ClearView Healthcare Partners

THE ALLIANCE FOR DIGITAL PATHOLOGY

Value of Digital Pathology

Alliance 2020 Conference Presentation

February 27, 2020

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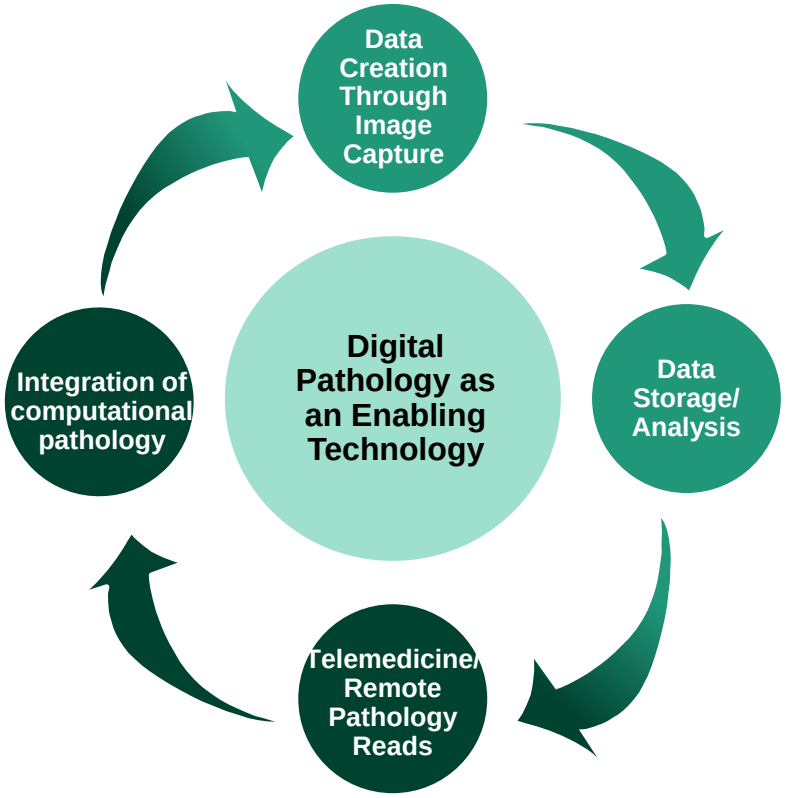
In addition to advancing digital pathology technology we need to advance our ability to articulate the value it can provide.



1) Initially the focus has been on creation of data through advancements in image capture technologies
2) This created a need for improvements data storage and analysis
3) It also enables telemedicine/remote pathology reads through data transfer
4) We are now beginning to evaluate how to integrate of computational pathology

An initial focus on data collection and storage undersells the potential value of digital pathology technology

Many companies are now exploring additional value additive opportunities in this space including a number of venture backed start-up companies.

NON-EXHAUSTIVE

Company	Overview	Product Capabilities
PHILIPS	• A global health technology company offering a wide array of digital services across therapeutic areas and care continuum	• **TissueMark** allows automated detection and quantification in NSCLC and breast cancer • **Xplore** is a data management system for tissue micro array studies
TEMPUS	• A medical startup advancing precision medicine in oncology with data-driven approaches and artificial intelligence	• Next generation DNA and RNA sequencing tests • Pathology and radiology image analysis • An AI-enabled laboratory test platform contextualizing test results within clinical contexts
inspirata	• A medical startup developing oncology informatics solutions to facilitate translational medicine in cancer	• **Dynamyx** streamlines pathology workflows and provides condition-specific algorithms and functional frameworks to generate automated diagnostic insights
PathAI	• A startup supplying AI-powered technology for pathology to improve diagnostic accuracy and enable personalized medicine	• Quantitative assessment of liver histology in patients with NASH • AI-powered analysis of PD-L1 expression in prediction of treatment response in non-small cell lung cancer patients
PAIGE	• A computational pathology startup employing clinical-grade artificial intelligence in cancer diagnosis and treatment	• Received FDA breakthrough designation in 2019 • **Paige Modules** offer tools for cancer detection, stratification, and segmentation, prediction of treatment response and survival
BostonGene	• A biomedical software startup to advance and improve cancer treatment decision-making	• **BostonGene Molecular-Functional Portrait** analyzes the microenvironment, molecular, and cellular composition of tumors and next-generation sequencing data

Source: Company Website and Press Releases; ClearView Analysis.

Digital pathology services and products can offer greater efficiency, improved quality, and/or novel information in clinical care.

Key Value Propositions in Digital Pathology

Greater Efficiency to Optimize Time and Cost

- Digital pathology can generate results more rapidly, thereby streamlining pathology workflow and reducing the burden on providers and pathologists

Improved Quality of Patient Care

- It can also improve consistency and accuracy in diagnostic testing versus subjective pathology techniques
- Algorithms can be trained to correlate quantitative features with patient outcome, thus enabling precision and personalized medicine

Novel Information to Inform Treatment

- It can also facilitate the translation of expanded medical knowledge into clinically meaningful applications (i.e., data derived treatment decisions/diagnoses)
- When visual assessment is limited, machine learning methods may help identify new features in image analysis

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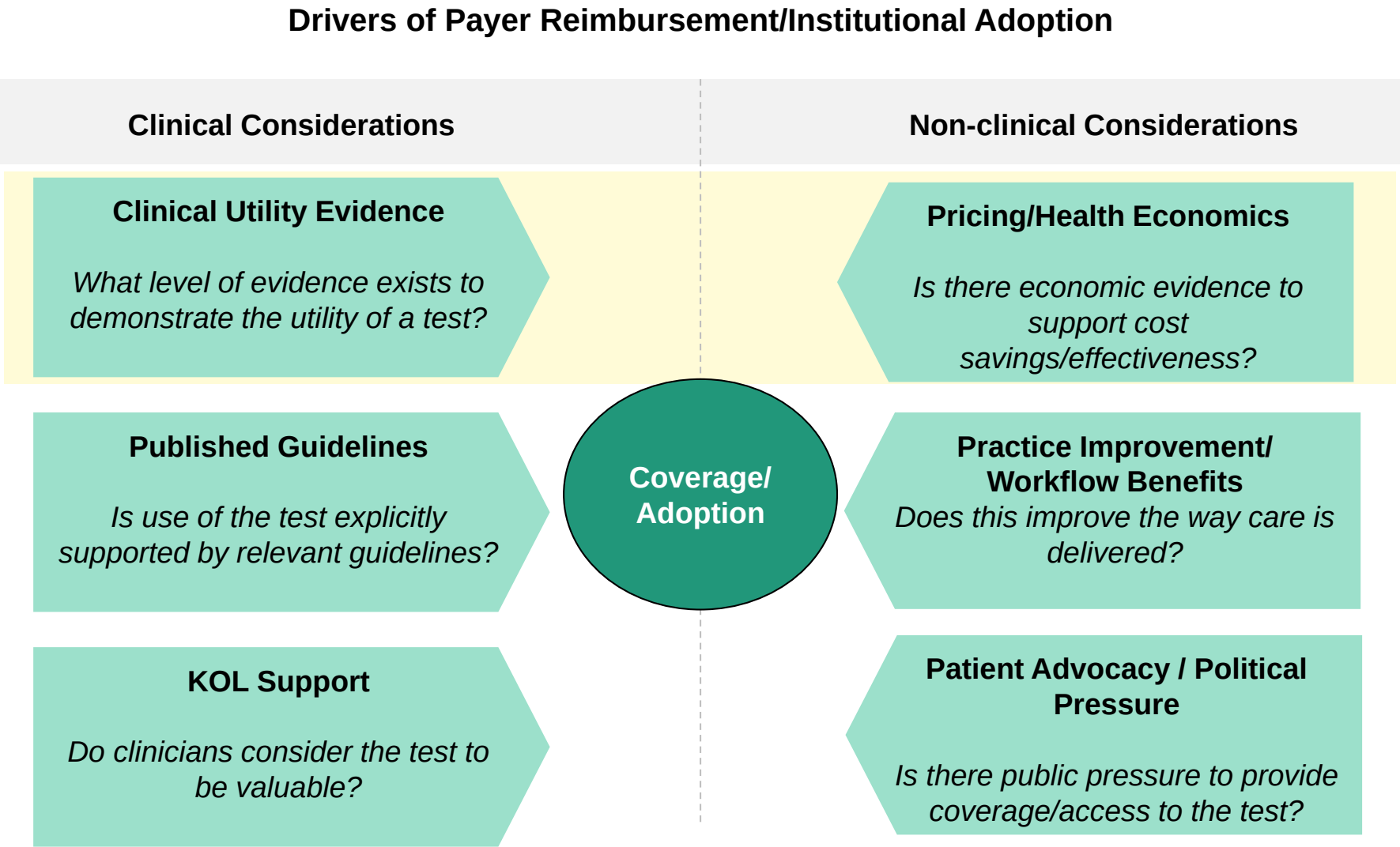
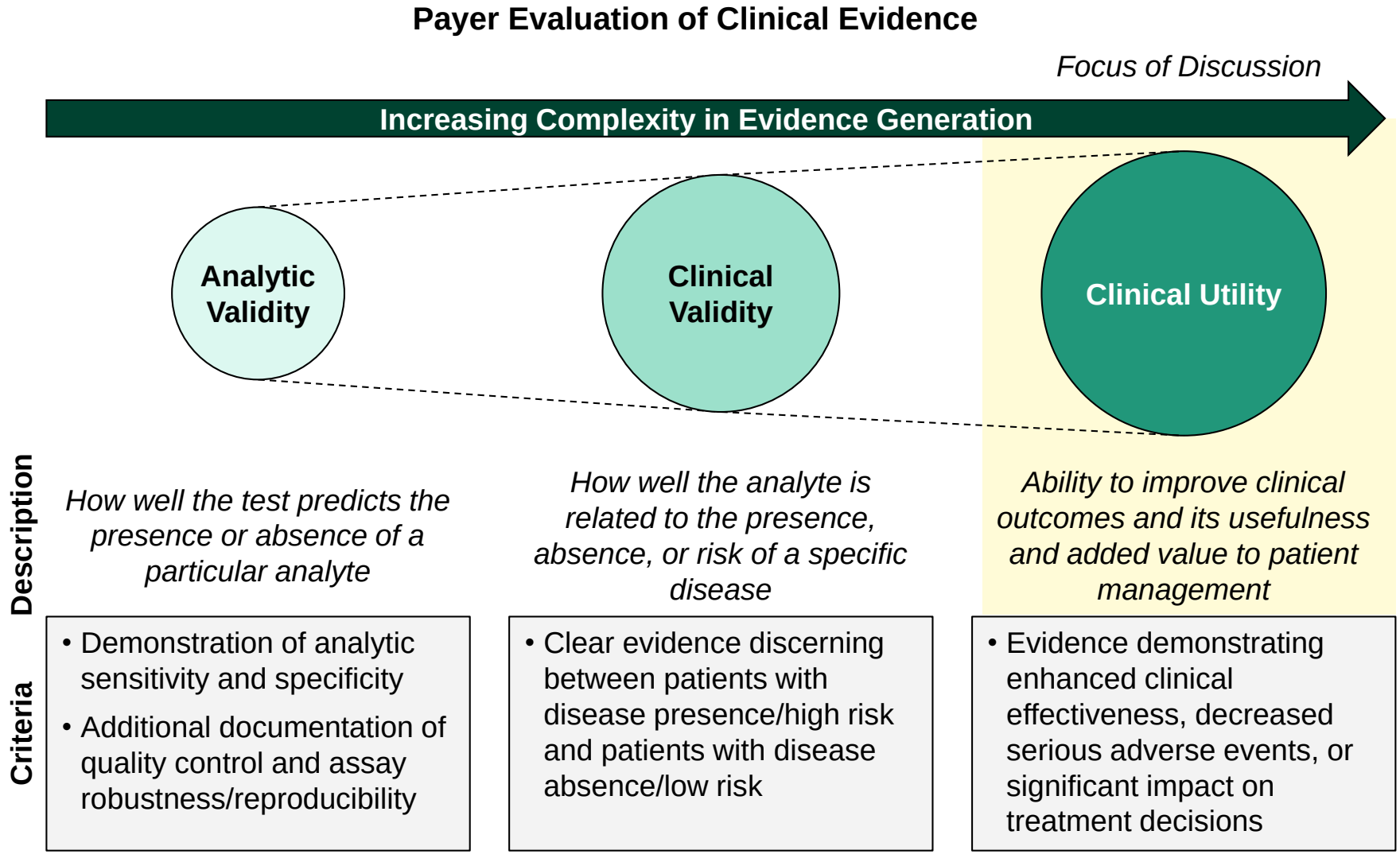
Payer coverage and hospital system adoption decisions are influenced by both clinical and non-clinical factors.



Source: ClearView Analysis.

Evidence of clinical utility is distinct from analytical and clinical validity and requires proof of enhanced clinical outcomes and/or patient management.



Source: ClearView Analysis.

There are a myriad of study designs/approaches digital pathology innovators can take to demonstrate clinical utility.

Trial Design	Endpoints/Outputs	Payer Needs Met	Issues/Limitations
Prospective Multicenter RCT	• Treatment decision-making and outcomes such as progression-free survival / reduced morbidity and mortality	• Use results in improvements in patient outcomes	• Expensive and complex
Prospective Observational/ Case Cohort Studies	• Validation of test accuracy • Shows potential impact of test on treatment	• Test results are reliable, accurate, and predictive of in identified populations	• Open to potential biases on basis of trial design
Pre-Test/Post Test Studies	• Confirmation of anticipated changes in treatment behavior in a limited timeframe	• Means to confirm impact on physician and patient treatment decisions • Especially important if validating the use of an emerging care paradigm	• Does not track real follow-through or highlight potential outcome benefits
Data Registry	• Confirmation of test value and actual adoption and practice changes	• Provides evidence to defend any aggressive utilization controls or management	• Requires willing participation from customers • May be difficult to spin out publication
Payer claims analysis	• Confirmation of test value and actual adoption and practice changes	• Tracking of reality of test influence on behavior	• Data may not be portable to other payers • Can be tied to risk-sharing concepts

Source: ClearView Analysis.

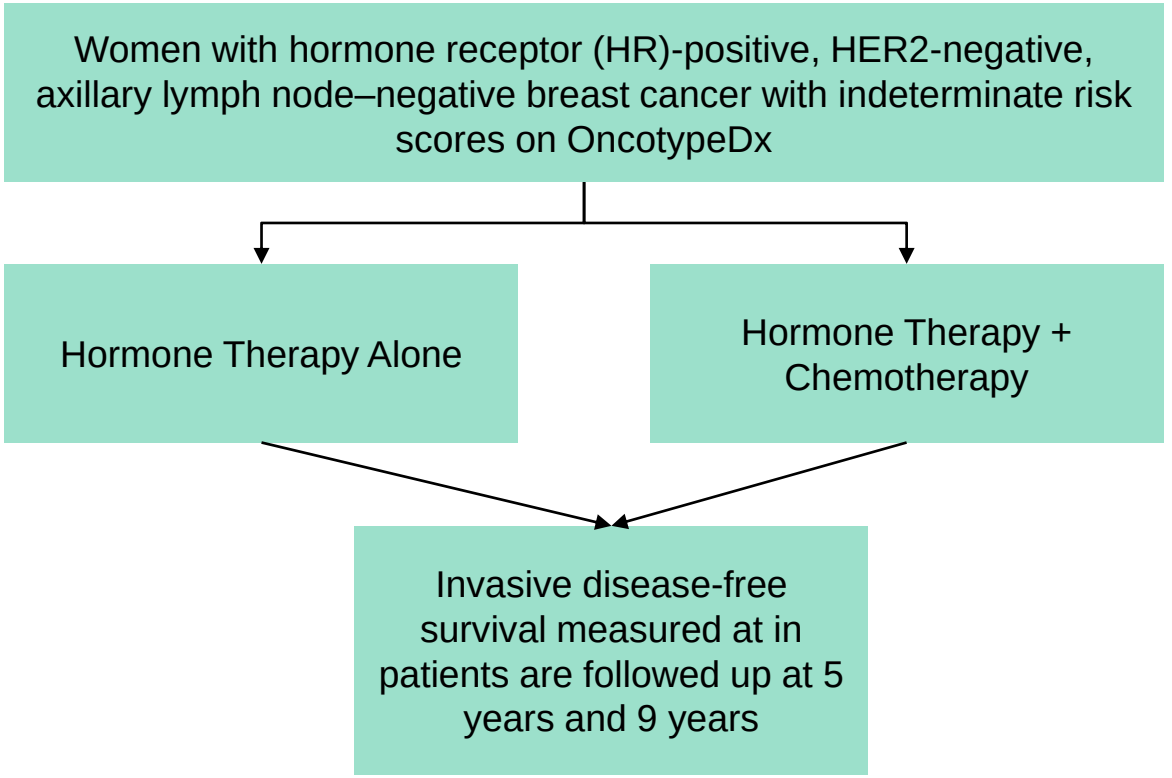
Genomic Health was able to leverage the TAILORx randomized controlled trial through policy/government (NCI) support.

Study Objective	*Determine best therapy for women who have node-negative, estrogen-receptor positive breast cancer by using Oncotype DX, and whether hormone therapy +/- chemotherapy is better for women who have an Oncotype DX recurrence score of 11-25*

Study Components

- **Number of sites:** 1,182 sites in the United States, Australia, Canada, Ireland, New Zealand, and Peru
- **N:** 10,273 women
- **Analysis:**
  - Compare hormone therapy alone vs. hormone therapy plus chemotherapy
- **Endpoints:**
  - Invasive disease-free survival
  - Overall survival
  - Recurrence rate

Trial Design



Source: Clinicaltrials.gov NCT00310180; ClearView Analysis.

Health economics value can be demonstrated in different ways.

Types of Health Economic Models/Data

	Cost Impact	Cost-effectiveness
Description	• An analysis of the direct cost additions/offsets associated with deployment of technology	• A review of the cost of intervention relative to the outcomes (effects) associated with different courses of action
Key features	• Focus on money saved/avoided costs (“does this save me money”) • Cost PM/PM • Often simple Excel based/VBS calculators	• Focus on value for money spent (“yes it may cost more but is it worth it”) • QALYs gained per $ spent, ICERs • Often more sophisticated tools (e.g., Markov models)
Where useful	• Often focused on a particular technology/intervention • Useful in situations where cost offsets are unclear • More often used in the US by commercial payers	• Very often used at programmatic or a societal level • In situations were relative trade-offs between different health interventions needs to be measured • Often used ex-US (e.g., the UK’s NICE)

Source: ClearView Analysis.

There has been limited work done to date to support our understanding of the health economic impact of digital health technologies

Can Digital Pathology Result In Cost Savings? A Financial Projection For Digital Pathology Implementation At A Large Integrated Health Care Organization

Jonhan Ho, Stefan M. Ahlers, [...], and Anil V. Parwani

Original Article

Evaluating the benefits of digital pathology implementation: time savings in laboratory logistics

Alexi Baidoshvili, Anca Bucur, Jasper van Leeuwen, Jeroen van der Laak, Philip Kluin, Paul J van Diest

First published:20 June 2018 | https://doi.org/10.1111/his.13691 | Citations: 7

Implementation of Digital Pathology Offers Clinical and Operational Increase in Efficiency and Cost Savings

Matthew G. Hanna, MD; Victor E. Reuter, MD; Jennifer Samboy, MS; Christine England, MS, MBA; Lorraine Corsale, BS; Samson W. Fine, MD; Narasimhan P. Agaram, MBBS; Evangelos Stamelos, MS; Yukako Yagi, PhD; Meera Hameed, MD; David S. Klimstra, MD; S. Joseph Sirintrapun, MD

The cost analyses that have been done to date have been primarily focused on understanding the time and cost efficiencies associated with different workflows rather than measure direct clinical outcome impact

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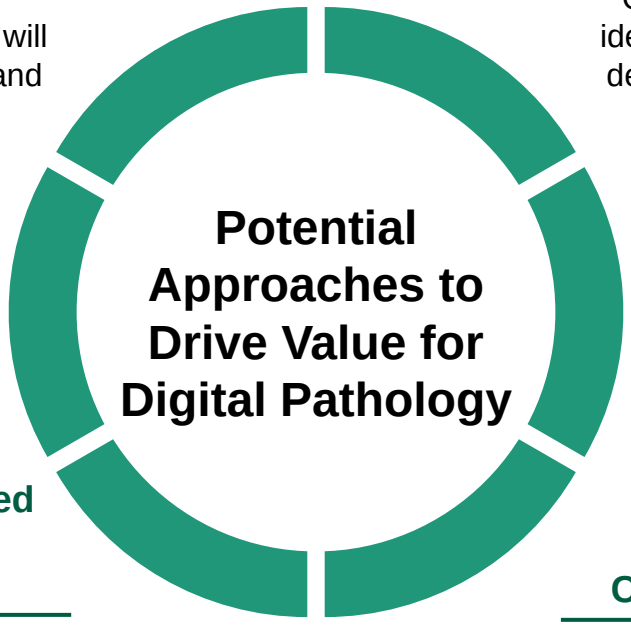
We can explore several different strategies to drive patient access for digital pathology technologies.

Overview of ClearView Value Proposition as a Strategic Partner



Identify Key Clinical Use Cases

Determine which applications/value propositions will best support digital pathology and focus efforts on these

Harmonize Clinical Utility Data to Create Virtuous Cycle

Once success are had a data collection infrastructure will be in place that will allow for more digital pathology innovation

Consider Govt Sponsored Studies and/or Policy/Legislation

Some issues may not be resolvable through reimbursement reform alone and may require a legislative fix

Align on Clinical Utility/CEA Approaches

Once applications have been identified we must collaborate to develop and deploy reasonable clinical utility/CEA studies

Coverage/Guidelines Process Engagement

We must engage guidelines bodies and key payer groups to gain their support for coverage and routine payment

Coding/Payment Reform

We must create novel coding that enables use of technologies in practice (i.e., CPTs, PLAs, payment for interpretation and reporting, digital pieces, etc.)