Philips Genomics WS

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Exploring signals from the body

"RIGHT NEXT STEP" – INTEGRATED RADIOLOGY, GENOMICS, PROTEOMICS



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Measurement and learning at each step

IntelliSpace Precision Medicine – Oncology Platform | Patient list | Workflows | Insights | Charlie Chaplin

Insights

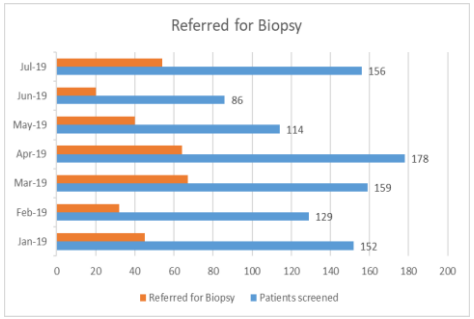
Generate Report

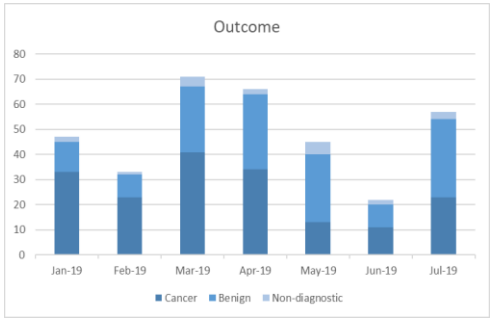
Lung Screening | Incidental Findings | Biopsy & Outcomes

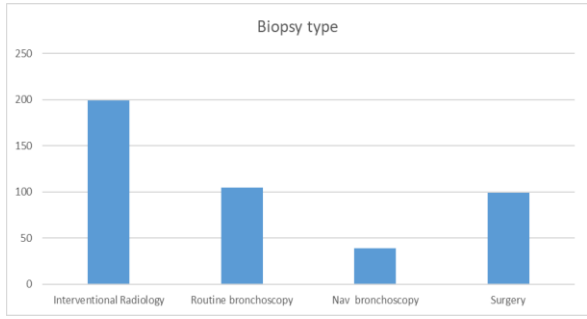
Date range: 01/01/2019 – 07/01/2019 Facility: All

Biopsy and Outcomes

Date	Patients screened	Referred for biopsy	Cancer	Benign	Non-diagnostic	Interventional Radiology	Routine bronchoscopy	Nav bronchoscopy	Surgery	Total
Jan-19	152	45	33	12	2	34	14	5	16	313
Feb-19	129	32	23	9	1	45	12	4	11	266
Mar-19	159	67	41	26	4	23	32	7	17	376
Apr-19	178	64	34	30	2	34	19	7	12	380
May-19	114	40	13	27	5	21	9	3	18	250
Jun-19	86	20	11	9	2	27	11	9	11	186
Jul-19	156	54	23	31	3	15	8	4	14	308
Total	974	322	178	144	19	199	105	39	99	







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Philips genomics workspace

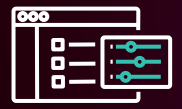
FROM MOLECULAR DATA TO CLINICAL IMPACT



Automate genomic analysis for more precise diagnostics and to inform therapy options and clinical trials



Automated end-to-end workflow
Automated integration of clinical data



Customizable knowledgebase and report generation



Actionability for oncologists



Support clinical and research applications with analytics



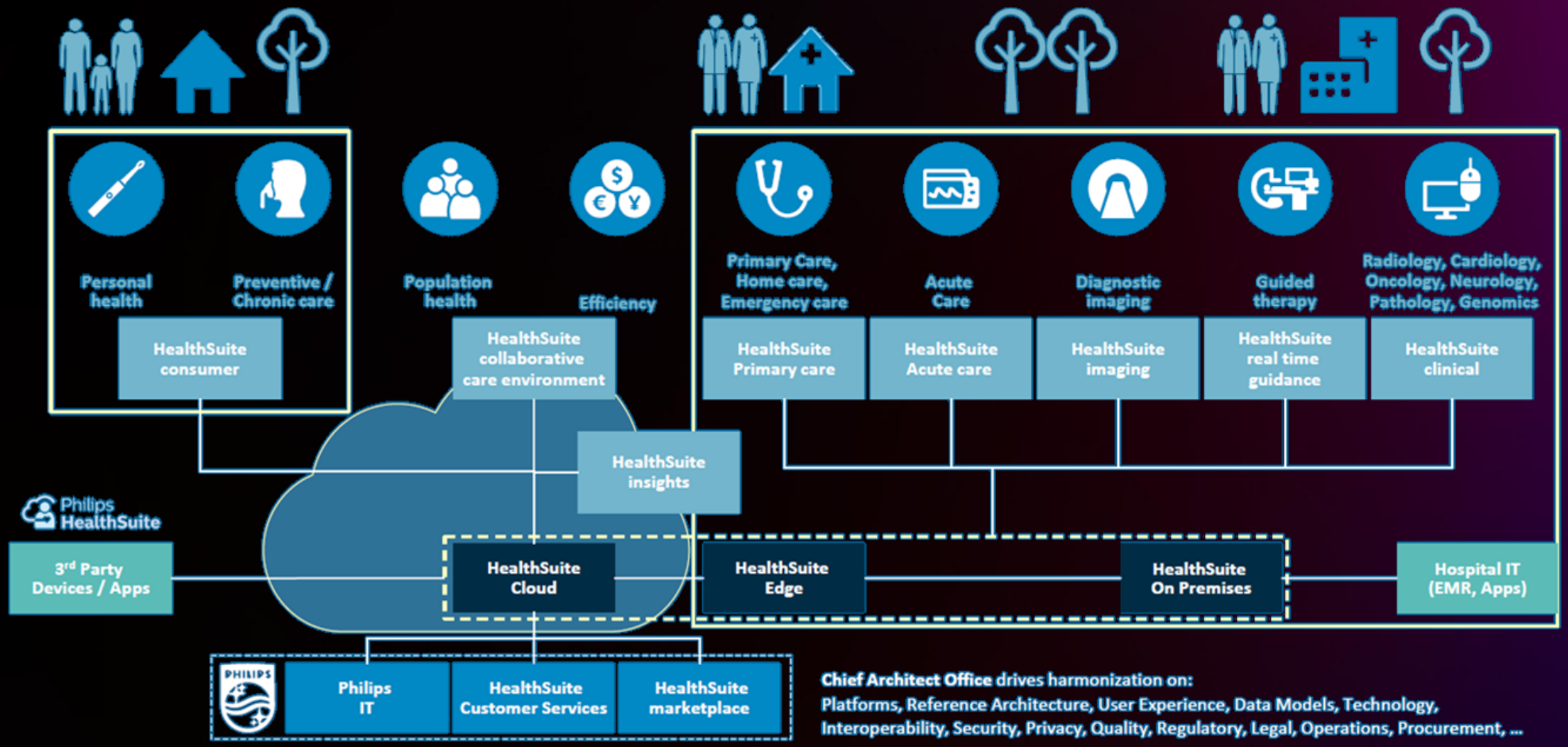
Molecular Tumor Board

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Philips HealthSuite reference architecture



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IntelliSpace precision medicine

SECURITY OVERVIEW

HSD

Responsible for security of their application and data

Pathways, genomics | **Lung Cancer Orchestrator** | **Tumor Board**

Client-side and server-side data encryption and data integrity authentication

HSP

Responsible for security "in" the cloud

Platform: interoperability, audit, identity and access management

Operating system, elastic search, network, and firewall configuration

SOC 2 Type 1 and Type 2, ISO 27001/27018, HIPAA/HITRUST, CSA STAR Level 2 Certified

Philips HealthSuite

AWS

Responsible for security "of " the cloud

Compute | **Storage** | **Database** | **Networking**

AWS Global Infrastructure

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Secure



Connected



Intelligent

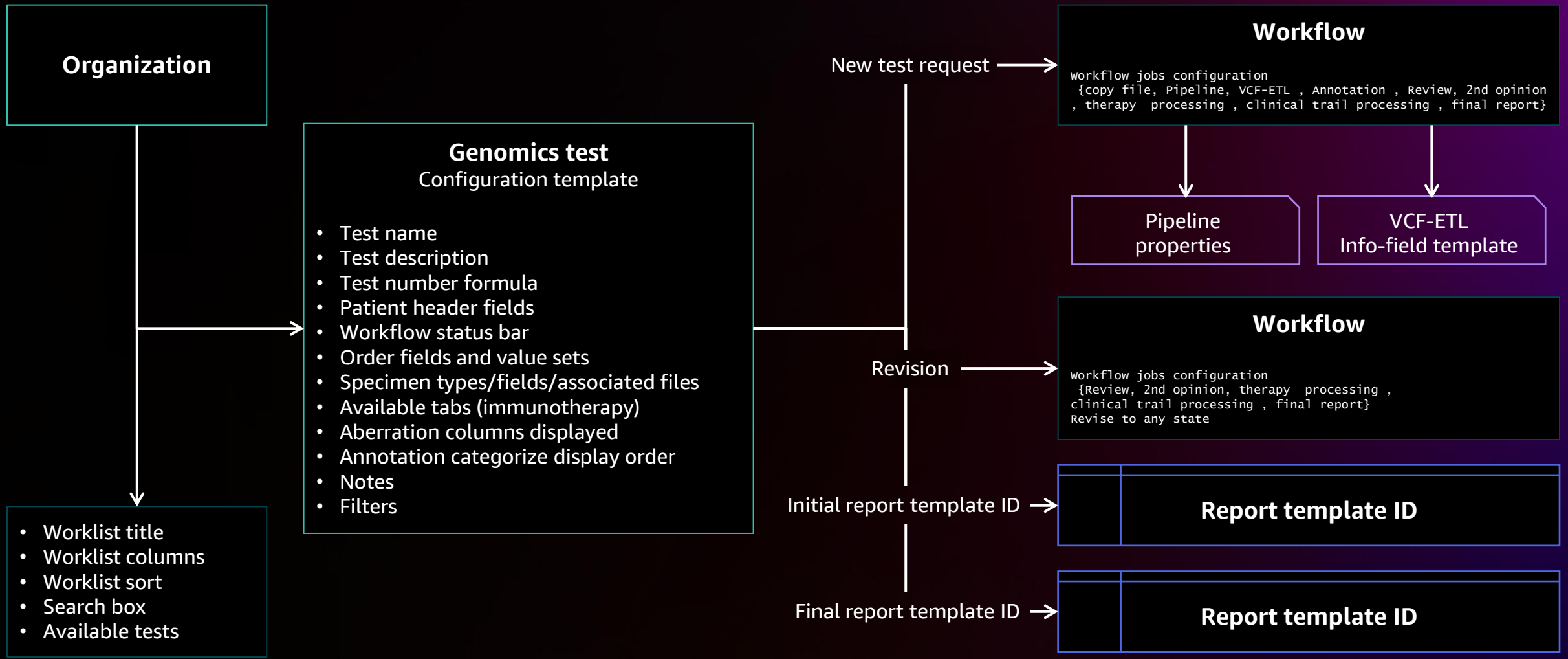
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Philips genomics workspace OpenTest

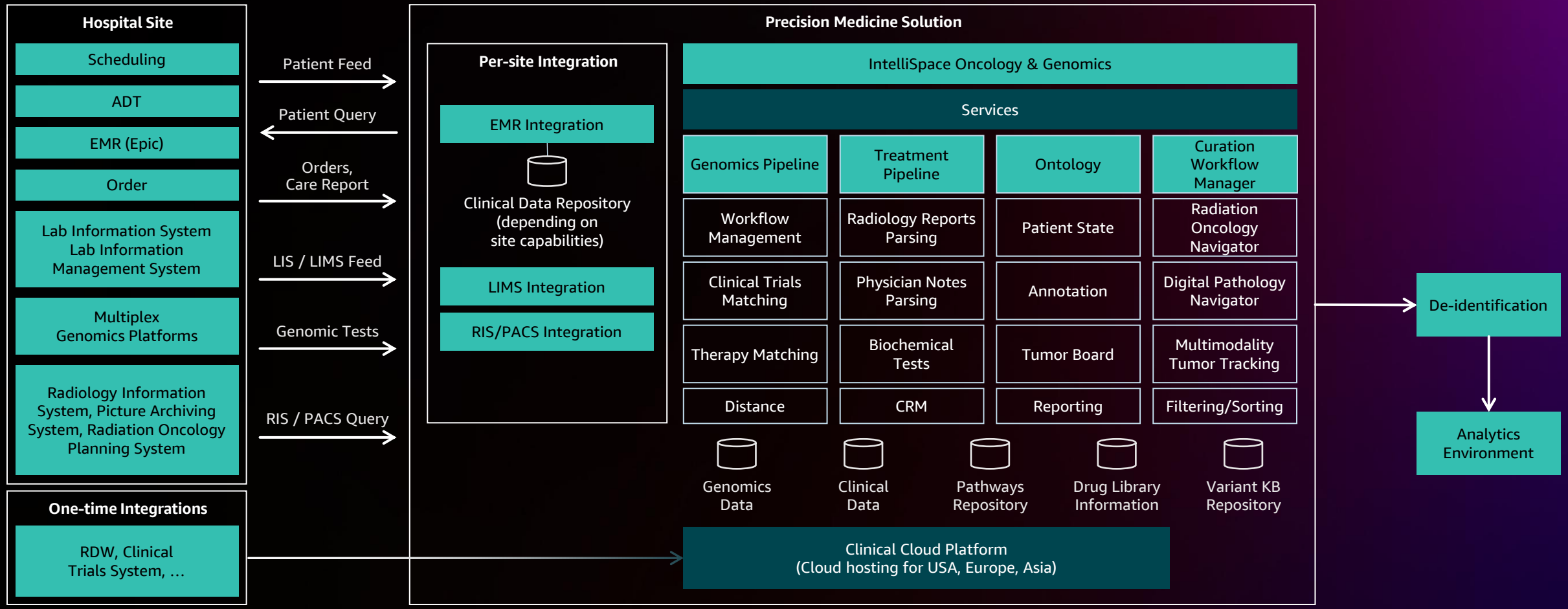
GENOMIC TEST ONBOARDING



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Solution architecture and HIS integration

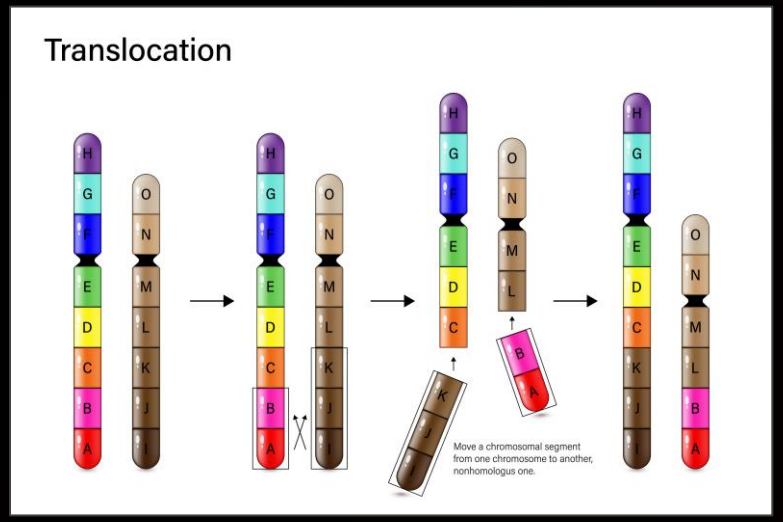
HIGH-LEVEL DEPLOYMENT OVERVIEW

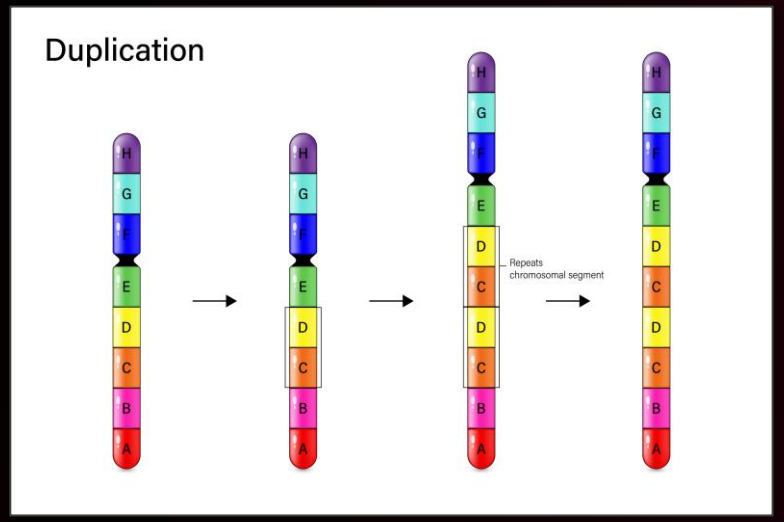


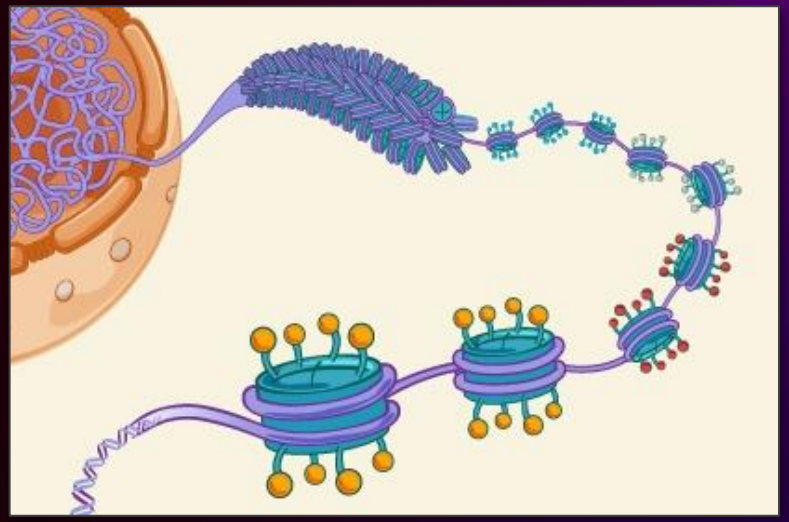
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What’s next?







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In closing

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AWS and Children's National Hospital





"I drew a heart because I love all of the people that took care of me at Children's National."

Patient artwork provided by

Alice
Age 11
Patient with neurological condition

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Explore **AWS Healthcare and Life Sciences demos** and new additions to the AWS for Health portfolio!



Location: AWS Industries Networking Lounges; Caesars Forum Main Hall

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